

METPOR SA - AESA - ANCAP
 FILTRO TAG 3101L A/B
 SOIME SRL - 1654-MC-01 REV.C
 PV Elite 2010 Licensee: S.O.I.M.E. S.R.L.
 FileName : 1654-MC-3101L_C----- Page 64
 Nozzle Calcs. : I Nozl: 10 10:21a May 17,2010

Nozzle Junction Minimum Design Metal Temperature (MDMT) Calculations:

MDMT of the Nozzle Neck to Flange Weld, Curve:
 B

 Govrn. thk, tg = 11.113 , tr = 1.372 , c = 3.2000 mm , E* = 1.00
 Stress Ratio = tr * (E*) / (tg - c) = 0.173 , Temp. Reduction = 78 C

Min Metal Temp. w/o impact per UCS-66 -26 C
 Min Metal Temp per UCS-66 and UCS-68(c),PWHT credit -42 C
 Min Metal Temp. at Required thickness (UCS 66.1) -104 C

MDMT of Nozzle-Shell/Head Weld for the Nozzle (UCS-66(a)1(b)), Curve: B

 Govrn. thk, tg = 9.500 , tr = 2.855 , c = 3.2000 mm , E* = 1.00
 Stress Ratio = tr * (E*) / (tg - c) = 0.453 , Temp. Reduction = 41 C

Min Metal Temp. w/o impact per UCS-66 -29 C
 Min Metal Temp per UCS-66 and UCS-68(c),PWHT credit -46 C
 Min Metal Temp. at Required thickness (UCS 66.1) -65 C

Governing MDMT of all the sub-joints of this Junction : -65 C

ANSI Flange MDMT including Temperature reduction per UCS-66.1:

Unadjusted MDMT of ANSI B16.5/47 flanges per UCS-66(c) -29 C
 Flange MDMT with Temp reduction per UCS-66(b) (1) (b) -40 C
 Flange MDMT with Temp reduction per UCS-66(b) (1) (c) -104 C

Where the Stress Reduction Ratio per UCS-66(b) (1) (b) is :
 Design Pressure/Ambient Rating = 1.58/1.97 = 0.803

Note: Using the minimum value from (b) (1) (b) and (b) (1) (c) above
 as the calculated nozzle flange MDMT.

Weld Size Calculations, Description: I

Intermediate Calc. for nozzle/shell Welds Tmin 6.3000 mm

Results Per UW-16.1:

| | Required Thickness | Actual Thickness |
|-------------|----------------------|----------------------|
| Nozzle Weld | 4.4100 = 0.7 * tmin. | 5.6560 = 0.7 * Wo mm |

Weld Strength and Weld Loads per UG-41.1, Sketch (a) or (b)

Weld Load [W]:
 = (A-A1+2*tn*fr1*(E1*t-tr))*Sv
 = (586.8178 - 692.3030 + 2 * 7.9125 * 0.8550 *
 (1.00 * 6.3000 - 2.8549)) * 137
 = 0.00 N

Note: F is always set to 1.0 throughout the calculation.

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Weld Load [W1]:

$$= (A2+A5+A4-(Wi-Can/.707)^2*fr2)*Sv$$

$$= (176.1638 + 0.0000 + 54.7200 - 0.0000 * 0.86) * 137$$

$$= 31836.17 \text{ N}$$

Weld Load [W2]:

$$= (A2 + A3 + A4 + (2 * tn * t * fr1)) * Sv$$

$$= (176.1638 + 0.0000 + 54.7200 + (85.2414)) * 137$$

$$= 43589.96 \text{ N}$$

Weld Load [W3]:

$$= (A2+A3+A4+A5+(2*tn*t*fr1))*S$$

$$= (176.1638 + 0.0000 + 54.7200 + 0.0000 + (85.2414)) * 137$$

$$= 43589.96 \text{ N}$$

Strength of Connection Elements for Failure Path Analysis

Shear, Outward Nozzle Weld [Sonw]:

$$= (\pi/2) * Dlo * Wo * 0.49 * Snw$$

$$= (3.1416 / 2.0) * 219.0750 * 8.0000 * 0.49 * 117$$

$$= 159035. \text{ N}$$

Shear, Nozzle Wall [Snw]:

$$= (\pi * (Dlr + Dlo)/4) * (Thk - Can) * 0.7 * Sn$$

$$= (3.1416 * 105.5812) * (11.1125 - 3.2000) * 0.7 * 117$$

$$= 216592. \text{ N}$$

Tension, Shell Groove Weld [Tngw]:

$$= (\pi/2) * Dlo * (Wgnvi-Cas) * 0.74 * Sng$$

$$= (3.1416 / 2.0) * 219.0750 * (8.3344 - 3.2000) * 0.74 * 137$$

$$= 180286. \text{ N}$$

Strength of Failure Paths:

PATH11 = (SONW + SNW) = (159034 + 216591) = 375626 N
 PATH22 = (Sonw + Tpgw + Tngw + Sinw)

$$= (159034 + 0 + 180285 + 0) = 339320 \text{ N}$$

 PATH33 = (Sonw + Tngw + Sinw)

$$= (159034 + 180285 + 0) = 339320 \text{ N}$$

Summary of Failure Path Calculations:

Path 1-1 = 375626 N , must exceed W = 0 N or W1 = 31836 N
 Path 2-2 = 339320 N , must exceed W = 0 N or W2 = 43589 N
 Path 3-3 = 339320 N , must exceed W = 0 N or W3 = 43589 N

Maximum Allowable Pressure for this Nozzle at this Location:
 Converged Max. Allow. Pressure in Operating case 2.0179 MPa

Nozzle is O.K. for the External Pressure 0.103 MPa

The Drop for this Nozzle is : 25.9096 mm
 The Cut Length for this Nozzle is, Drop + Ho + H + T : 206.9616 mm

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Nozzle Calcs. : I

Noz1: 10 10:21a May 17,2010

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Nozzle Calcs. : UC Nozl: 11 10:21a May 17,2010

INPUT VALUES, Nozzle Description: UC From : 20

| | | | |
|---|--------|-----------|-----|
| Pressure for Reinforcement Calculations | P | 1.5826 | MPa |
| Temperature for Internal Pressure | Temp | 150 | C |
| Design External Pressure | Pext | 0.10 | MPa |
| Temperature for External Pressure | Tempex | 150 | C |
| Shell Material [Normalized] | | SA-516 | 70 |
| Shell Allowable Stress at Temperature | S | 137.90 | MPa |
| Shell Allowable Stress At Ambient | Sa | 137.90 | MPa |
| Inside Diameter of Cylindrical Shell | D | 489.00 | mm |
| Design Length of Section | L | 2039.8887 | mm |
| Shell Finished (Minimum) Thickness | t | 9.5000 | mm |
| Shell Internal Corrosion Allowance | c | 3.2000 | mm |
| Shell External Corrosion Allowance | co | 0.0000 | mm |
| Distance from Bottom/Left Tangent | | 730.0001 | mm |
| User Entered Minimum Design Metal Temperature | | -3.00 | C |
| Type of Element Connected to the Shell : Nozzle | | | |
| Material | | SA-105 | |
| Material UNS Number | | K03504 | |
| Material Specification/Type | | Forgings | |
| Allowable Stress at Temperature | Sn | 137.90 | MPa |
| Allowable Stress At Ambient | Sna | 137.90 | MPa |
| Diameter Basis (for tr calc only) | | OD | |
| Layout Angle | | 90.00 | deg |
| Diameter | | 3.6250 | in. |
| Size and Thickness Basis | | Actual | |
| Actual Thickness | tn | 15.8750 | mm |
| Corrosion Allowance | can | 3.2000 | mm |
| Joint Efficiency of Shell Seam at Nozzle | E1 | 1.00 | |
| Joint Efficiency of Nozzle Neck | En | 1.00 | |
| Outside Projection | ho | 76.2250 | mm |
| Weld leg size between Nozzle and Pad/Shell | Wo | 8.0000 | mm |
| Groove weld depth between Nozzle and Vessel | Wgnv | 8.3344 | mm |
| Inside Projection | h | 0.0000 | mm |
| Weld leg size, Inside Element to Shell | Wi | 0.0000 | mm |
| ASME Code Weld Type per UW-16 | | None | |

The Pressure Design option was Design Pressure + static head.

Nozzle Sketch (may not represent actual weld type/configuration)

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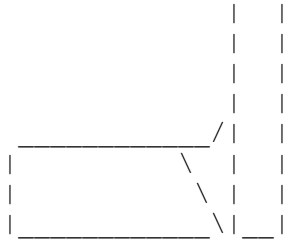
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Nozzle Calcs. : UC

Nozl: 11 10:21a May 17,2010



Insert Nozzle No Pad, no Inside projection

Reinforcement CALCULATION, Description: UC

ASME Code, Section VIII, Division 1, 2007, A-09 UG-37 to UG-45

Actual Outside Diameter Used in Calculation 3.625 in.

Actual Thickness Used in Calculation 0.625 in.

Nozzle input data check completed without errors.

Reqd thk per UG-37(a) of Cylindrical Shell, Tr [Int. Press]

= $(P \cdot R) / (S \cdot E - 0.6 \cdot P)$ per UG-27 (c) (1)

= $(1.58 \cdot 247.7000) / (137 \cdot 1.00 - 0.6 \cdot 1.58)$

= 2.8624 mm

Reqd thk per UG-37(a) of Nozzle Wall, Trn [Int. Press]

= $(P \cdot R_o) / (S \cdot E + 0.4 \cdot P)$ per Appendix 1-1 (a) (1)

= $(1.58 \cdot 46.0375) / (137 \cdot 1.00 + 0.4 \cdot 1.58)$

= 0.5259 mm

Required Nozzle thickness under External Pressure per UG-28 : 0.2721 mm

UG-40, Limits of Reinforcement : [Int. Press]

Parallel to Vessel Wall (Diameter Limit) D1 133.4500 mm

Parallel to Vessel Wall, opening length d 66.7250 mm

Normal to Vessel Wall (Thickness Limit), no pad Tlnp 15.7500 mm

Note: Taking a UG-36(c) (3) (a) exemption for UC.

This calculation is valid for nozzles that meet all the requirements of paragraph UG-36. Please check the Code carefully, especially for nozzles that are not isolated or do not meet Code spacing requirements. To force the computation of areas for small nozzles go to Tools->Configuration and check the box to force the area computation.

UG-45 Minimum Nozzle Neck Thickness Requirement: [Int. Press.]

Wall Thickness per UG45(a), tra = 3.7259 mm

Wall Thickness per UG16(b), tr16b = 4.7000 mm

Wall Thickness per UG45(b) (1), trb1 = 6.0624 mm

Wall Thickness per UG45(b) (3), trb3 = Max(trb1, trb2, tr16b) = 6.0624 mm

Std. Wall Pipe per UG45(b) (4), trb4 = 8.2228 mm

Wall Thickness per UG45(b), trb = Min(trb3, trb4) = 6.0624 mm

Final Required Thickness, tr45 = Max(tra, trb) = 6.0624 mm

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Nozzle Calcs. : UC Nozl: 11 10:21a May 17,2010

Available Nozzle Neck Thickness = 15.8750 mm --> OK

Nozzle Junction Minimum Design Metal Temperature (MDMT) Calculations:

MDMT of Nozzle-Shell/Head Weld for the Nozzle (UCS-66(a)1(b)), Curve: B

Govrn. thk, $t_g = 9.500$, $t_r = 2.862$, $c = 3.2000$ mm , $E^* = 1.00$
Stress Ratio = $t_r * (E^*) / (t_g - c) = 0.454$, Temp. Reduction = 41 C

Min Metal Temp. w/o impact per UCS-66 -29 C
Min Metal Temp per UCS-66 and UCS-68(c),PWHT credit -46 C
Min Metal Temp. at Required thickness (UCS 66.1) -65 C

Governing MDMT of all the sub-joints of this Junction : -65 C

Weld Size Calculations, Description: UC

Intermediate Calc. for nozzle/shell Welds T_{min} 6.3000 mm

Results Per UW-16.1:

| | Required Thickness | Actual Thickness |
|-------------|--------------------------|-------------------------|
| Nozzle Weld | $4.4100 = 0.7 * t_{min}$ | $5.6560 = 0.7 * W_o$ mm |

NOTE : Skipping the nozzle attachment weld strength calculations.
Per UW-15(b) (2) the nozzles exempted by UG-36(c) (3) (a)
(small nozzles) do not require a weld strength check.

Maximum Allowable Pressure for this Nozzle at this Location:
Converged Max. Allow. Pressure in Operating case 3.4478 MPa

Note: The MAWP of this junction was limited by the parent Shell/Head.

The Drop for this Nozzle is : 4.3734 mm
The Cut Length for this Nozzle is, Drop + Ho + H + T : 90.0984 mm

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Nozzle Calcs. : PSV Nozl: 12 10:21a May 17,2010

INPUT VALUES, Nozzle Description: PSV From : 20

| | | | |
|---|--------|--------|-----|
| Pressure for Reinforcement Calculations | P | 1.5742 | MPa |
| Temperature for Internal Pressure | Temp | 150 | C |
| Design External Pressure | Pext | 0.10 | MPa |
| Temperature for External Pressure | Tempex | 150 | C |

| | | | |
|---------------------------------------|----|-----------|-----|
| Shell Material [Normalized] | | SA-516 70 | |
| Shell Allowable Stress at Temperature | S | 137.90 | MPa |
| Shell Allowable Stress At Ambient | Sa | 137.90 | MPa |

| | | | |
|--------------------------------------|----|-----------|----|
| Inside Diameter of Cylindrical Shell | D | 489.00 | mm |
| Design Length of Section | L | 2039.8887 | mm |
| Shell Finished (Minimum) Thickness | t | 9.5000 | mm |
| Shell Internal Corrosion Allowance | c | 3.2000 | mm |
| Shell External Corrosion Allowance | co | 0.0000 | mm |

Distance from Bottom/Left Tangent 1573.0000 mm

User Entered Minimum Design Metal Temperature -3.00 C

Type of Element Connected to the Shell : Nozzle

| | | | |
|---------------------------------|-----|----------|-----|
| Material | | SA-105 | |
| Material UNS Number | | K03504 | |
| Material Specification/Type | | Forgings | |
| Allowable Stress at Temperature | Sn | 137.90 | MPa |
| Allowable Stress At Ambient | Sna | 137.90 | MPa |

| | | | |
|-----------------------------------|--|--------|-----|
| Diameter Basis (for tr calc only) | | OD | |
| Layout Angle | | 135.00 | deg |
| Diameter | | 3.6250 | in. |

| | | | |
|--------------------------|----|---------|----|
| Size and Thickness Basis | | Actual | |
| Actual Thickness | tn | 15.8750 | mm |

| | | | |
|--|-----|--------|----|
| Corrosion Allowance | can | 3.2000 | mm |
| Joint Efficiency of Shell Seam at Nozzle | E1 | 1.00 | |
| Joint Efficiency of Nozzle Neck | En | 1.00 | |

| | | | |
|---|------|---------|----|
| Outside Projection | ho | 76.2250 | mm |
| Weld leg size between Nozzle and Pad/Shell | Wo | 8.0000 | mm |
| Groove weld depth between Nozzle and Vessel | Wgnv | 8.3344 | mm |
| Inside Projection | h | 0.0000 | mm |
| Weld leg size, Inside Element to Shell | Wi | 0.0000 | mm |
| ASME Code Weld Type per UW-16 | | None | |

The Pressure Design option was Design Pressure + static head.

Nozzle Sketch (may not represent actual weld type/configuration)

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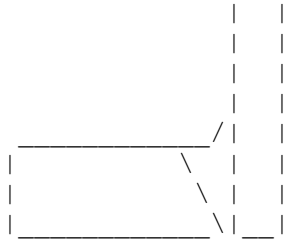
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Nozzle Calcs. : PSV

Nozl: 12 10:21a May 17,2010



Insert Nozzle No Pad, no Inside projection

Reinforcement CALCULATION, Description: PSV

ASME Code, Section VIII, Division 1, 2007, A-09 UG-37 to UG-45

Actual Outside Diameter Used in Calculation 3.625 in.

Actual Thickness Used in Calculation 0.625 in.

Nozzle input data check completed without errors.

Reqd thk per UG-37(a) of Cylindrical Shell, Tr [Int. Press]

= $(P \cdot R) / (S \cdot E - 0.6 \cdot P)$ per UG-27 (c) (1)

= $(1.57 \cdot 247.7000) / (137 \cdot 1.00 - 0.6 \cdot 1.57)$

= 2.8471 mm

Reqd thk per UG-37(a) of Nozzle Wall, Trn [Int. Press]

= $(P \cdot R_o) / (S \cdot E + 0.4 \cdot P)$ per Appendix 1-1 (a) (1)

= $(1.57 \cdot 46.0375) / (137 \cdot 1.00 + 0.4 \cdot 1.57)$

= 0.5231 mm

Required Nozzle thickness under External Pressure per UG-28 : 0.2721 mm

UG-40, Limits of Reinforcement : [Int. Press]

Parallel to Vessel Wall (Diameter Limit) D1 133.4500 mm

Parallel to Vessel Wall, opening length d 66.7250 mm

Normal to Vessel Wall (Thickness Limit), no pad Tlnp 15.7500 mm

Note: Taking a UG-36(c) (3) (a) exemption for PSV.

This calculation is valid for nozzles that meet all the requirements of paragraph UG-36. Please check the Code carefully, especially for nozzles that are not isolated or do not meet Code spacing requirements. To force the computation of areas for small nozzles go to Tools->Configuration and check the box to force the area computation.

UG-45 Minimum Nozzle Neck Thickness Requirement: [Int. Press.]

Wall Thickness per UG45(a), tra = 3.7231 mm

Wall Thickness per UG16(b), tr16b = 4.7000 mm

Wall Thickness per UG45(b) (1), trb1 = 6.0471 mm

Wall Thickness per UG45(b) (3), trb3 = Max(trb1, trb2, tr16b) = 6.0471 mm

Std. Wall Pipe per UG45(b) (4), trb4 = 8.2228 mm

Wall Thickness per UG45(b), trb = Min(trb3, trb4) = 6.0471 mm

Final Required Thickness, tr45 = Max(tra, trb) = 6.0471 mm

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Nozzle Calcs. : PSV Nozl: 12 10:21a May 17,2010

Available Nozzle Neck Thickness = 15.8750 mm --> OK

Nozzle Junction Minimum Design Metal Temperature (MDMT) Calculations:

MDMT of Nozzle-Shell/Head Weld for the Nozzle (UCS-66(a)1(b)), Curve: B

Govrn. thk, $t_g = 9.500$, $t_r = 2.847$, $c = 3.2000$ mm , $E^* = 1.00$
Stress Ratio = $t_r * (E^*) / (t_g - c) = 0.452$, Temp. Reduction = 42 C

Min Metal Temp. w/o impact per UCS-66 -29 C
Min Metal Temp per UCS-66 and UCS-68(c),PWHT credit -46 C
Min Metal Temp. at Required thickness (UCS 66.1) -65 C

Governing MDMT of all the sub-joints of this Junction : -65 C

Weld Size Calculations, Description: PSV

Intermediate Calc. for nozzle/shell Welds T_{min} 6.3000 mm

Results Per UW-16.1:

| | Required Thickness | Actual Thickness |
|-------------|--------------------------|-------------------------|
| Nozzle Weld | $4.4100 = 0.7 * t_{min}$ | $5.6560 = 0.7 * W_o$ mm |

NOTE : Skipping the nozzle attachment weld strength calculations.
Per UW-15(b) (2) the nozzles exempted by UG-36(c) (3) (a)
(small nozzles) do not require a weld strength check.

Maximum Allowable Pressure for this Nozzle at this Location:
Converged Max. Allow. Pressure in Operating case 3.4394 MPa

Note: The MAWP of this junction was limited by the parent Shell/Head.

The Drop for this Nozzle is : 4.3734 mm
The Cut Length for this Nozzle is, Drop + Ho + H + T : 90.0984 mm

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 Nozzle Calcs. : V Nozl: 13 10:21a May 17,2010

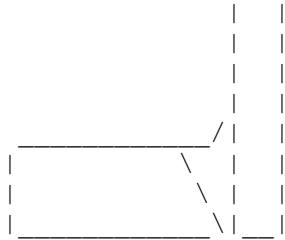
INPUT VALUES, Nozzle Description: V From : 50

| | | | |
|---|--------|-----------|-----|
| Pressure for Reinforcement Calculations | P | 1.5695 | MPa |
| Temperature for Internal Pressure | Temp | 150 | C |
| Design External Pressure | Pext | 0.10 | MPa |
| Temperature for External Pressure | Tempex | 150 | C |
| Shell Material [Normalized] | | SA-516 70 | |
| Shell Allowable Stress at Temperature | S | 137.90 | MPa |
| Shell Allowable Stress At Ambient | Sa | 137.90 | MPa |
| Inside Diameter of Elliptical Head | D | 491.33 | mm |
| Aspect Ratio of Elliptical Head | Ar | 2.00 | |
| Head Finished (Minimum) Thickness | t | 8.3344 | mm |
| Head Internal Corrosion Allowance | c | 3.2000 | mm |
| Head External Corrosion Allowance | co | 0.0000 | mm |
| Distance from Head Centerline | L1 | 185.0000 | mm |
| User Entered Minimum Design Metal Temperature | | -3.00 | C |
| Type of Element Connected to the Shell : Nozzle | | | |
| Material | | SA-105 | |
| Material UNS Number | | K03504 | |
| Material Specification/Type | | Forgings | |
| Allowable Stress at Temperature | Sn | 137.90 | MPa |
| Allowable Stress At Ambient | Sna | 137.90 | MPa |
| Diameter Basis (for tr calc only) | | OD | |
| Layout Angle | | 90.00 | deg |
| Diameter | | 3.6250 | in. |
| Size and Thickness Basis | | Actual | |
| Actual Thickness | tn | 15.8750 | mm |
| Corrosion Allowance | can | 3.2000 | mm |
| Joint Efficiency of Shell Seam at Nozzle | E1 | 1.00 | |
| Joint Efficiency of Nozzle Neck | En | 1.00 | |
| Outside Projection | ho | 77.3906 | mm |
| Weld leg size between Nozzle and Pad/Shell | Wo | 8.0000 | mm |
| Groove weld depth between Nozzle and Vessel | Wgnv | 8.3344 | mm |
| Inside Projection | h | 0.0000 | mm |
| Weld leg size, Inside Element to Shell | Wi | 0.0000 | mm |
| ASME Code Weld Type per UW-16 | | None | |

The Pressure Design option was Design Pressure + static head.

Nozzle Sketch (may not represent actual weld type/configuration)

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Insert Nozzle No Pad, no Inside projection

Note : Checking Nozzle in the Meridional direction.

Reinforcement CALCULATION, Description: V

ASME Code, Section VIII, Division 1, 2007, A-09 UG-37 to UG-45

Actual Outside Diameter Used in Calculation 3.625 in.
 Actual Thickness Used in Calculation 0.625 in.

Nozzle input data check completed without errors.

Reqd thk per UG-37(a) of Elliptical Head, Tr [Int. Press]
 = $(P \cdot D \cdot K) / (2 \cdot S \cdot E - 0.2 \cdot P)$ Appendix 1-4(c)
 = $(1.57 \cdot 497.7312 \cdot 0.983) / (2 \cdot 137.90 \cdot 1.00 - 0.2 \cdot 1.57)$
 = 2.7880 mm

Reqd thk per UG-37(a) of Nozzle Wall, Trn [Int. Press]
 = $(P \cdot R_o) / (S \cdot E + 0.4 \cdot P)$ per Appendix 1-1 (a) (1)
 = $(1.57 \cdot 46.0375) / (137 \cdot 1.00 + 0.4 \cdot 1.57)$
 = 0.5216 mm

Required Nozzle thickness under External Pressure per UG-28 : 0.2739 mm

UG-40, Limits of Reinforcement : [Int. Press]
 Parallel to Vessel Wall (Diameter Limit) D1 155.4258 mm
 Parallel to Vessel Wall, opening length d 77.7129 mm
 Normal to Vessel Wall (Thickness Limit), no pad Tlnp 12.8359 mm

Note: Taking a UG-36(c) (3) (a) exemption for V.
 This calculation is valid for nozzles that meet all the requirements of paragraph UG-36. Please check the Code carefully, especially for nozzles that are not isolated or do not meet Code spacing requirements. To force the computation of areas for small nozzles go to Tools->Configuration and check the box to force the area computation.

Nozzle Junction Minimum Design Metal Temperature (MDMT) Calculations:

MDMT of Nozzle-Shell/Head Weld for the Nozzle (UCS-66(a)1(b)), Curve: B

 Govern. thk, tg = 8.334 , tr = 2.788 , c = 3.2000 mm , E* = 1.00
 Stress Ratio = $tr \cdot (E^*) / (tg - c) = 0.543$, Temp. Reduction = 29 C

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Nozzle Calcs. : V Nozl: 13 10:21a May 17,2010

Min Metal Temp. w/o impact per UCS-66 -29 C

Min Metal Temp per UCS-66 and UCS-68(c),PWHT credit -46 C

Min Metal Temp. at Required thickness (UCS 66.1) -65 C

Governing MDMT of all the sub-joints of this Junction : -65 C

Weld Size Calculations, Description: V

Intermediate Calc. for nozzle/shell Welds Tmin 6.3000 mm

Results Per UW-16.1:

| | Required Thickness | Actual Thickness |
|-------------|----------------------|----------------------|
| Nozzle Weld | 4.4100 = 0.7 * tmin. | 5.6560 = 0.7 * Wo mm |

NOTE : Skipping the nozzle attachment weld strength calculations.
Per UW-15(b) (2) the nozzles exempted by UG-36(c) (3) (a)
(small nozzles) do not require a weld strength check.

Maximum Allowable Pressure for this Nozzle at this Location:

Converged Max. Allow. Pressure in Operating case 2.8868 MPa

Note: The MAWP of this junction was limited by the parent Shell/Head.

Note : Checking Nozzle in the Latitudinal direction.

Reinforcement CALCULATION, Description: V

ASME Code, Section VIII, Division 1, 2007, A-09 UG-37 to UG-45

Actual Outside Diameter Used in Calculation 3.625 in.

Actual Thickness Used in Calculation 0.625 in.

Nozzle input data check completed without errors.

Reqd thk per UG-37(a) of Elliptical Head, Tr [Int. Press]

= $(P \cdot D \cdot K) / (2 \cdot S \cdot E - 0.2 \cdot P)$ Appendix 1-4 (c)

= $(1.57 \cdot 497.7312 \cdot 0.983) / (2 \cdot 137.90 \cdot 1.00 - 0.2 \cdot 1.57)$

= 2.7880 mm

Reqd thk per UG-37(a) of Nozzle Wall, Trn [Int. Press]

= $(P \cdot R_o) / (S \cdot E + 0.4 \cdot P)$ per Appendix 1-1 (a) (1)

= $(1.57 \cdot 46.0375) / (137 \cdot 1.00 + 0.4 \cdot 1.57)$

= 0.5216 mm

Required Nozzle thickness under External Pressure per UG-28 : 0.2739 mm

UG-40, Limits of Reinforcement : [Int. Press]

Parallel to Vessel Wall (Diameter Limit) D1 133.4500 mm

Parallel to Vessel Wall, opening length d 66.7250 mm

Normal to Vessel Wall (Thickness Limit), no pad Tlnp 12.8359 mm

Note: Taking a UG-36(c) (3) (a) exemption for V.

This calculation is valid for nozzles that meet all the requirements of

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Nozzle Calcs. : V

Noz1: 13 10:21a May 17,2010

paragraph UG-36. Please check the Code carefully, especially for nozzles that are not isolated or do not meet Code spacing requirements. To force the computation of areas for small nozzles go to Tools->Configuration and check the box to force the area computation.

UG-45 Minimum Nozzle Neck Thickness Requirement: [Int. Press.]

Wall Thickness per UG45(a), tra = 3.7216 mm

Wall Thickness per UG16(b), tr16b = 4.7000 mm

Wall Thickness per UG45(b)(1), trb1 = 5.9880 mm

Wall Thickness per UG45(b)(3), trb3 = Max(trb1, trb2, tr16b) = 5.9880 mm

Std. Wall Pipe per UG45(b)(4), trb4 = 8.2228 mm

Wall Thickness per UG45(b), trb = Min(trb3, trb4) = 5.9880 mm

Final Required Thickness, tr45 = Max(tra, trb) = 5.9880 mm

Available Nozzle Neck Thickness = 15.8750 mm --> OK

Weld Size Calculations, Description: V

Intermediate Calc. for nozzle/shell Welds Tmin 6.3000 mm

Results Per UW-16.1:

| | Required Thickness | Actual Thickness |
|-------------|----------------------|----------------------|
| Nozzle Weld | 4.4100 = 0.7 * tmin. | 5.6560 = 0.7 * Wo mm |

NOTE : Skipping the nozzle attachment weld strength calculations.
Per UW-15(b)(2) the nozzles exempted by UG-36(c)(3)(a)
(small nozzles) do not require a weld strength check.

Maximum Allowable Pressure for this Nozzle at this Location:

Converged Max. Allow. Pressure in Operating case 2.8868 MPa

Note: The MAWP of this junction was limited by the parent Shell/Head.

The Drop for this Nozzle is : 24.1284 mm

The Cut Length for this Nozzle is, Drop + Ho + H + T : 110.6494 mm

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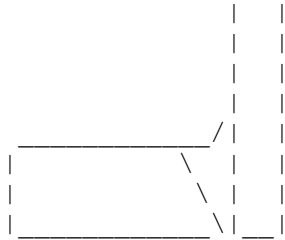
Nozzle Calcs. : P Nozl: 14 10:21a May 17,2010

INPUT VALUES, Nozzle Description: P From : 50

| | | | |
|---|--------|-----------|-----|
| Pressure for Reinforcement Calculations | P | 1.5695 | MPa |
| Temperature for Internal Pressure | Temp | 150 | C |
| Design External Pressure | Pext | 0.10 | MPa |
| Temperature for External Pressure | Tempex | 150 | C |
| Shell Material [Normalized] | | SA-516 70 | |
| Shell Allowable Stress at Temperature | S | 137.90 | MPa |
| Shell Allowable Stress At Ambient | Sa | 137.90 | MPa |
| Inside Diameter of Elliptical Head | D | 491.33 | mm |
| Aspect Ratio of Elliptical Head | Ar | 2.00 | |
| Head Finished (Minimum) Thickness | t | 8.3344 | mm |
| Head Internal Corrosion Allowance | c | 3.2000 | mm |
| Head External Corrosion Allowance | co | 0.0000 | mm |
| Distance from Head Centerline | L1 | 185.0000 | mm |
| User Entered Minimum Design Metal Temperature | | -3.00 | C |
| Type of Element Connected to the Shell : Nozzle | | | |
| Material | | SA-105 | |
| Material UNS Number | | K03504 | |
| Material Specification/Type | | Forgings | |
| Allowable Stress at Temperature | Sn | 137.90 | MPa |
| Allowable Stress At Ambient | Sna | 137.90 | MPa |
| Diameter Basis (for tr calc only) | | OD | |
| Layout Angle | | 0.00 | deg |
| Diameter | | 1.5000 | in. |
| Size and Thickness Basis | | Actual | |
| Actual Thickness | tn | 6.9200 | mm |
| Corrosion Allowance | can | 3.2000 | mm |
| Joint Efficiency of Shell Seam at Nozzle | E1 | 1.00 | |
| Joint Efficiency of Nozzle Neck | En | 1.00 | |
| Outside Projection | ho | 38.1250 | mm |
| Weld leg size between Nozzle and Pad/Shell | Wo | 6.0000 | mm |
| Groove weld depth between Nozzle and Vessel | Wgnv | 8.3344 | mm |
| Inside Projection | h | 0.0000 | mm |
| Weld leg size, Inside Element to Shell | Wi | 0.0000 | mm |
| ASME Code Weld Type per UW-16 | | None | |

The Pressure Design option was Design Pressure + static head.

Nozzle Sketch (may not represent actual weld type/configuration)



Insert Nozzle No Pad, no Inside projection

Note : Checking Nozzle in the Meridional direction.

Reinforcement CALCULATION, Description: P

ASME Code, Section VIII, Division 1, 2007, A-09 UG-37 to UG-45

Actual Outside Diameter Used in Calculation 1.500 in.
 Actual Thickness Used in Calculation 0.272 in.

Nozzle input data check completed without errors.

Reqd thk per UG-37(a) of Elliptical Head, Tr [Int. Press]
 = $(P \cdot D \cdot K) / (2 \cdot S \cdot E - 0.2 \cdot P)$ Appendix 1-4(c)
 = $(1.57 \cdot 497.7312 \cdot 0.983) / (2 \cdot 137.90 \cdot 1.00 - 0.2 \cdot 1.57)$
 = 2.7880 mm

Reqd thk per UG-37(a) of Nozzle Wall, Trn [Int. Press]
 = $(P \cdot R_o) / (S \cdot E + 0.4 \cdot P)$ per Appendix 1-1 (a) (1)
 = $(1.57 \cdot 19.0500) / (137 \cdot 1.00 + 0.4 \cdot 1.57)$
 = 0.2158 mm

Required Nozzle thickness under External Pressure per UG-28 : 0.1223 mm

UG-40, Limits of Reinforcement : [Int. Press]
 Parallel to Vessel Wall (Diameter Limit) D1 70.3922 mm
 Parallel to Vessel Wall, opening length d 35.1961 mm
 Normal to Vessel Wall (Thickness Limit), no pad Tlnp 9.3000 mm

Note: Taking a UG-36(c) (3) (a) exemption for P.
 This calculation is valid for nozzles that meet all the requirements of paragraph UG-36. Please check the Code carefully, especially for nozzles that are not isolated or do not meet Code spacing requirements. To force the computation of areas for small nozzles go to Tools->Configuration and check the box to force the area computation.

Nozzle Junction Minimum Design Metal Temperature (MDMT) Calculations:

MDMT of Nozzle-Shell/Head Weld for the Nozzle (UCS-66(a)1(b)), Curve: B

 Govrn. thk, tg = 6.920 , tr = 0.216 , c = 3.2000 mm , E* = 1.00
 Stress Ratio = $tr \cdot (E^*) / (tg - c) = 0.058$, Temp. Reduction = 78 C

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Nozzle Calcs. : P Nozl: 14 10:21a May 17,2010

Min Metal Temp. w/o impact per UCS-66 -29 C

Min Metal Temp per UCS-66 and UCS-68(c),PWHT credit -46 C

Min Metal Temp. at Required thickness (UCS 66.1) -104 C

Governing MDMT of all the sub-joints of this Junction : -104 C

Weld Size Calculations, Description: P

Intermediate Calc. for nozzle/shell Welds Tmin 3.7200 mm

Results Per UW-16.1:

| | Required Thickness | Actual Thickness |
|-------------|--------------------------|-------------------------|
| Nozzle Weld | $2.6040 = 0.7 * t_{min}$ | $4.2420 = 0.7 * W_o$ mm |

NOTE : Skipping the nozzle attachment weld strength calculations.
Per UW-15(b) (2) the nozzles exempted by UG-36(c) (3) (a)
(small nozzles) do not require a weld strength check.

Maximum Allowable Pressure for this Nozzle at this Location:

Converged Max. Allow. Pressure in Operating case 2.8868 MPa

Note: The MAWP of this junction was limited by the parent Shell/Head.

Note : Checking Nozzle in the Latitudinal direction.

Reinforcement CALCULATION, Description: P

ASME Code, Section VIII, Division 1, 2007, A-09 UG-37 to UG-45

Actual Outside Diameter Used in Calculation 1.500 in.

Actual Thickness Used in Calculation 0.272 in.

Nozzle input data check completed without errors.

Reqd thk per UG-37(a) of Elliptical Head, Tr [Int. Press]

= $(P * D * K) / (2 * S * E - 0.2 * P)$ Appendix 1-4 (c)

= $(1.57 * 497.7312 * 0.983) / (2 * 137.90 * 1.00 - 0.2 * 1.57)$

= 2.7880 mm

Reqd thk per UG-37(a) of Nozzle Wall, Trn [Int. Press]

= $(P * R_o) / (S * E + 0.4 * P)$ per Appendix 1-1 (a) (1)

= $(1.57 * 19.0500) / (137 * 1.00 + 0.4 * 1.57)$

= 0.2158 mm

Required Nozzle thickness under External Pressure per UG-28 : 0.1223 mm

UG-40, Limits of Reinforcement : [Int. Press]

Parallel to Vessel Wall (Diameter Limit) D1 61.3200 mm

Parallel to Vessel Wall, opening length d 30.6600 mm

Normal to Vessel Wall (Thickness Limit), no pad Tlnp 9.3000 mm

Note: Taking a UG-36(c) (3) (a) exemption for P.

This calculation is valid for nozzles that meet all the requirements of

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Nozzle Calcs. : P

Noz1: 14 10:21a May 17,2010

paragraph UG-36. Please check the Code carefully, especially for nozzles that are not isolated or do not meet Code spacing requirements. To force the computation of areas for small nozzles go to Tools->Configuration and check the box to force the area computation.

UG-45 Minimum Nozzle Neck Thickness Requirement: [Int. Press.]

Wall Thickness per UG45(a), tra = 3.4158 mm

Wall Thickness per UG16(b), tr16b = 4.7000 mm

Wall Thickness per UG45(b)(1), trb1 = 5.9880 mm

Wall Thickness per UG45(b)(3), trb3 = Max(trb1, trb2, tr16b) = 5.9880 mm

Std. Wall Pipe per UG45(b)(4), trb4 = 6.3115 mm

Wall Thickness per UG45(b), trb = Min(trb3, trb4) = 5.9880 mm

Final Required Thickness, tr45 = Max(tra, trb) = 5.9880 mm

Available Nozzle Neck Thickness = 6.9200 mm --> OK

Weld Size Calculations, Description: P

Intermediate Calc. for nozzle/shell Welds Tmin 3.7200 mm

Results Per UW-16.1:

| | Required Thickness | Actual Thickness |
|-------------|--------------------------|-------------------------|
| Nozzle Weld | $2.6040 = 0.7 * t_{min}$ | $4.2420 = 0.7 * W_o$ mm |

NOTE : Skipping the nozzle attachment weld strength calculations.
Per UW-15(b)(2) the nozzles exempted by UG-36(c)(3)(a)
(small nozzles) do not require a weld strength check.

Maximum Allowable Pressure for this Nozzle at this Location:

Converged Max. Allow. Pressure in Operating case 2.8868 MPa

Note: The MAWP of this junction was limited by the parent Shell/Head.

The Drop for this Nozzle is : 9.1638 mm

The Cut Length for this Nozzle is, Drop + Ho + H + T : 56.4192 mm

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Nozzle Schedule : Step: 25 10:21a May 17,2010

Nozzle Schedule:

| Description | Nominal Flange | | | Noz. O/Dia in. | Wall Thk mm | ODia mm | Re-Pad Thick mm | Cut Length mm |
|-------------|----------------|-------------|------|----------------------|-------------------|------------|-----------------------|---------------------|
| | Size in. | Sch/ Cls | Type | | | | | |
| P | 1.500 | - | None | 1.500 | 6.920 | - | - | 56.42 |
| D | 2.000 | 160 | WNF | 2.375 | 8.738 | - | - | 161.75 |
| UC | 3.625 | - | None | 3.625 | 15.875 | - | - | 90.10 |
| PSV | 3.625 | - | None | 3.625 | 15.875 | - | - | 90.10 |
| V | 3.625 | - | None | 3.625 | 15.875 | - | - | 110.65 |
| O | 8.000 | 80 | WNF | 8.625 | 12.700 | - | - | 206.96 |
| I | 8.000 | 80 | WNF | 8.625 | 12.700 | - | - | 206.96 |

Note on the Cut Length Calculation:

The Cut Length is the Outside Projection + Inside Projection + Drop + In Plane Shell Thickness. This value does not include weld gaps, nor does it account for shrinkage.

Please Note: In the case of Oblique Nozzles, the Outside Diameter must be increased. The Re-Pad WIDTH around the nozzle is calculated as follows:
Width of Pad = (Pad Outside Dia. (per above) - Nozzle Outside Dia.)/2

Nozzle Material and Weld Fillet Leg Size Details:

| Nozzle | Material | Shl Grve | Noz Shl/Pad | Pad OD | Pad Grve | Inside |
|--------|----------|------------|-------------|------------|------------|------------|
| | | Weld mm | Weld mm | Weld mm | Weld mm | Weld mm |
| P | SA-105 | 8.334 | 6.000 | - | - | - |
| D | SA-106 B | 8.334 | 6.000 | - | - | - |
| UC | SA-105 | 8.334 | 8.000 | - | - | - |
| PSV | SA-105 | 8.334 | 8.000 | - | - | - |
| V | SA-105 | 8.334 | 8.000 | - | - | - |
| O | SA-106 B | 8.334 | 8.000 | - | - | - |
| I | SA-106 B | 8.334 | 8.000 | - | - | - |

Note: The Outside projections below do not include the flange thickness.

Nozzle Miscellaneous Data:

| Nozzle | Elevation/Distance | Layout Angle deg. | Projection | | Installed In Component |
|--------|--------------------|-------------------------|---------------|--------------|---------------------------|
| | From Datum mm | | Outside mm | Inside mm | |
| P | | 0.00 | 38.12 | 0.00 | CAB. SUP. |
| D | | 180.00 | 152.40 | 0.00 | CAB. INF. |
| UC | 730.000 | 90.00 | 76.22 | 0.00 | CUERPO |
| PSV | 1573.000 | 135.00 | 76.22 | 0.00 | CUERPO |
| V | | 90.00 | 77.39 | 0.00 | CAB. SUP. |
| O | 200.000 | 270.00 | 171.55 | 0.00 | CUERPO |
| I | 1140.000 | 90.00 | 171.55 | 0.00 | CUERPO |

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Nozzle Schedule : Step: 25 10:21a May 17,2010

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Nozzle Summary : Step: 26 10:21a May 17,2010

Nozzle Calculation Summary

| Description | MAWP MPa | Ext | MAPNC MPa | UG45 [tr] | Weld Path | Areas |
|-------------|-------------|-----|--------------|-----------|--------------|-----------|
| D | 2.8657 | ... | ... | OK 6.03 | OK | NoCalc[*] |
| O | 1.9992 | OK | ... | OK 6.07 | OK | Passed |
| I | 2.0086 | OK | ... | OK 6.05 | OK | Passed |
| UC | 3.4343 | ... | ... | OK 6.06 | OK | NoCalc[*] |
| PSV | 3.4343 | ... | ... | OK 6.05 | OK | NoCalc[*] |
| V | 2.8864 | ... | ... | OK 5.99 | OK | NoCalc[*] |
| V | 2.8864 | ... | ... | OK 5.99 | OK | NoCalc[*] |
| P | 2.8864 | ... | ... | OK 5.99 | OK | NoCalc[*] |
| P | 2.8864 | ... | ... | OK 5.99 | OK | NoCalc[*] |

Min. - Nozzles 1.9992 O

Min. Shell&Flgs 1.5568

Computed Vessel M.A.W.P. 1.557 MPa

[*] - This was a small opening and the areas were not computed or the MAWP of this connection could not be computed because the longitudinal bending stress was greater than the hoop stress.

Note: MAWPs (Internal Case) shown above are at the High Point.

Check the Spatial Relationship between the Nozzles

| From Node | Nozzle Description | Y Coordinate, | Layout Angle, | Dia. Limit |
|-----------|--------------------|---------------|---------------|------------|
| 10 | D | 0.000 | 180.000 | 102.868 |
| 20 | O | 200.000 | 270.000 | 406.500 |
| 20 | I | 1140.000 | 90.000 | 406.500 |
| 20 | UC | 730.000 | 90.000 | 133.450 |
| 20 | PSV | 1573.000 | 135.000 | 133.450 |
| 50 | V | 0.000 | 90.000 | 133.450 |
| 50 | P | 0.000 | 0.000 | 61.320 |

The nozzle spacing is computed by the following:

= Sqrt($l_1^2 + l_c^2$) where

l_1 - Arc length along the inside vessel surface in the long. direction.

l_c - Arc length along the inside vessel surface in the circ. direction

If any interferences/violations are found, they will be noted below.

No interference violations have been detected !

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MDMT Summary : Step: 27 10:21a May 17,2010

Minimum Design Metal Temperature Results Summary :

| Description | Notes | Curve | Basic MDMT C | Reduced MDMT C | UG-20 (f) MDMT C | Thickness ratio | Gov Thk mm | E* |
|-------------|-------|-------|--------------|----------------|------------------|-----------------|------------|-------|
| CAB. INF. | [10] | D | -65 | | | 0.556 | 8.334 | 1.000 |
| CAB. INF. | [7] | D | -65 | | | 0.457 | 9.500 | 1.000 |
| CUERPO | [8] | D | -65 | | | 0.463 | 9.500 | 1.000 |
| BRIDA 1 | [8] | D | -58 | -104 | | 0.189 | 19.000 | 1.000 |
| BRIDA 2 | [8] | D | -58 | -104 | | 0.189 | 19.000 | 1.000 |
| CAB. SUP. | [10] | D | -65 | | | 0.548 | 8.334 | 1.000 |
| CAB. SUP. | [7] | D | -65 | | | 0.457 | 9.500 | 1.000 |
| D | [1] | B | -46 | -104 | | 0.079 | 7.645 | 1.000 |
| Nozzle Flg | [4] | | -29 | -104 | | 0.079 | | |
| O | [1] | B | -46 | -65 | | 0.456 | 9.500 | 1.000 |
| Nozzle Flg | [4] | | -29 | -104 | | 0.174 | | |
| I | [1] | B | -46 | -65 | | 0.453 | 9.500 | 1.000 |
| Nozzle Flg | [4] | | -29 | -104 | | 0.173 | | |
| UC | [1] | B | -46 | -65 | | 0.454 | 9.500 | 1.000 |
| PSV | [1] | B | -46 | -65 | | 0.452 | 9.500 | 1.000 |
| V | [1] | B | -46 | -65 | | 0.543 | 8.334 | 1.000 |
| P | [1] | B | -46 | -104 | | 0.058 | 6.920 | 1.000 |

Required Minimum Design Metal Temperature -3 C
Warmest Computed Minimum Design Metal Temperature -65 C

Notes:

- [!] - This was an impact tested material.
- [1] - Governing Nozzle Weld.
- [4] - ANSI Flange MDMT Calcs; Thickness ratio per UCS-66(b) (1) (c).
- [5] - ANSI Flange MDMT Calcs; Thickness ratio per UCS-66(b) (1) (b).
- [6] - MDMT Calculations at the Shell/Head Joint.
- [7] - MDMT Calculations for the Straight Flange.
- [8] - Cylinder/Cone/Flange Junction MDMT.
- [9] - Calculations in the Spherical Portion of the Head.
- [10] - Calculations in the Knuckle Portion of the Head.
- [11] - Calculated (Body Flange) Flange MDMT.
- [12] - Calculated Flat Head MDMT per UCS-66.3

UG-84(b) (2) was not considered.

UCS-66(g) was not considered.

UCS-66(i) was not considered.

Notes:

Impact test temps were not entered in and not considered in the analysis.
UCS-66(i) applies to impact tested materials not by specification and
UCS-66(g) applies to materials impact tested per UG-84.1 General Note (c).
The Basic MDMT includes the (30F) PWHT credit if applicable.

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 Vessel Design Summary : Step: 28 10:21a May 17,2010

Design Code: ASME Code Section VIII Division 1, 2007 A-09

Diameter Spec : 508.000 x 527.000 mm OD
 Vessel Design Length, Tangent to Tangent 1958.00 mm
 Distance of Bottom Tangent above Grade 0.00 mm
 Specified Datum Line Distance 0.00 mm
 Shell Material Specification SA-516 70 [Normalized]
 Nozzle Material Specification SA-106 B
 Nozzle Material Specification SA-105
 Internal Design Temperature 150 C
 Internal Design Pressure 1.57 MPa
 External Design Temperature 150 C
 External Design Pressure 0.01 MPa
 Maximum Allowable Working Pressure 1.56 MPa
 External Max. Allowable Working Pressure 0.69 MPa
 Hydrostatic Test Pressure 2.35 MPa
 Required Minimum Design Metal Temperature -3 C
 Warmest Computed Minimum Design Metal Temperature -65 C
 Wind Design Code User Defined
 Earthquake Design Code No Seismic

Element Pressures and MAWP: MPa

| Element Desc | Design Pres. + Stat. head | External Pressure | M.A.W.P | Corrosion Allowance |
|--------------|------------------------------|----------------------|---------|------------------------|
| CAB. INF. | 1.591 | 0.103 | 2.866 | 3.2000 |
| CUERPO | 1.589 | 0.103 | 3.434 | 3.2000 |
| BRIDA 1 | 1.573 | 0.103 | 8.468 | 3.2000 |
| BRIDA 2 | 1.572 | 0.103 | 8.469 | 3.2000 |
| CAB. SUP. | 1.571 | 0.103 | 2.886 | 3.2000 |

Liquid Level: 2203.67 mm Dens.: 0.001 kg/cm³ Sp. Gr.: 1.016

| Element Type | "To" Elev mm | Length mm | Element Thk mm | Reqd Thk Int. | Ext. | Joint Eff Long | Circ |
|--------------|-----------------|--------------|-------------------|------------------|------|-------------------|------|
| Ellipse | 40.0 | 40.0 | 9.5 | 6.1 | 4.5 | 1.00 | 1.00 |
| Cylinder | 1690.0 | 1650.0 | 9.5 | 6.1 | 6.1 | 1.00 | 1.00 |
| Cylinder | 1804.0 | 114.0 | 19.0 | 6.2 | 6.2 | 1.00 | 1.00 |
| Cylinder | 1918.0 | 114.0 | 19.0 | 6.2 | 6.2 | 1.00 | 1.00 |
| Ellipse | 1958.0 | 40.0 | 9.5 | 6.0 | 4.5 | 1.00 | 1.00 |

Element thicknesses are shown as Nominal if specified, otherwise are Minimum

Total Wind Shear on top of all Legs 1574. N

METPOR SA - AESA - ANCAP

FILTRO TAG 3101L A/B

SOIME SRL - 1654-MC-01 REV.C

PV Elite 2010 Licensee: S.O.I.M.E. S.R.L.

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Vessel Design Summary : Step: 28 10:21a May 17,2010

| | | |
|--|----------|------|
| Total Wind Moment at top of all Legs | 1553939. | N-mm |
| Total Earthquake Moment at top of all Legs | 353650. | N-mm |
| Max. Wind Shear on one Leg (top & bottom) | 626. | N |
| Max. Wind Moment at base of one Leg | 438540. | N-mm |
| Max. Vertical Load (Wt. + Wind) on one Leg | 4804. | N |
| Max. Vertical Load (Wt. + Eq.) on one Leg | 2645. | N |

Note: Wind and Earthquake moments include the effects of user defined forces and moments if any exist in the job and were specified to act (compute loads and stresses) during these cases. Also included are moment effects due to eccentric weights if any are present in the input.

Weights:

| | | |
|--|-------|-----|
| Fabricated - Bare W/O Removable Internals | 398.1 | kgm |
| Shop Test - Fabricated + Water (Full) | 796.9 | kgm |
| Shipping - Fab. + Rem. Intls.+ Shipping App. | 398.1 | kgm |
| Erected - Fab. + Rem. Intls.+ Insul. (etc) | 518.1 | kgm |
| Empty - Fab. + Intls. + Details + Wghts. | 518.1 | kgm |
| Operating - Empty + Operating Liquid (No CA) | 853.4 | kgm |
| Field Test - Empty Weight + Water (Full) | 796.9 | kgm |

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Input Echo, Leg & Lug Item 1, Description: OREJA IZAJE

Design Internal Pressure 0.00 MPa
 Design Temperature for Attachment TEMP 40.00 C
 Vessel Outside Diameter OD 508.000 mm
 Vessel Wall Thickness Ts 9.5000 mm
 Vessel Corrosion Allowance Cas 3.2000 mm
 Vessel Material SA-516 70
 Vessel Material UNS Number K02700
 Vessel Allowable Stress at Design S 137.90 MPa
 Analysis Type: Lifting Lug

Empty Weight of Vessel Wemp 4500.00 N
 Operating Weight of Vessel (vertical load) W 0.00 N

Lifting Lug Material SA-516 70
 Lifting Lug Material UNS Number K02700
 Lifting Lug Yield Stress YIELD 260.74 MPa

Lifting Lug Orientation to Vessel Perpendicular
 Total Height of Lifting Lug w 210.0000 mm
 Thickness of Lifting Lug t 19.0500 mm
 Diameter of Hole in Lifting Lug dh 40.0000 mm
 Radius of Semi-Circular Arc of Lifting Lug r 70.0000 mm
 Height of Lug from bottom to Center of Hole h 105.0000 mm
 Offset from Vessel OD to Center of Hole off 45.0000 mm
 Minimum thickness of Fillet Weld around Lug tw 6.0000 mm
 Length of weld along side of Lifting Lug wl 210.0000 mm
 Length of Weld along Bottom of Lifting Lug wb 19.0500 mm
 Lift Orientation Vertical
 Force Along Vessel Axis Fax 4500.00 N
 Force Normal to Vessel Fn 0.00 N
 Force Tangential to Vessel Ft 0.00 N
 Impact Factor Impfac 1.50
 Occasional Load Factor (AISC A5.2) Occfac 1.00

Results for lifting lugs, Description : OREJA IZAJE

Weld Group Inertia about the Circumferential Axis ILC 0.105E+08 mm**4
 Weld Group Centroid distance in the Long. Direction YLL 109.686 mm
 Dist. of Weld Group Centroid from Lug bottom YLL_B 100.314 mm
 Weld Group Inertia about the Longitudinal Axis ILL 118307.094 mm**4
 Weld Group Centroid Distance in the Circ. Direction YLC 9.525 mm

Applying the Impact factor to the loads:

$$Fax = 4500.00 * 1.50 = 6750.00 \text{ N}$$

Primary Shear Stress in the Welds due to Shear Loads [Ssll]:

$$= \text{Sqrt}(Fax^2 + Ft^2 + Fn^2) / ((2*wl + wb) * tw)$$

$$= \text{Sqrt}(6750^2 + 0^2 + 0^2) / ((2*210.0 + 19.0) * 6.0000)$$

$$= 2.56 \text{ MPa}$$

Shear Stress in the Welds due to Bending Loads [Sblf]:

$$= (F_n * (h - YLL_B)) * YLL / ILC + (F_{ax} * off * YLL / ILC) + (F_t * off * YLC / ILL)$$

$$= (0 * (105.000 - 100.314)) * 109.686 / .10537E+08 +$$

$$(6750 * 45.000 * 109.686 / .10537E+08) +$$

$$(0 * 45.000 * 9.525 / 118307.094)$$

$$= 3.16 \text{ MPa}$$

Total Shear Stress for Combined Loads [St]:

$$= S_{s11} + S_{blf}$$

$$= 2.563 + 3.162$$

$$= 5.72 \text{ MPa}$$

Allowable Shear Stress for Combined Loads [Sta]:

$$= 0.4 * Yield * Occfac \text{ (AISC Shear All.)}$$

$$= 0.4 * 260 * 1.00$$

$$= 104.30 \text{ MPa}$$

Shear Stress in Lug above Hole [Shs]:

$$= \text{Sqrt}(F_{ax}^2 + F_n^2 + F_t^2) / S_{ha}$$

$$= \text{Sqrt}(6750^2 + 0^2 + 0^2) / 1905.000$$

$$= 3.54 \text{ MPa}$$

Allowable Shear Stress in Lug above Hole [Sas]:

$$= 0.4 * Yield * Occfac$$

$$= 0.4 * 260 * 1.00$$

$$= 104.30 \text{ MPa}$$

Pin Hole Bearing Stress [Pbs]:

$$= \text{Sqrt}(F_{ax}^2 + F_n^2) / (t * d_h)$$

$$= \text{Sqrt}(6750^2 + 0^2) / (19.050 * 40.000)$$

$$= 8.86 \text{ MPa}$$

Allowable Bearing Stress [Pba]:

$$= \text{Min}(0.75 * Yield * Occfac, 0.9 * Yield) \text{ AISC Bearing All.}$$

$$= \text{Min}(0.75 * 260 * 1.00, 234.7)$$

$$= 195.56 \text{ MPa}$$

Bending stress at the base of the lug [Fbs]:

$$= F_t * off / (w * t^2 / 6) + F_{ax} * off / (w^2 * t / 6)$$

$$= 0 * 45.000 / (210.000 * 19.050^2 / 6) +$$

$$6750 * 45.000 / (210.000^2 * 19.050 / 6)$$

$$= 2.17 \text{ MPa}$$

Tensile stress at the base of the lug [Fa]:

$$= F_n / (w * t) = 0 / (210.000 * 19.050)$$

$$= 0.00 \text{ MPa}$$

Total Combined Stress at the base of the lug:

$$= F_{bs} + F_a = 2.2 \text{ MPa}$$

Lug Allowable Stress for Bending and Tension:

$$\begin{aligned} &= \text{Min}(0.66 * \text{Yield} * \text{Occfac}, 0.75 * \text{Yield}) \\ &= \text{Min}(0.66 * 260 * 1.00 , 195.6) = 172.1 \text{ MPa} \end{aligned}$$

Note: Check the Shell Stresses using method such as WRC-107.

Summary Of Results

| Stress (MPa) | Actual | Allowable | P/F |
|---|--------|-----------|-----|
| Primary Shear Stress of Weld : | 5.72 | 104.30 | Ok |
| Shear Stress above Hole : | 3.54 | 104.30 | Ok |
| Pin Hole Bearing Stress : | 8.86 | 195.56 | Ok |
| Total Combined Stress at the lug base : | 2.17 | 172.09 | Ok |

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Leg Lug Results Summary for Item 1 : OREJA IZAJE

The Vessel outside diameter is 508.000 mm

Summary Of Results

| Stress (MPa) | Actual | Allowable | P/F |
|---|--------|-----------|-----|
| Primary Shear Stress of Weld : | 5.72 | 104.30 | Ok |
| Shear Stress above Hole : | 3.54 | 104.30 | Ok |
| Pin Hole Bearing Stress : | 8.86 | 195.56 | Ok |
| Total Combined Stress at the lug base : | 2.17 | 172.09 | Ok |

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Input Echo, Nozzle Item 2, Description: PSV

| | | | |
|-------------------------------------|--------|--------|-----|
| Design Internal Pressure (Case 1) | P | 1.57 | MPa |
| Temperature for Internal Pressure | TEMP | 150.00 | C |
| Design External Pressure (Case 2) | PEXT | 0.10 | MPa |
| Temperature for External Pressure | TEMPEX | 150.00 | C |

| | | | |
|---------------------------------------|--------|--------------------|--|
| Include Hydrostatic Head Components | YES | | |
| Operating Liquid Density | 0.001 | kg/cm ³ | |
| Height of Liquid Column (Operating) | 117.00 | mm | |

| | | | |
|---|-----------|---------|-----|
| Shell or Head Material (Not Normalized or NA) | SA-516 70 | | |
| Material UNS Number | K02700 | | |
| Shell/Head Allowable Stress at Temperature | S | 137.900 | MPa |
| Shell/Head Allowable Stress At Ambient | SA | 137.900 | MPa |
| Shell/Head Yield Stress at Temperature | Sy | 231.522 | MPa |

| | | | |
|---------------------------------------|-----|----------|----|
| Outside Diameter of Cylindrical Shell | D | 508.000 | mm |
| Design Length of Section | L | 1650.000 | mm |
| Actual Thickness of Shell or Head | T | 9.5250 | mm |
| Corrosion Allowance for Shell or Head | CAS | 3.2000 | mm |

| | |
|---|-----|
| Is this Nozzle a Radial Nozzle | YES |
| Is this Nozzle a Lateral Nozzle (Y-angle) | NO |

The Attached Flange is Class CL 300 Grade GR 1.1

| | | | |
|--|----------|---------|-----|
| Nozzle Material (Not Normalized or NA) | SA-106 B | | |
| Material UNS Number | K03006 | | |
| Nozzle Allowable Stress at Temperature | SN | 117.905 | MPa |
| Nozzle Allowable Stress At Ambient | SNA | 117.905 | MPa |

| | | | |
|----------------------------|--------|--------|----|
| Diameter Basis for Nozzle | BASISN | OD | |
| Nominal Diameter of Nozzle | DIA | 50.800 | mm |

| | | | |
|--|--------|---------|----|
| Nozzle Size and Thickness Basis | DBN | Minimum | |
| Nominal Thickness of Nozzle | THKNOM | SCH 160 | |
| Corrosion Allowance for Nozzle | CAN | 3.2000 | mm |
| Joint Efficiency of Shell Seam at Nozzle | ES | 1.00 | |
| Joint Efficiency of Nozzle Neck | EN | 1.00 | |

| | | | |
|---|------|---------|----|
| Insert or Abutting Nozzle Type | NTYP | Insert | |
| Outward Projection of Nozzle | HO | 103.000 | mm |
| Weld leg size between Nozzle and Pad/Shell | WO | 6.0000 | mm |
| Groove weld depth between Nozzle and Vessel | WGNV | 9.5000 | mm |

| | |
|---|-----|
| Is this is Manway/Access/Inspection Opening | No |
| Skip Iterative Failure Thickness Calculations | Yes |

Reinforcement CALCULATION, Description: PSV

ASME Code, Section VIII, Division 1, 2007, A-09 UG-37 to UG-45

Actual Outside Diameter Used in Calculation 60.325 mm.
 Actual Thickness Used in Calculation 7.645 mm

Internal Pressure Results for SHELL/HEAD :

Reqd thk per UG-37(a) of Cylindrical Shell, Tr [Internal Press]
 Thickness Due to Internal Pressure:
 = $(P*(D/2-CAE)) / (S*E+0.4*P)$ per Appendix 1-1 (a) (1)
 = $(1.57*(508.0000/2-0.000))/(137.90*1.00+0.4*1.57)$
 = $2.8790 + 3.2000 = 6.0790$ mm

External Pressure Results for SHELL/HEAD :

External Pressure Results, Shell Number 2, Desc.: PSV
 ASME Code, Section VIII, Division 1, 2007 A-09

External Pressure Chart CS-2 at 150.00 C
 Elastic Modulus for Material 199818.77 MPa

Results for Max. Allowable External Pressure (Emawp):
 Corroded Thickness of Shell TCA 6.3250 mm
 Outside Diameter of Shell ODCA 508.000 mm
 Design Length of Cylinder or Cone SLEN 1650.000 mm
 Diameter / Thickness Ratio (D/T) 80.3162
 Length / Diameter Ratio LD 3.2480
 Geometry Factor, A f(DT,LD) A 0.0005648
 Materials Factor, B, f(A, Chart) B 56.4275 MPa
 Maximum Allowable Working Pressure 0.94 MPa
 $EMAWP = (4*B)/(3*(D/T)) = (4 * 56.4275) / (3 * 80.3162) = 0.9368$

Results for Reqd Thickness for Ext. Pressure (Tca):
 Corroded Thickness of Shell TCA 2.6256 mm
 Outside Diameter of Shell ODCA 508.000 mm
 Design Length of Cylinder or Cone SLEN 1650.000 mm
 Diameter / Thickness Ratio (D/T) 193.4768
 Length / Diameter Ratio LD 3.2480
 Geometry Factor, A f(DT,LD) A 0.0001502
 Materials Factor, B, f(A, Chart) B 15.0084 MPa
 Maximum Allowable Working Pressure 0.10 MPa
 $EMAWP = (4*B)/(3*(D/T)) = (4 * 15.0084) / (3 * 193.4768) = 0.1034$

Results for Maximum Length Calculation: No Conversion
 Corroded Thickness of Shell TCA 6.3250 mm
 Outside Diameter of Shell ODCA 508.000 mm
 Design Length of Cylinder or Cone SLEN 0.128E+21 mm
 Diameter / Thickness Ratio (D/T) 80.3162
 Length / Diameter Ratio LD 50.0000
 Geometry Factor, A f(DT,LD) A 0.0001705
 Materials Factor, B, f(A, Chart) B 17.0370 MPa
 Maximum Allowable Working Pressure 0.28 MPa

$$EMAWP = (4*B)/(3*(D/T)) = (4 *17.0370)/(3 *80.3162) = 0.2828$$

Summary of External Pressure Results:

| | | |
|---|------------|-----|
| Allowable Pressure at Corroded thickness | 0.94 | MPa |
| Required Pressure as entered by User | 0.10 | MPa |
| Required Thickness including Corrosion all. | 5.8256 | mm |
| Actual Thickness as entered by User | 9.5250 | mm |
| Maximum Length for Thickness and Pressure | 0.1280E+21 | mm |
| Actual Length as entered by User | 1650.00 | mm |

Internal Pressure Results for NOZZLE :

Reqd thk per UG-37(a) of Nozzle Wall, Trn [Internal Press]

Thickness Due to Internal Pressure:

$$= (P*(D/2-CAE)) / (S*E+0.4*P) \text{ per Appendix 1-1 (a) (1)}$$

$$= (1.57*(60.3250/2-0.000))/(117.90*1.00+0.4*1.57)$$

$$= 0.3996 + 3.2000 = 3.5996 \text{ mm}$$

External Pressure Results for Nozzle per UG-28 :

External Pressure Results, Shell Number 2, Desc.: PSV
 ASME Code, Section VIII, Division 1, 2007 A-09

| | | | | |
|------------------------------|------|----|-----------|-----|
| External Pressure Chart | CS-2 | at | 150.00 | C |
| Elastic Modulus for Material | | | 199818.77 | MPa |

Results for Max. Allowable External Pressure (Emawp):

| | | | |
|--|-------|-----------|-----|
| Corroded Thickness of Shell | TCA | 4.4454 | mm |
| Outside Diameter of Shell | ODCA | 60.325 | mm |
| Design Length of Cylinder or Cone | SLEN | 103.000 | mm |
| Diameter / Thickness Ratio | (D/T) | 13.5702 | |
| Length / Diameter Ratio | LD | 1.7074 | |
| Geometry Factor, A f(DT,LD) | A | 0.0164045 | |
| Materials Factor, B, f(A, Chart) | B | 122.6765 | MPa |
| Maximum Allowable Working Pressure | | 12.05 | MPa |
| EMAWP = (4*B)/(3*(D/T)) = (4 *122.6765)/(3 *13.5702) = 12.0535 | | | |

Results for Req'd Thickness for Ext. Pressure (Tca):

| | | | |
|---|-------|-----------|-----|
| Corroded Thickness of Shell | TCA | 0.2404 | mm |
| Outside Diameter of Shell | ODCA | 60.325 | mm |
| Design Length of Cylinder or Cone | SLEN | 103.000 | mm |
| Diameter / Thickness Ratio | (D/T) | 250.9088 | |
| Length / Diameter Ratio | LD | 1.7074 | |
| Geometry Factor, A f(DT,LD) | A | 0.0001948 | |
| Materials Factor, B, f(A, Chart) | B | 19.4636 | MPa |
| Maximum Allowable Working Pressure | | 0.10 | MPa |
| EMAWP = (4*B)/(3*(D/T)) = (4 *19.4636)/(3 *250.9088) = 0.1034 | | | |

Results for Maximum Length Calculation: No Conversion

| | | | |
|-----------------------------|------|--------|----|
| Corroded Thickness of Shell | TCA | 4.4454 | mm |
| Outside Diameter of Shell | ODCA | 60.325 | mm |

| | | | |
|--|-------|-----------|-----|
| Design Length of Cylinder or Cone | SLEN | 0.109E+33 | mm |
| Diameter / Thickness Ratio | (D/T) | 13.5702 | |
| Length / Diameter Ratio | LD | 50.0000 | |
| Geometry Factor, A f(DT,LD) | A | 0.0059734 | |
| Materials Factor, B, f(A, Chart) | B | 121.0112 | MPa |
| Maximum Allowable Working Pressure | | 11.89 | MPa |
| EMAWP = (4*B)/(3*(D/T)) = (4 *121.0112)/(3 *13.5702) = 11.8899 | | | |

Summary of External Pressure Results:

| | | |
|---|------------|-----|
| Allowable Pressure at Corroded thickness | 12.05 | MPa |
| Required Pressure as entered by User | 0.10 | MPa |
| Required Thickness including Corrosion all. | 3.4404 | mm |
| Actual Thickness as entered by User | 7.6454 | mm |
| Maximum Length for Thickness and Pressure | 0.1089E+33 | mm |
| Actual Length as entered by User | 103.00 | mm |

UG-40, Thickness and Diameter Limit Results : Internal Pressure

| | | | |
|--|------|---------|----|
| Effective material diameter limit, | DL | 102.868 | mm |
| Effective material thickness limit, no pad | TLNP | 11.113 | mm |

NOTE : Taking a UG-36(c)(3)(a) exemption for PSV .

This calculation is valid for nozzles that meet all the requirements of paragraph UG-36. Please check the Code carefully, especially for nozzles that are not isolated or do not meet Code spacing requirements. To force the computation of areas for small nozzles, go to the Miscellaneous Tab.

Opening size: 51.434, Shell/Head Req. thk.: 2.879 mm

UG-45 Minimum Nozzle Neck Thickness Requirement:

| | | |
|--------------------------------|--|----|
| Wall Thickness per UG45(a), | tra = 3.5996 | mm |
| Wall Thickness per UG16(b), | tr16b = 4.7875 | mm |
| Wall Thickness per UG45(b)(1), | trb1 = 6.0790 | mm |
| Wall Thickness per UG45(b)(2), | trb2 = 3.3904 | mm |
| Wall Thickness per UG45(b)(3), | trb3 = Max(trb1, trb2, tr16b) = 6.0790 | mm |
| Std. Wall Pipe per UG45(b)(4), | trb4 = 6.6227 | mm |
| Wall Thickness per UG45(b), | trb = Min(trb3, trb4) = 6.0790 | mm |

| | | |
|---------------------------------|-------------------------------|-----------|
| Final Required Thickness, | tr45 = Max(tra, trb) = 6.0790 | mm |
| Available Nozzle Neck Thickness | = 7.6454 | mm --> OK |

| | | |
|---|-------|---|
| Weight of Nozzle, with Flange, Uncorroded | 42.61 | N |
| Weight of Nozzle, with Flange, Corroded | 38.55 | N |

Minimum Design Metal Temperature (MDMT) Results :

MDMT of Shell, UCS curve : B

 Govrn. thk, tg = 9.525 , tr = 2.879 , c = 3.2000 mm , E* = 1.00
 Stress Ratio = tr * (E*) / (tg - c) = 0.455 , Temp. Reduction = 41 C

| | | |
|---|-----|---|
| Min. Metal Temp. w/o impact per Fig. UCS-66 | -29 | C |
| Min. Metal Temp. at Req'd thk. (UCS 66.1) | -48 | C |

Min. Metal Temp. w/o impact per UG-20(f) -29 C

MDMT of Nozzle Neck to Flange Weld, UCS Curve : B

Govrn. thk, tg = 7.645 , tr = 0.400 , c = 3.2000 mm , E* = 1.00
Stress Ratio = tr * (E*) / (tg - c) = 0.090 , Temp. Reduction = 78 C

Min. Metal Temp. w/o impact per Fig. UCS-66 -29 C
Min. Metal Temp. at Req'd thk. (UCS 66.1) -104 C
Min. Metal Temp. w/o impact per UG-20(f) -29 C

MDMT of Nozzle-Shell/Head Weld for the Nozzle (UCS-66(a)1(b)), Curve : B

Govrn. thk, tg = 7.645 , tr = 0.400 , c = 3.2000 mm , E* = 1.00
Stress Ratio = tr * (E*) / (tg - c) = 0.090 , Temp. Reduction = 78 C

Min. Metal Temp. w/o impact per Fig. UCS-66 -29 C
Min. Metal Temp. at Req'd thk. (UCS 66.1) -104 C
Min. Metal Temp. w/o impact per UG-20(f) -29 C

Governing MDMT of the Shell : -48 C
Governing MDMT of all the sub-joints on this junction : -48 C

Weld Size Calculations, Nozzle Number 2, Desc.: PSV

Intermediate Calcs. for nozzle/shell welds Tmin 4.4454 mm

Results Per UW-16.1:

Required Thickness Actual Thickness
Nozzle Weld 3.1118 = 0.7 * Tmin 4.2426 = 0.707 * WO , mm

NOTE : Skipping the nozzle attachment weld strength calculations.
Per UW-15(b)(2) the nozzles exempted by UG-36(c)(3)(a) (small nozzles)
do not require a weld strength check.

M.A.W.P. Results Based on, Shell and Nozzle neck:

Converged M.A.W.P for given geometry AMAWP 3.467 MPa

Flange Pressure Rating for CL 300 GR 1.1 (ASME/ANSI B16.5 2003 Ed.):

Pressure Rating for B16.5 Flange at : 150 C is : 4.514 MPa

Pressure Rating for B16.5 Flange at : 21 C is : 5.102 MPa

Minimum Design Metal Temperature of Flange Without Impact Testing, Curve: B

Stress Ratio, Sfrat = Design Pressure / Flange Rating at MDMT
= 1.57 / 5.10 = 0.308

Min. Metal Temp. w/o impact per UCS-66(c) -29 C
Reduction in Min. Metal Temp. per UCS-66.1 using Sfrat 78 C
Final Minimum Metal Temperature at Design Pressure -104 C

Input Echo, Nozzle Item 1, Description: UC

| | | | |
|-------------------------------------|--------|--------|-----|
| Design Internal Pressure (Case 1) | P | 1.57 | MPa |
| Temperature for Internal Pressure | TEMP | 150.00 | C |
| Design External Pressure (Case 2) | PEXT | 0.10 | MPa |
| Temperature for External Pressure | TEMPEX | 150.00 | C |

| | | | |
|---------------------------------------|--------|--------------------|--|
| Include Hydrostatic Head Components | YES | | |
| Operating Liquid Density | 0.001 | kg/cm ³ | |
| Height of Liquid Column (Operating) | 960.00 | mm | |

| | | | |
|---|-----------|---------|-----|
| Shell or Head Material (Not Normalized or NA) | SA-516 70 | | |
| Material UNS Number | K02700 | | |
| Shell/Head Allowable Stress at Temperature | S | 137.900 | MPa |
| Shell/Head Allowable Stress At Ambient | SA | 137.900 | MPa |
| Shell/Head Yield Stress at Temperature | Sy | 231.522 | MPa |

| | | | |
|---------------------------------------|-----|----------|----|
| Outside Diameter of Cylindrical Shell | D | 508.000 | mm |
| Design Length of Section | L | 1650.000 | mm |
| Actual Thickness of Shell or Head | T | 9.5250 | mm |
| Corrosion Allowance for Shell or Head | CAS | 3.2000 | mm |

| | |
|---|-----|
| Is this Nozzle a Radial Nozzle | YES |
| Is this Nozzle a Lateral Nozzle (Y-angle) | NO |

The Attached Flange is Class CL 150 Grade GR 1.1

| | | | |
|--|----------|---------|-----|
| Nozzle Material (Not Normalized or NA) | SA-106 B | | |
| Material UNS Number | K03006 | | |
| Nozzle Allowable Stress at Temperature | SN | 117.905 | MPa |
| Nozzle Allowable Stress At Ambient | SNA | 117.905 | MPa |

| | | | |
|----------------------------|--------|--------|----|
| Diameter Basis for Nozzle | BASISN | OD | |
| Nominal Diameter of Nozzle | DIA | 50.800 | mm |

| | | | |
|--|--------|---------|----|
| Nozzle Size and Thickness Basis | DBN | Minimum | |
| Nominal Thickness of Nozzle | THKNOM | SCH 160 | |
| Corrosion Allowance for Nozzle | CAN | 3.2000 | mm |
| Joint Efficiency of Shell Seam at Nozzle | ES | 1.00 | |
| Joint Efficiency of Nozzle Neck | EN | 1.00 | |

| | | | |
|---|------|---------|----|
| Insert or Abutting Nozzle Type | NTYP | Insert | |
| Outward Projection of Nozzle | HO | 103.000 | mm |
| Weld leg size between Nozzle and Pad/Shell | WO | 6.0000 | mm |
| Groove weld depth between Nozzle and Vessel | WGNV | 9.5000 | mm |

| | |
|---|-----|
| Is this is Manway/Access/Inspection Opening | No |
| Skip Iterative Failure Thickness Calculations | Yes |

Reinforcement CALCULATION, Description: UC

ASME Code, Section VIII, Division 1, 2007, A-09 UG-37 to UG-45

Actual Outside Diameter Used in Calculation 60.325 mm.
Actual Thickness Used in Calculation 7.645 mm

Internal Pressure Results for SHELL/HEAD :

Reqd thk per UG-37(a) of Cylindrical Shell, Tr [Internal Press]

Thickness Due to Internal Pressure:

= (P*(D/2-CAE)) / (S*E+0.4*P) per Appendix 1-1 (a) (1)
= (1.58*(508.0000/2-0.000))/(137.90*1.00+0.4*1.58)
= 2.8943 + 3.2000 = 6.0943 mm

External Pressure Results for SHELL/HEAD :

External Pressure Results, Shell Number 1, Desc.: UC
ASME Code, Section VIII, Division 1, 2007 A-09

External Pressure Chart CS-2 at 150.00 C
Elastic Modulus for Material 199818.77 MPa

Results for Max. Allowable External Pressure (Emawp):

Corroded Thickness of Shell TCA 6.3250 mm
Outside Diameter of Shell ODCA 508.000 mm
Design Length of Cylinder or Cone SLEN 1650.000 mm
Diameter / Thickness Ratio (D/T) 80.3162
Length / Diameter Ratio LD 3.2480
Geometry Factor, A f(DT,LD) A 0.0005648
Materials Factor, B, f(A, Chart) B 56.4275 MPa
Maximum Allowable Working Pressure 0.94 MPa
EMAWP = (4*B)/(3*(D/T)) = (4 *56.4275)/(3 *80.3162) = 0.9368

Results for Reqd Thickness for Ext. Pressure (Tca):

Corroded Thickness of Shell TCA 2.6256 mm
Outside Diameter of Shell ODCA 508.000 mm
Design Length of Cylinder or Cone SLEN 1650.000 mm
Diameter / Thickness Ratio (D/T) 193.4768
Length / Diameter Ratio LD 3.2480
Geometry Factor, A f(DT,LD) A 0.0001502
Materials Factor, B, f(A, Chart) B 15.0084 MPa
Maximum Allowable Working Pressure 0.10 MPa
EMAWP = (4*B)/(3*(D/T)) = (4 *15.0084)/(3 *193.4768) = 0.1034

Results for Maximum Length Calculation: No Conversion

Corroded Thickness of Shell TCA 6.3250 mm
Outside Diameter of Shell ODCA 508.000 mm
Design Length of Cylinder or Cone SLEN 0.128E+21 mm
Diameter / Thickness Ratio (D/T) 80.3162
Length / Diameter Ratio LD 50.0000
Geometry Factor, A f(DT,LD) A 0.0001705
Materials Factor, B, f(A, Chart) B 17.0370 MPa
Maximum Allowable Working Pressure 0.28 MPa

EMAWP = (4*B)/(3*(D/T)) = (4 *17.0370)/(3 *80.3162) = 0.2828

Summary of External Pressure Results:

| | | |
|---|------------|-----|
| Allowable Pressure at Corroded thickness | 0.94 | MPa |
| Required Pressure as entered by User | 0.10 | MPa |
| Required Thickness including Corrosion all. | 5.8256 | mm |
| Actual Thickness as entered by User | 9.5250 | mm |
| Maximum Length for Thickness and Pressure | 0.1280E+21 | mm |
| Actual Length as entered by User | 1650.00 | mm |

Internal Pressure Results for NOZZLE :

Reqd thk per UG-37(a) of Nozzle Wall, Trn [Internal Press]

Thickness Due to Internal Pressure:

= (P*(D/2-CAE)) / (S*E+0.4*P) per Appendix 1-1 (a) (1)
 = (1.58*(60.3250/2-0.000))/(117.90*1.00+0.4*1.58)
 = 0.4017 + 3.2000 = 3.6017 mm

External Pressure Results for Nozzle per UG-28 :

External Pressure Results, Shell Number 1, Desc.: UC
ASME Code, Section VIII, Division 1, 2007 A-09

| | | | | |
|------------------------------|------|----|-----------|-----|
| External Pressure Chart | CS-2 | at | 150.00 | C |
| Elastic Modulus for Material | | | 199818.77 | MPa |

Results for Max. Allowable External Pressure (Emawp):

| | | | |
|--|-------|-----------|-----|
| Corroded Thickness of Shell | TCA | 4.4454 | mm |
| Outside Diameter of Shell | ODCA | 60.325 | mm |
| Design Length of Cylinder or Cone | SLEN | 103.000 | mm |
| Diameter / Thickness Ratio | (D/T) | 13.5702 | |
| Length / Diameter Ratio | LD | 1.7074 | |
| Geometry Factor, A f(DT,LD) | A | 0.0164045 | |
| Materials Factor, B, f(A, Chart) | B | 122.6765 | MPa |
| Maximum Allowable Working Pressure | | 12.05 | MPa |
| EMAWP = (4*B)/(3*(D/T)) = (4 *122.6765)/(3 *13.5702) = 12.0535 | | | |

Results for Req'd Thickness for Ext. Pressure (Tca):

| | | | |
|---|-------|-----------|-----|
| Corroded Thickness of Shell | TCA | 0.2404 | mm |
| Outside Diameter of Shell | ODCA | 60.325 | mm |
| Design Length of Cylinder or Cone | SLEN | 103.000 | mm |
| Diameter / Thickness Ratio | (D/T) | 250.9088 | |
| Length / Diameter Ratio | LD | 1.7074 | |
| Geometry Factor, A f(DT,LD) | A | 0.0001948 | |
| Materials Factor, B, f(A, Chart) | B | 19.4636 | MPa |
| Maximum Allowable Working Pressure | | 0.10 | MPa |
| EMAWP = (4*B)/(3*(D/T)) = (4 *19.4636)/(3 *250.9088) = 0.1034 | | | |

Results for Maximum Length Calculation: No Conversion

| | | | |
|-----------------------------|------|--------|----|
| Corroded Thickness of Shell | TCA | 4.4454 | mm |
| Outside Diameter of Shell | ODCA | 60.325 | mm |

| | | | |
|--|-------|-----------|-----|
| Design Length of Cylinder or Cone | SLEN | 0.109E+33 | mm |
| Diameter / Thickness Ratio | (D/T) | 13.5702 | |
| Length / Diameter Ratio | LD | 50.0000 | |
| Geometry Factor, A f(DT,LD) | A | 0.0059734 | |
| Materials Factor, B, f(A, Chart) | B | 121.0112 | MPa |
| Maximum Allowable Working Pressure | | 11.89 | MPa |
| EMAWP = (4*B)/(3*(D/T)) = (4 *121.0112)/(3 *13.5702) = 11.8899 | | | |

Summary of External Pressure Results:

| | | |
|---|------------|-----|
| Allowable Pressure at Corroded thickness | 12.05 | MPa |
| Required Pressure as entered by User | 0.10 | MPa |
| Required Thickness including Corrosion all. | 3.4404 | mm |
| Actual Thickness as entered by User | 7.6454 | mm |
| Maximum Length for Thickness and Pressure | 0.1089E+33 | mm |
| Actual Length as entered by User | 103.00 | mm |

UG-40, Thickness and Diameter Limit Results : Internal Pressure

| | | | |
|--|------|---------|----|
| Effective material diameter limit, | DL | 102.868 | mm |
| Effective material thickness limit, no pad | TLNP | 11.113 | mm |

NOTE : Taking a UG-36(c)(3)(a) exemption for UC .

This calculation is valid for nozzles that meet all the requirements of paragraph UG-36. Please check the Code carefully, especially for nozzles that are not isolated or do not meet Code spacing requirements. To force the computation of areas for small nozzles, go to the Miscellaneous Tab.

Opening size: 51.434, Shell/Head Req. thk.: 2.894 mm

UG-45 Minimum Nozzle Neck Thickness Requirement:

| | | |
|--------------------------------|--|----|
| Wall Thickness per UG45(a), | tra = 3.6017 | mm |
| Wall Thickness per UG16(b), | tr16b = 4.7875 | mm |
| Wall Thickness per UG45(b)(1), | trb1 = 6.0943 | mm |
| Wall Thickness per UG45(b)(2), | trb2 = 3.3904 | mm |
| Wall Thickness per UG45(b)(3), | trb3 = Max(trb1, trb2, tr16b) = 6.0943 | mm |
| Std. Wall Pipe per UG45(b)(4), | trb4 = 6.6227 | mm |
| Wall Thickness per UG45(b), | trb = Min(trb3, trb4) = 6.0943 | mm |

| | | |
|---------------------------------|-------------------------------|-----------|
| Final Required Thickness, | tr45 = Max(tra, trb) = 6.0943 | mm |
| Available Nozzle Neck Thickness | = 7.6454 | mm --> OK |

| | | |
|---|-------|---|
| Weight of Nozzle, with Flange, Uncorroded | 33.45 | N |
| Weight of Nozzle, with Flange, Corroded | 29.26 | N |

Minimum Design Metal Temperature (MDMT) Results :

MDMT of Shell, UCS curve : B

Govrn. thk, tg = 9.525 , tr = 2.894 , c = 3.2000 mm , E* = 1.00
 Stress Ratio = tr * (E*) / (tg - c) = 0.458 , Temp. Reduction = 40 C

| | | |
|---|-----|---|
| Min. Metal Temp. w/o impact per Fig. UCS-66 | -29 | C |
| Min. Metal Temp. at Req'd thk. (UCS 66.1) | -48 | C |

Min. Metal Temp. w/o impact per UG-20(f) -29 C

MDMT of Nozzle Neck to Flange Weld, UCS Curve : B

Govrn. thk, tg = 7.645 , tr = 0.402 , c = 3.2000 mm , E* = 1.00
Stress Ratio = tr * (E*) / (tg - c) = 0.090 , Temp. Reduction = 78 C

Min. Metal Temp. w/o impact per Fig. UCS-66 -29 C
Min. Metal Temp. at Req'd thk. (UCS 66.1) -104 C
Min. Metal Temp. w/o impact per UG-20(f) -29 C

MDMT of Nozzle-Shell/Head Weld for the Nozzle (UCS-66(a)1(b)), Curve : B

Govrn. thk, tg = 7.645 , tr = 0.402 , c = 3.2000 mm , E* = 1.00
Stress Ratio = tr * (E*) / (tg - c) = 0.090 , Temp. Reduction = 78 C

Min. Metal Temp. w/o impact per Fig. UCS-66 -29 C
Min. Metal Temp. at Req'd thk. (UCS 66.1) -104 C
Min. Metal Temp. w/o impact per UG-20(f) -29 C

Governing MDMT of the Shell : -48 C
Governing MDMT of all the sub-joints on this junction : -48 C

Weld Size Calculations, Nozzle Number 1, Desc.: UC

Intermediate Calcs. for nozzle/shell welds Tmin 4.4454 mm

Results Per UW-16.1:

Required Thickness Actual Thickness
Nozzle Weld 3.1118 = 0.7 * Tmin 4.2426 = 0.707 * WO , mm

NOTE : Skipping the nozzle attachment weld strength calculations.
Per UW-15(b)(2) the nozzles exempted by UG-36(c)(3)(a) (small nozzles)
do not require a weld strength check.

M.A.W.P. Results Based on, Shell and Nozzle neck:

Converged M.A.W.P for given geometry AMAWP 3.459 MPa

Flange Pressure Rating for CL 150 GR 1.1 (ASME/ANSI B16.5 2003 Ed.):

Pressure Rating for B16.5 Flange at : 150 C is : 1.582 MPa
Pressure Rating for B16.5 Flange at : 21 C is : 1.965 MPa

Minimum Design Metal Temperature of Flange Without Impact Testing, Curve: B

Stress Ratio, Sfrat = Design Pressure / Flange Rating at MDMT
= 1.58 / 1.97 = 0.803

Min. Metal Temp. w/o impact per UCS-66(c) -29 C
Reduction in Min. Metal Temp. per UCS-66.1 using Sfrat 11 C
Final Minimum Metal Temperature at Design Pressure -40 C

Input Echo, Nozzle Item 3, Description: V

| | | | |
|-------------------------------------|--------|--------|-----|
| Design Internal Pressure (Case 1) | P | 1.57 | MPa |
| Temperature for Internal Pressure | TEMP | 150.00 | C |
| Design External Pressure (Case 2) | PEXT | 0.10 | MPa |
| Temperature for External Pressure | TEMPEX | 150.00 | C |

| | | | |
|---------------------------------------|-------|--------------------|--|
| Include Hydrostatic Head Components | YES | | |
| Operating Liquid Density | 0.001 | kg/cm ³ | |
| Height of Liquid Column (Operating) | 0.00 | mm | |

| | | | |
|---|-----------|---------|-----|
| Shell or Head Material (Not Normalized or NA) | SA-516 70 | | |
| Material UNS Number | K02700 | | |
| Shell/Head Allowable Stress at Temperature | S | 137.900 | MPa |
| Shell/Head Allowable Stress At Ambient | SA | 137.900 | MPa |
| Shell/Head Yield Stress at Temperature | Sy | 231.522 | MPa |

| | | | |
|---------------------------------------|-----|---------|----|
| Outside Diameter of Elliptical Head | D | 508.000 | mm |
| Aspect Ratio of Elliptical Head | AR | 2.00 | |
| Actual Thickness of Shell or Head | T | 9.5250 | mm |
| Corrosion Allowance for Shell or Head | CAS | 3.2000 | mm |

Is this Nozzle a Radial Nozzle YES

The Attached Flange is Class CL 150 Grade GR 1.1

Is the Nozzle Outside the 80% diameter Limit NO

| | | | |
|--|----------|---------|-----|
| Nozzle Material (Not Normalized or NA) | SA-106 B | | |
| Material UNS Number | K03006 | | |
| Nozzle Allowable Stress at Temperature | SN | 117.905 | MPa |
| Nozzle Allowable Stress At Ambient | SNA | 117.905 | MPa |

| | | | |
|----------------------------|--------|--------|----|
| Diameter Basis for Nozzle | BASISN | OD | |
| Nominal Diameter of Nozzle | DIA | 50.800 | mm |

| | | | |
|--|--------|---------|----|
| Nozzle Size and Thickness Basis | DBN | Minimum | |
| Nominal Thickness of Nozzle | THKNOM | SCH 160 | |
| Corrosion Allowance for Nozzle | CAN | 3.2000 | mm |
| Joint Efficiency of Shell Seam at Nozzle | ES | 1.00 | |
| Joint Efficiency of Nozzle Neck | EN | 1.00 | |

| | | | |
|---|------|---------|----|
| Insert or Abutting Nozzle Type | NTYP | Insert | |
| Outward Projection of Nozzle | HO | 103.000 | mm |
| Weld leg size between Nozzle and Pad/Shell | WO | 6.0000 | mm |
| Groove weld depth between Nozzle and Vessel | WGNV | 9.5000 | mm |

| | |
|---|-----|
| Is this is Manway/Access/Inspection Opening | No |
| Skip Iterative Failure Thickness Calculations | Yes |

Reinforcement CALCULATION, Description: V

ASME Code, Section VIII, Division 1, 2007, A-09 UG-37 to UG-45

Actual Outside Diameter Used in Calculation 60.325 mm.
 Actual Thickness Used in Calculation 7.645 mm

Internal Pressure Results for SHELL/HEAD :

Reqd thk per UG-37(a) of Elliptical Head, Tr [Internal Press]
 Thickness Due to Internal Pressure:
 = $(P*(D-2*CAE)*K) / (2*S*E+0.8*P)$ per Appendix 1-1 (a) (2)
 = $(1.57*(508.0000-2*0.000)*0.90) / (2*137.90*1.00+0.8*1.57)$
 = 2.5892 + 3.2000 = 5.7892 mm

External Pressure Results for SHELL/HEAD :

External Pressure Results, Shell Number 3, Desc.: V
 ASME Code, Section VIII, Division 1, 2007 A-09

External Pressure Chart CS-2 at 150.00 C
 Elastic Modulus for Material 199818.77 MPa

Results for Max. Allowable External Pressure (Emawp):
 Corroded Thickness of Head TCA 6.3250 mm
 Outside Diameter of Shell ODCA 508.000 mm
 Diameter / Thickness Ratio (D/T) 80.3162
 Geometry Factor, A f(DT,LD) A 0.0017293
 Materials Factor, B, f(A, Chart) B 100.1249 MPa
 Maximum Allowable Working Pressure 1.39 MPa
 EMAWP = $B / (K0*(D/T)) = 100.1249 / (0.9000 * 80.3162) = 1.3851$

Results for Reqd Thickness for Ext. Pressure (Tca):
 Corroded Thickness of Head TCA 1.3158 mm
 Outside Diameter of Shell ODCA 508.000 mm
 Diameter / Thickness Ratio (D/T) 386.0915
 Geometry Factor, A f(DT,LD) A 0.0003597
 Materials Factor, B, f(A, Chart) B 35.9405 MPa
 Maximum Allowable Working Pressure 0.10 MPa
 EMAWP = $B / (K0*(D/T)) = 35.9405 / (0.9000 * 386.0915) = 0.1034$

Summary of External Pressure Results:
 Allowable Pressure at Corroded thickness 1.39 MPa
 Required Pressure as entered by User 0.10 MPa
 Required Thickness including Corrosion all. 4.5157 mm
 Actual Thickness as entered by User 9.5250 mm

Internal Pressure Results for NOZZLE :

Reqd thk per UG-37(a) of Nozzle Wall, Trn [Internal Press]
 Thickness Due to Internal Pressure:
 = $(P*(D/2-CAE)) / (S*E+0.4*P)$ per Appendix 1-1 (a) (1)
 = $(1.57*(60.3250/2-0.000)) / (117.90*1.00+0.4*1.57)$

= 0.3993 + 3.2000 = 3.5993 mm

External Pressure Results for Nozzle per UG-28 :

External Pressure Results, Shell Number 3, Desc.: V
 ASME Code, Section VIII, Division 1, 2007 A-09

External Pressure Chart CS-2 at 150.00 C
 Elastic Modulus for Material 199818.77 MPa

Results for Max. Allowable External Pressure (Emawp):

Corroded Thickness of Shell TCA 4.4454 mm
 Outside Diameter of Shell ODCA 60.325 mm
 Design Length of Cylinder or Cone SLEN 103.000 mm
 Diameter / Thickness Ratio (D/T) 13.5702
 Length / Diameter Ratio LD 1.7074
 Geometry Factor, A f(DT,LD) A 0.0164045
 Materials Factor, B, f(A, Chart) B 122.6765 MPa
 Maximum Allowable Working Pressure 12.05 MPa
 $EMAWP = (4*B)/(3*(D/T)) = (4 * 122.6765) / (3 * 13.5702) = 12.0535$

Results for Req'd Thickness for Ext. Pressure (Tca):

Corroded Thickness of Shell TCA 0.2404 mm
 Outside Diameter of Shell ODCA 60.325 mm
 Design Length of Cylinder or Cone SLEN 103.000 mm
 Diameter / Thickness Ratio (D/T) 250.9088
 Length / Diameter Ratio LD 1.7074
 Geometry Factor, A f(DT,LD) A 0.0001948
 Materials Factor, B, f(A, Chart) B 19.4636 MPa
 Maximum Allowable Working Pressure 0.10 MPa
 $EMAWP = (4*B)/(3*(D/T)) = (4 * 19.4636) / (3 * 250.9088) = 0.1034$

Results for Maximum Length Calculation: No Conversion

Corroded Thickness of Shell TCA 4.4454 mm
 Outside Diameter of Shell ODCA 60.325 mm
 Design Length of Cylinder or Cone SLEN 0.109E+33 mm
 Diameter / Thickness Ratio (D/T) 13.5702
 Length / Diameter Ratio LD 50.0000
 Geometry Factor, A f(DT,LD) A 0.0059734
 Materials Factor, B, f(A, Chart) B 121.0112 MPa
 Maximum Allowable Working Pressure 11.89 MPa
 $EMAWP = (4*B)/(3*(D/T)) = (4 * 121.0112) / (3 * 13.5702) = 11.8899$

Summary of External Pressure Results:

Allowable Pressure at Corroded thickness 12.05 MPa
 Required Pressure as entered by User 0.10 MPa
 Required Thickness including Corrosion all. 3.4404 mm
 Actual Thickness as entered by User 7.6454 mm
 Maximum Length for Thickness and Pressure 0.1089E+33 mm
 Actual Length as entered by User 103.00 mm

UG-40, Thickness and Diameter Limit Results : Internal Pressure
Effective material diameter limit, DL 102.868 mm
Effective material thickness limit, no pad TLNP 11.113 mm

NOTE : Taking a UG-36(c)(3)(a) exemption for V .
This calculation is valid for nozzles that meet all the requirements of paragraph UG-36. Please check the Code carefully, especially for nozzles that are not isolated or do not meet Code spacing requirements. To force the computation of areas for small nozzles, go to the Miscellaneous Tab.

Opening size: 51.434, Shell/Head Req. thk.: 2.589 mm

UG-45 Minimum Nozzle Neck Thickness Requirement:
Wall Thickness per UG45(a), tra = 3.5993 mm
Wall Thickness per UG16(b), tr16b = 4.7875 mm
Wall Thickness per UG45(b)(1), trb1 = 6.0607 mm
Wall Thickness per UG45(b)(2), trb2 = 3.3714 mm
Wall Thickness per UG45(b)(3), trb3 = Max(trb1, trb2, tr16b) = 6.0607 mm
Std. Wall Pipe per UG45(b)(4), trb4 = 6.6227 mm
Wall Thickness per UG45(b), trb = Min(trb3, trb4) = 6.0607 mm

Final Required Thickness, tr45 = Max(tra, trb) = 6.0607 mm
Available Nozzle Neck Thickness = 7.6454 mm --> OK

Weight of Nozzle, with Flange, Uncorroded 33.45 N
Weight of Nozzle, with Flange, Corroded 29.26 N

Minimum Design Metal Temperature (MDMT) Results :

MDMT of Shell, UCS curve : B

Govrn. thk, tg = 9.525 , tr = 2.589 , c = 3.2000 mm , E* = 1.00
Stress Ratio = tr * (E*) / (tg - c) = 0.409 , Temp. Reduction = 56 C

Min. Metal Temp. w/o impact per Fig. UCS-66 -29 C
Min. Metal Temp. at Req'd thk. (UCS 66.1) -48 C
Min. Metal Temp. w/o impact per UG-20(f) -29 C

MDMT of Nozzle Neck to Flange Weld, UCS Curve : B

Govrn. thk, tg = 7.645 , tr = 0.399 , c = 3.2000 mm , E* = 1.00
Stress Ratio = tr * (E*) / (tg - c) = 0.090 , Temp. Reduction = 78 C

Min. Metal Temp. w/o impact per Fig. UCS-66 -29 C
Min. Metal Temp. at Req'd thk. (UCS 66.1) -104 C
Min. Metal Temp. w/o impact per UG-20(f) -29 C

MDMT of Nozzle-Shell/Head Weld for the Nozzle (UCS-66(a)1(b)), Curve : B

Govrn. thk, tg = 7.645 , tr = 0.399 , c = 3.2000 mm , E* = 1.00
Stress Ratio = tr * (E*) / (tg - c) = 0.090 , Temp. Reduction = 78 C

| | | |
|---|------|---|
| Min. Metal Temp. w/o impact per Fig. UCS-66 | -29 | C |
| Min. Metal Temp. at Req'd thk. (UCS 66.1) | -104 | C |
| Min. Metal Temp. w/o impact per UG-20(f) | -29 | C |

| | | | |
|---|---|-----|---|
| Governing MDMT of the Head | : | -48 | C |
| Governing MDMT of all the sub-joints on this junction | : | -48 | C |

Weld Size Calculations, Nozzle Number 3, Desc.: V

Intermediate Calcs. for nozzle/shell welds Tmin 4.4454 mm

Results Per UW-16.1:

| | | | |
|-------------|---------------------|---------------------|------|
| | Required Thickness | Actual Thickness | |
| Nozzle Weld | 3.1118 = 0.7 * Tmin | 4.2426 = 0.707 * WO | , mm |

NOTE : Skipping the nozzle attachment weld strength calculations. Per UW-15(b) (2) the nozzles exempted by UG-36(c) (3) (a) (small nozzles) do not require a weld strength check.

M.A.W.P. Results Based on, Head and Nozzle neck:

Converged M.A.W.P for given geometry AMAWP 3.512 MPa

Flange Pressure Rating for CL 150 GR 1.1 (ASME/ANSI B16.5 2003 Ed.):

| | | | |
|---------------------------------------|-------|------|-----------|
| Pressure Rating for B16.5 Flange at : | 150 C | is : | 1.582 MPa |
| Pressure Rating for B16.5 Flange at : | 21 C | is : | 1.965 MPa |

Minimum Design Metal Temperature of Flange Without Impact Testing, Curve: B
Stress Ratio, Sfrat = Design Pressure / Flange Rating at MDMT
= 1.57 / 1.97 = 0.798

| | | |
|--|-----|---|
| Min. Metal Temp. w/o impact per UCS-66(c) | -29 | C |
| Reduction in Min. Metal Temp. per UCS-66.1 using Sfrat | 11 | C |
| Final Minimum Metal Temperature at Design Pressure | -40 | C |

S.O.I.M.E. S. R. L.

SERVICIOS Y OBRAS INTEGRALES, MECÁNICAS Y ESTRUCTURALES

Administración y Talleres: D. Borghi 35 TE/Fax 54-341-4918600/839 - S2156BDA - Fray Luis Beltrán - Santa Fe - Argentina
http://www.soime.com.ar e-mail: info@soime.com.ar

CARCASA PARA FILTRO 3101L A/B MEMORIA DE CÁLCULO DE CIERRE

1654-MC-02 Rev. B

| |
|---|
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| APPROVED BY |
| |
| 20/04/2010 |
| DATE |

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|-------------|
| |
| ACCEPTED BY |
| |
| DATE |


FOR: MC
20-10-10
Pg 1 de 3
1

SOIME SRL BORGHI 35 - (2156) FRAY LUIS BELTRAN
PCIA. DE SANTA FE - ARGENTINA - TE/FAX: 54-341-4918600 y 4918639
E-mail: info@soime.com.ar Web: www.soime.com.ar

DATA BOOK

OBRA N°: FECHA:

ORDEN DE COMPRA O CONTRATO N°:

COMITENTE:

PROYECTO N°:

UBICACIÓN:

COMPONENTE (TAG N°):

3

**PLAN DE EXAMEN E INSPECCION Y
PROTOCOLOS**


Por favor usar
20-10-D



EXAMINATION AND INSPECTION PLAN
(PLAN DE EXAMEN E INSPECCION)

DATE (FECHA): 23/02/2010

Page (Página) 1 of 7

PLAN No: PEI-1654-01-B
(PLAN N°)

JOB No: O-1654
(OBRA N°)

PURCHASE ORDER No: 31245-28938
(ORDE DE COMPRA N°)

PURCHASER: METPOR S.A
(COMPRADOR)

PROJECT No: -
(PROYECTO N°)

PROJECT DESC.: HDS FEED FILTERS
(DESCRIPCION DEL PROYECTO)

LOCATION No: BUENOS AIRES
(UBICACION N°)

TAG No: 3101L B
(EQUIPO N°)

DRAWING No: 1654-3101L
(PLANO N°)

ASME CODE SECTION: VIII Div. 1 EDITION: 2007 ADDENDA: 2009
(SECCION DEL CODIGO ASME) (EDICION) (ADENDA)

NOMENCLATURE FOR EXAMINATION AND INSPECTION CATEGORIES
(NOMENCLATURA PARA CATEGORIAS DE EXAMEN E INSPECCION)

*R - REVIEW
(REVISION)
*HP - HOLD POINT
(PUNTO DE DETENIMIENTO)

*W - WITNESS POINT
(PUNTO DE PRESENCIA)
*S - SELECT
(SELECCIONAR)

| REV. No (REV. N°) | DATE (FECHA) | SOIME'S REPRESENTANT (REPRESENTANTE DE SOIME) | SUPPLIER'S REPRESENTANT (REPRESENTANTE DEL COMPRADOR) | AUTORIZED INSPECTOR (INSPECTOR AUTORIZADO) |
|----------------------|-----------------|--|--|---|
| A | 23/02/2010 | DANIEL CAMAZON | | |
| B | 15/04/2010 | DANIEL CAMAZON | | |
| | | | | |

ADRESS (DIRECCION): SOIME S.R.L. - BORGHINI 35 - (2156) FRAY LUIS BELTRAN - PCIA. DE SANTA FE
TE / FAX: (54) 341-4918600 / (54) 341-4918639 - E-MAIL: info@soime.com.ar - WEB: www.soime.com.ar

EXHIBIT 9.1
REV.0
Koroni Mac.
20-10-10



EXAMINATION AND INSPECTION PLAN
(PLAN DE EXAMEN E INSPECCION)

DATE (FECHA) 23/02/2010

Page (Página) 2 of 7

PLAN No: PEI-1654-01-B

(PLAN N°)

REV. No: B

(REV. N°)

TAG No: 3101L B

(EQUIPO N°)

| ITEM (NUMERO) | ACTIVITY DESCRIPTION (DESCRIPCION DE LA ACTIVIDAD) | CODE PARAGRAPH OR PROCEDURE APPLICABLE (PARRAFO DEL CODIGO O PROCEDIMIENTO APLICABLE) | INSPECTION POINT (PUNTO DE INSPECCION) | | | SIGN AND DATES (NOTAS DE COMPRA) | | |
|---------------|---|---|--|----------|------|----------------------------------|----------|------|
| | | | SOIME | SUPPLIER | A.I. | SOIME | SUPPLIER | A.I. |
| 1 | REVISION DE DOCUMENTACION | | | | | | | |
| 1.1 | Revisión de planos | ASME VIII DIV. 1 UG-UW-UCS | R | | RD | | | |
| 1.2 | Revisión de memoria de cálculo | ASME VIII DIV. 1 UG-UW-UCS | R | | RD | | | |
| 1.3 | Revisión de WPS's | ASME IX | HP | | RD | | | |
| 1.4 | Revisión de PQR's | ASME IX | HP | | RD | | | |
| 1.5 | Revisión de WPI's | ASME IX | HP | | RD | | | |
| 1.6 | Revisión de procedimientos de END | PR-NOT-01 Rev. 0 | HP | | RD | | | |
| 2 | RECEPCION DE MATERIALES | | | | | | | |
| 2.1 | Recepcion de materiales | DC Manual de Soime, ASME II and VIII Div. 1 | R | | RD | | | |
| 2.2 | Verificación de MTR | DC Manual de Soime, ASME II and VIII Div. 1 | HP | | RD | | | |
| 2.3 | Estampado de código de trazabilidad | DC Manual de Soime, ASME II and VIII Div. 1 | HP | | IV | | | |
| 3 | INSPECCIONES DE FABRICACION | | | | | | | |
| 3.1 | CABEZALES Y CUERPO | | | | | | | |
| 3.1.1 | Corte de chapas | DWG SOIME N° 1654-1-02 | W | | IV | | | |
| 3.1.2 | Presentación de biseles longitudinales (ver anexo "A") | DWG SOIME N° 1654-1-02, 1654-01 WM Y UW-31,32 y 33 | W | | HP | | | |
| 3.1.3 | Control mecanizado de tapa de cierre. | DWG SOIME N° 1654-1-02 | HP | | | | | |
| 3.1.4 | Control de redondez | DWG SOIME N° 1654-01 Y UG-80 | HP | | RD | | | |
| 3.1.5 | Presentación de biseles circunferenciales (ver anexo "A") | DWG SOIME N° 1654-1-02, 1654-WM y UW-31,32 y 33 | W | | HP | | | |
| 3.1.6 | Inspeccion visual de soldaduras (ver anexo "A") | DWG SOIME N° 1654-02, 1654-WM y UW-35 | W | | HP | | | |
| 3.1.7 | END a soldaduras (ver anexo "A") | DWG SOIME N°1654-1-01, 1654-1-WM and ASME VIII Div. 1 | HP | | RD | | | |
| 3.1.8 | Trazado y corte de cabezales y virolas para conexiones. | DWG SOIME N°1654-1-01 | W | | | | | |

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EXHIBIT 9.1

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20-10-10



EXAMINATION AND INSPECTION PLAN
(PLAN DE EXAMEN E INSPECCION)

DATE (FECHA) 23/02/2010

Page (Página) 3 of 7

PLAN No: PEI-1654-01-B
(PLAN N°)

REV. No: B
(REV. N°)

TAG No: 3101L B
(EQUIPO N°)

| ITEM (NUMERO) | ACTIVITY DESCRIPTION (DESCRIPCION DE LA ACTIVIDAD) | CODE PARAGRAPH OR PROCEDURE APPLICABLE (PARRAFO DEL CODIGO O PROCEDIMIENTO APPLICABLE) | INSPECTION POINT (PUNTO DE INSPECCION) | | | SIGN AND DATES (NOTAS DE COMPRA) | | |
|------------------|--|---|---|----------|------|-------------------------------------|----------|------|
| | | | SOIME | SUPPLIER | A.I. | SOIME | SUPPLIER | A.I. |
| 3.2 | CONEXIONES | | | | | | | |
| 3.2.1 | Corte de caños | DWG SOIME N°1654-1-03 | W | | IV | | | |
| 3.2.2 | Presentacion de caños con bridas y media cupla (ver anexo "B") | DWG SOIME N°1654-1-03, 1654-1-WM y UW-31,32 y 33 | W | | IV | | | |
| 3.2.3 | Control visual de soldaduras (ver anexo "B") | DWG SOIME N° 1654-1-03, 1654-1-WM y UW-35 | W | | IV | | | |
| 3.3 | SOPORTES Y PESCANTE | | | | | | | |
| 3.3.1 | Corte de chapas y caños | DWG SOIME N°1654-1-04, 1654-1-05 | W | | | | | |
| 3.3.2 | Inspección presentación y soldaduras | DWG SOIME N°1654-1-04, 1654-1-05 y UW-31,32 y 33 | W | | | | | |
| 3.3.2 | Control dimensional | DWG SOIME N°1654-1-01 | W | | | | | |
| 3.4 | ENSAMBLE DE CUERPO CON CONEXIONES, SOPORTES Y PESCANTE | | | | | | | |
| 3.4.1 | Presentación de conexiones a cuerpo (ver anexo "B") | DWG SOIME N° 1654-1-01, 1654-1-WM y UW31,32 y 33 | W | | IV | | | |
| 3.4.2 | Presentación y soldadura de soportes | DWG SOIME N° 1654-1-01 y UW-31,32 y 33 | W | | IV | | | |
| 3.4.3 | Inspección de soldaduras (ver anexo "B") | DWG SOIME N°1654-1-01, 1654-1-WM UW-34 y 36 | HP | | IV | | | |
| 3.4.4 | Presentación y soldadura de pescante | DWG SOIME N°1654-1-04 y UW-36 | W | | IV | | | |
| 3.4.5 | Presentación y soldadura de soporte de placa de identificación | DWG SOIME N°1654-1-01 y UW-36 | W | | IV | | | |
| 3.5 | INTERNOS | | | | | | | |
| 3.5.1 | Cortes de chapas | DWG SOIME N°1654-1-02 | W | | | | | |
| 3.5.2 | Presentacion y soldadura contra cuerpo | DWG SOIME N°1654-1-02 y UW31,32 y 33 | W | | | | | |
| 3.6 | PWHT | | | | | | | |
| 3.6.1 | Control de tiempo, temperatura y certificados | DWG SOIME N°1654-1-01 UC556 | R | | RD | | | |

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EXAMINATION AND INSPECTION PLAN
(PLAN DE EXAMEN E INSPECCION)

DATE (FECHA) 23/02/2010

Page (Página) 4 of 7

PLAN No: PEI-1654-01-A

(PLAN N°)

REV. No: B

(REV. N°)

TAG No: 3101L A

(EQUIPO N°)

| ITEM (NUMERO) | ACTIVITY DESCRIPTION (DESCRIPCION DE LA ACTIVIDAD) | CODE PARAGRAPH OR PROCEDURE APLICABLE (PARRAFO DEL CODIGO O PROCEDIMIENTO APLICABLE) | INSPECTION POINT (PUNTO DE INSPECCION) | | | SIGN AND DATES (NOTAS DE COMPRA) | | |
|------------------|---|---|---|----------|------|-------------------------------------|----------|-----------------|
| | | | SOIME | SUPPLIER | A.I. | SOIME | SUPPLIER | A.I. |
| 4 | INSPECCIONES Y PRUEBAS FINALES | | | | | | | |
| 4.1 | Control dimensional | DWG SOIME N°1638-01 | HP | | IV | | | |
| 4.2 | Inspeccion visual interna y externa | DWG SOIME N°1654-01 y ASME VIII Div. 1 | HP | | HD | | | hmg 23/02/10 |
| 4.4 | Prueba hidrostática | Procedimiento SOIME PEP-01 y DWG SOIME N° 1654-1-01 | HP | | HD | | | 23/02/10 |
| 5 | PINTURA | | | | | | | |
| 5.1 | Control de arenado y desengrasado | DWG SOIME N°1654-1-01 | R | | | | | |
| 5.2 | control de esquema y espesor de pintura | DWG SOIME N°1654-1-01 | R | | | | | |
| 6 | APROBACIONES FINALES | | | | | | | |
| 6.1 | Resolucion de NO CONFORMIDADES | SOIME QC Manual | HP | | RD | | | |
| 6.2 | Estampado de la placa de identificacion | SOIME QC Manual | HP | | LD | | | |
| 6.3 | Firma de Data Report | SOIME QC Manual | HP | | LD | | | |
| 6.4 | Control del Data Book | SOIME QC Manual | HP | | RD | | | |
| 6.5 | Embalaje para transporte | SOIME QC Manual | HP | | | | | |

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Revision: 00

EXAMINATION AND INSPECTION PLAN
(PLAN DE EXAMEN E INSPECCION)

ANNEX "A" (BUTT JOINT)
ANEXO "A" (JUNTAS A TOPE)

PLAN No: PEI-1654-01-B

(PLAN N°): _____

REV. No: 0

(REV. N°): _____

TAG No: 31011 B

(EQUIPO N°): _____

| EQUIPMENT JOINT (UNTA DE EQUIPO) | CODE PARAGRAF (PARRAFO DEL CODIGO) | BEVEL PREPARATION, FIT UP & TACK WELD V.E. | | | VISUAL INSPECTION | | | NDE | | | | | | |
|----------------------------------|------------------------------------|--|-----------|----------|-------------------|-----------|----------|----------------|-----------|----------|----|----------|--|-------------|
| | | L.P. S&D SOIME | L.P. A.L. | S&D A.L. | L.P. S&D SOIME | L.P. A.L. | S&D A.L. | L.P. S&D SOIME | L.P. A.L. | S&D A.L. | | | | |
| L1 | UW-31.32.35.S1 | HP | | | HP | | | RT FULL | R | | LP | S&D A.L. | | |
| L2 | UW-31.32.35.S1 | HP | | | HP | | | RT FULL | R | | LP | S&D A.L. | | HP 15/25/10 |
| L3 | UW-31.32.35.S1 | HP | | | HP | | | RT FULL | R | | LP | S&D A.L. | | HP 15/25/10 |
| L4 | UW-31.32.35.S1 | HP | | | HP | | | RT FULL | R | | LP | S&D A.L. | | HP 15/25/10 |
| C1 | UW-31.32.35.S1 | HP | | | HP | | | RT FULL | R | | LP | S&D A.L. | | HP 15/25/10 |
| C2 | UW-31.32.35.S1 | HP | | | HP | | | RT FULL | R | | LP | S&D A.L. | | HP 15/25/10 |
| C3 | UW-31.32.35.S1 | HP | | | HP | | | RT FULL | R | | LP | S&D A.L. | | HP 15/25/10 |
| | UW-31.32.35.S1 | HP | | | HP | | | RT FULL | R | | LP | S&D A.L. | | HP 15/25/10 |

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20-10-10

- NOTES:
- * RT - RADIOGRAPHY (RADIOGRAFIA)
 - * UT - ULTRASOUND (ULTRASONIDO)
 - * PT - PENETRANT TINTS (TINTAS PENETRANTES)
 - * MT - MAGNETIC PARTICLES (PARTICULAS MAGNETICAS)

EXAMINATION AND INSPECTION PLAN
(PLAN DE EXAMEN E INSPECCION)

DATE (FECHA) 02/12/2009

Page (Página) 6 of 7

ANNEX "B" (NOZZLE)
ANEXO "B" (CONEXION)

PEI-165-4-01-B

PLAN No:
(PLAN N°)

REV. No:
(REV. N°)

TAG No:
(EQUIPO N°)

0

31011 B

| EQUIPMENT JOINT (UNTA DE EQUIPO) | CODE PARAGRAPH (PARRAFO DEL CODIGO) | BEVEL PREPARATION, FIT UP & TACK WELD V.E. | | | | | | VISUAL INSPECTION | | | | | | NDE | | | | | |
|-------------------------------------|--|---|--------------|--------------|-------------|--------------|-------------|-------------------|--------------|--------------|-------------|---------------|--------------|--------------|-------------|--------------|-------------|--|--|
| | | I.P. SOIME | S&D SOIME | I.P. A.I. | S&D A.I. | I.P. A.I. | S&D A.I. | I.P. SOIME | S&D SOIME | I.P. A.I. | S&D A.I. | I.P. SOIME | S&D SOIME | I.P. A.I. | S&D A.I. | I.P. A.I. | S&D A.I. | | |
| V-C1 | UW-35.36837 | W | [scribble] | | | | | HP | [scribble] | | | | | | | | | | |
| V-C2 | UW-35.36837 | W | [scribble] | | | | | HP | [scribble] | | | | | | | | | | |
| V-C3 | UW-35.36837 | W | [scribble] | | | | | HP | [scribble] | | | | | | | | | | |
| P-C1 | UW-35.36837 | W | [scribble] | | | | | HP | [scribble] | | | | | | | | | | |
| A-C1 | UW-35.36837 | W | [scribble] | | | | | HP | [scribble] | | | | | | | | | | |
| A-C2 | UW-35.36837 | W | [scribble] | | | | | HP | [scribble] | | | | | | | | | | |
| UC-C1 | UW-35.36837 | W | [scribble] | | | | | HP | [scribble] | | | | | | | | | | |
| UC-C2 | UW-35.36837 | W | [scribble] | | | | | HP | [scribble] | | | | | | | | | | |
| UC-C3 | UW-35.36837 | W | [scribble] | | | | | HP | [scribble] | | | | | | | | | | |
| B-C1 | UW-35.36837 | W | [scribble] | | | | | HP | [scribble] | | | | | | | | | | |
| B-C2 | UW-35.36837 | W | [scribble] | | | | | HP | [scribble] | | | | | | | | | | |

ADRESS (DIRECCION): SOIME S.R.L. - BORGHESI 45 - (2156) FRAY LUIS BELTRAN - POSE DE SANTA FE

EXHIBIT 9.1
REV.0
[Signature]
20-10-10

- NOTES:
- RT - RADIOGRAPHY (RADIOGRAFIA)
 - UT - ULTRASONID (ULTRASONIDO)
 - PT - PENETRANT TINTS (TINTAS PENETRANTES)
 - MT - MAGNETIC PARTICLES (PARTICULAS MAGNETICAS)

ANNEX "B" (NOZZLE)
ANEXO "B" (CONEXION)

PLAN No: PEI-1654-01-B

PLAN No:
(PLAN N°)

0

REV. No:
(REV. N°)

31011 B

TAG No:
(EQUIPO N°)

| EQUIPMENT JOINT (UNTA DE EQUIPO) | CODE PARAGRAPH (PARRAFO DEL CODIGO) | BEVEL PREPARATION, FIT UP & TACK WELD V.E. | | | | | | VISUAL INSPECTION | | | | | | NDE | | | | | | | |
|-------------------------------------|--|---|-----|------|-----|------|-----|-------------------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|--|--|
| | | L.P. | S&D | L.P. | S&D | L.P. | S&D | L.P. | S&D | L.P. | S&D | L.P. | S&D | L.P. | S&D | L.P. | S&D | L.P. | S&D | | |
| D-C1 | UW-35,36&37 | W | | | | | | HP | | | | | | | | | | | | | |
| D-C2 | UW-35,36&37 | W | | | | | | HP | | | | | | | | | | | | | |
| D-C3 | UW-35,36&37 | W | | | | | | HP | | | | | | MT | | | | | | | |
| C-C1 | UW-35,36&37 | W | | | | | | HP | | | | | | | | | | | | | |
| C-C2 | UW-35,36&37 | W | | | | | | HP | | | | | | | | | | | | | |
| C-C3 | UW-35,36&37 | W | | | | | | HP | | | | | | | | | | | | | |
| C-C4 | UW-35,36&37 | W | | | | | | HP | | | | | | | | | | | | | |
| PSV-C1 | UW-35,36&37 | W | | | | | | HP | | | | | | | | | | | | | |
| PSV-C2 | UW-35,36&37 | W | | | | | | HP | | | | | | | | | | | | | |
| PSV-C3 | UW-35,36&37 | W | | | | | | HP | | | | | | | | | | | | | |

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NOTES:

- RT - RADIOGRAPHY (RADIOGRAFIA)
- UT - ULTRASOUND (ULTRASONIDO)
- PT - PENETRANT TINTS (TINTAS PENETRANTES)
- MT - MAGNETIC PARTICLES (PARTICULAS MAGNETICAS)

EXHIBIT 9.1
REV.0

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20-10-10



EXAMINATION AND INSPECTION PLAN
(PLAN DE EXAMEN E INSPECCION)

DATE (FECHA): 23/02/2010

Page (Página) 1 of 7

PLAN No: PEI-1654-01-A
(PLAN N°:)

JOB No: O-1654
(OBRA N°:)

PURCHASE ORDER No: 31245-28938
(ORDE DE COMPRA N°:)

PURCHASER: METPOR S.A
(COMPRADOR:)

PROJECT No: -
(PROYECTO N°:)

PROJECT DESC.: HDS FEED FILTERS
(DESCRIPCION DEL PROYECTO:)

LOCATION No: BUENOS AIRES
(UBICACION N°:)

TAG No: 3101L A
(EQUIPO N°:)

DRAWING No: 1654-3101L
(PLANO N°:)

ASME CODE SECTION: VIII Div. 1 EDITION: 2007 ADDENDA: 2009
(SECCION DEL CODIGO ASME: (EDICION: (ADENDA:)

NOMENCLATURE FOR EXAMINATION AND INSPECTION CATEGORIES
(NOMENCLATURA PARA CATEGORIAS DE EXAMEN E INSPECCION)

*R - REVIEW
(REVISION)
*HP - HOLD POINT
(PUNTO DE DETENIMIENTO)

*W - WITNESS POINT
(PUNTO DE PRESENCIA)
*S - SELECT
(SELECCIONAR)

| REV. No (REV. N°) | DATE (FECHA) | SOIME'S REPRESENTANT (REPRESENTANTE DE SOIME) | SUPPLIER'S REPRESENTANT (REPRESENTANTE DEL COMPRADOR) | AUTORIZED INSPECTOR (INSPECTOR AUTORIZADO) |
|----------------------|-----------------|--|--|---|
| A | 23/02/2010 | DANIEL CAMAZON | | |
| B | 15/04/2010 | DANIEL CAMAZON | | July 4/2010 |
| | | | | |
| | | | | |

ADRESS (DIRECCION): SOIME S.R.L. - BORGI 35 - (2156) FRAY LUIS BELTRAN - PCIA. DE SANTA FE
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EXHIBIT 9.1

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20-10-10



EXAMINATION AND INSPECTION PLAN
(PLAN DE EXAMEN E INSPECCION)

DATE (FECHA) 23/02/2010

Page (Página) 2 of 7

PLAN No: PEI-1654-01-A
(PLAN N°:)

REV. No: B
(REV. N°:)

TAG No: 3101L A
(EQUIPO N°:)

| ITEM (NUMERO) | ACTIVITY DESCRIPTION (DESCRIPCION DE LA ACTIVIDAD) | CODE PARAGRAPH OR PROCEDURE APLICABLE (PARRAFO DEL CODIGO O PROCEDIMIENTO APLICABLE) | INSPECTION POINT (PUNTO DE INSPECCION) | | | SIGN AND DATES (NOTAS DE COMPRA) | | |
|---------------|---|--|--|----------|------|----------------------------------|----------|-------------|
| | | | SOIME | SUPPLIER | A.I. | SOIME | SUPPLIER | A.I. |
| 1 | REVISION DE DOCUMENTACION | | | | | | | |
| 1.1 | Revisión de planos | ASME VIII DIV. 1 UG-UW-UCS | R | | RD | | | hna 23/2/10 |
| 1.2 | Revisión de memoria de cálculo | ASME VIII DIV. 1 UG-UW-UCS | R | | RD | | | hna 23/2/10 |
| 1.3 | Revisión de WPS's | ASME IX | HP | | RD | | | hna 23/2/10 |
| 1.4 | Revisión de PQR's | ASME IX | HP | | RD | | | hna 23/2/10 |
| 1.5 | Revisión de WPQ's | ASME IX | HP | | RD | | | hna 23/2/10 |
| 1.6 | Revisión de procedimientos de END | PR-NDT-01 Rev. 0 | HP | | RD | | | hna 23/2/10 |
| 2 | RECEPCION DE MATERIALES | | | | | | | |
| 2.1 | Recepcion de materiales | OC Manual de Soime, ASME II and VIII Div. 1 | R | | RD | | | hna 23/2/10 |
| 2.2 | Verificación de MTR | OC Manual de Soime, ASME II and VIII Div. 1 | HP | | RD | | | hna 23/2/10 |
| 2.3 | Estampado de código de trazabilidad | OC Manual de Soime, ASME II and VIII Div. 1 | HP | | IV | | | hna 23/2/10 |
| 3 | INSPECCIONES DE FABRICACION | | | | | | | |
| 3.1 | CABEZALES Y CUERPO | | | | | | | |
| 3.1.1 | Corte de chapas | DWG SOIME N° 1654-1-02 | W | | IV | | | hna 23/2/10 |
| 3.1.2 | Presentación de biseles longitudinales (ver anexo "A") | DWG SOIME N° 1654-1-02, 1654-01 WM Y UW-31,32 y 33 | W | | HA | | | hna 23/2/10 |
| 3.1.3 | Control mecanizado de tapa de cierre. | DWG SOIME N° 1654-1-02 | HP | | | | | hna 23/2/10 |
| 3.1.4 | Control de redondez | DWG SOIME N° 1654-01 Y UG-80 | HP | | RD | | | hna 23/2/10 |
| 3.1.5 | Presentación de biseles circunferenciales (ver anexo "A") | DWG SOIME N° 1654-1-02, 1654-WM y LW-31,32 y 33 | W | | HA | | | hna 23/2/10 |
| 3.1.6 | Inspeccion visual de soldaduras (ver anexo "A") | DWG SOIME N° 1654-02, 1654-WM y UW-35 | W | | IV | | | hna 23/2/10 |
| 3.1.7 | END a soldaduras (ver anexo "A") | DWG SOIME N°1654-1-01, 1654-1-WM and ASME VIII Div. 1 | HP | | RD | | | hna 23/2/10 |
| 3.1.8 | Trazado y corte de cabezales y virolas para conexiones | DWG SOIME N°1654-1-01 | W | | | | | hna 23/2/10 |

ADRESS (DIRECCION): **SOIME S.R.L.** - BORGI 35 - (2156) FRAY LUIS BELTRAN - PCIA. DE SANTA FE
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EXAMINATION AND INSPECTION PLAN
(PLAN DE EXAMEN E INSPECCION)

DATE (FECHA) 23/02/2010

Page (Página) 3 of 7

PLAN No: PEI-1654-01-A

(PLAN N°):

REV. No: B

(REV. N°):

TAG No: 3101L A

(EQUIPO N°):

| ITEM (NUMERO) | ACTIVITY DESCRIPTION (DESCRIPCION DE LA ACTIVIDAD) | CODE PARAGRAPH OR PROCEDURE APPLICABLE (PARRAFO DEL CODIGO O PROCEDIMIENTO APLICABLE) | INSPECTION POINT (PUNTO DE INSPECCION) | | | SIGN AND DATES (NOTAS DE COMPRA) | | |
|---------------|--|---|--|----------|------|----------------------------------|----------|------|
| | | | SOIME | SUPPLIER | A.I. | SOIME | SUPPLIER | A.I. |
| 3.2 | CONEXIONES | | | | | | | |
| 3.1 | Corte de caños | DWG SOIME N°1654-1-03 | W | | | <i>[Signature]</i> | | |
| 3.2.2 | Presentacion de caños con bridas y media cupla (ver anexo "B") | DWG SOIME N°1654-1-03, 1654-1-WM y UW-31,32 y 33 | W | | | <i>[Signature]</i> | | |
| 3.2.3 | Control visual de soldaduras (ver anexo "B") | DWG SOIME N° 1654-1-03, 1654-1-WM y UW-35 | W | | | <i>[Signature]</i> | | |
| 3.3 | SOPORTES Y PESCANTE | | | | | | | |
| 3.3.1 | Corte de chapas y caños | DWG SOIME N°1654-1-04, 1654-1-05 | W | | | <i>[Signature]</i> | | |
| 3.3.2 | inspección presentacion y soldaduras | DWG SOIME N°1654-1-04, 1654-1-05 y UW-31,32 y 33 | W | | | <i>[Signature]</i> | | |
| 3.3.2 | Control dimensional | DWG SOIME N°1654-1-01 | W | | | <i>[Signature]</i> | | |
| 3.4 | ENSAMBLE DE CUERPO CON CONEXIONES, SOPORTES Y PESCANTE | | | | | | | |
| 3.4.1 | Presentación de conexiones a cuerpo (ver anexo "B") | DWG SOIME N° 1654-1-01, 1654-1-WM y UW31,32 y 33 | W | | | <i>[Signature]</i> | | |
| 3.4.2 | Presentación y soldadura de soportes | DWG SOIME N° 1654-1-01 y UW-31,32 y 33 | W | | | <i>[Signature]</i> | | |
| 3.4.3 | Inspeccion de soldaduras (ver anexo "B") | DWG SOIME N°1654-1-01, 1654-1-WM UW-34 y 36 | HP | | | <i>[Signature]</i> | | |
| 3.4.4 | Presentación y soldadura de pescante | DWG SOIME N°1654-1-04 y UW-36 | W | | | <i>[Signature]</i> | | |
| 3.4.5 | Presentación y soldadura de soporte de placa de identificación | DWG SOIME N°1654-1-01 y UW-36 | W | | | <i>[Signature]</i> | | |
| 3.5 | INTERNOS | | | | | | | |
| 3.5.1 | Cortes de chapas | DWG SOIME N°1654-1-02 | W | | | <i>[Signature]</i> | | |
| 3.5.2 | Presentacion y soldadura contra cuerpo | DWG SOIME N°1654-1-02 y UW31,32 y 33 | W | | | <i>[Signature]</i> | | |
| 3.6 | PWHT | | | | | | | |
| 3.6.1 | Control de tiempo, temperatura y certificados | DWG SOIME N°1654-1-01 UCS56 | R | | | <i>[Signature]</i> | | |

ADDRESS (DIRECCION): **SOIME S.R.L.** - BORGHINI 35 - (2156) FRAY LUIS BELTRAN - PCIA. DE SANTA FE
TE / FAX: (54) 341- 4918600 / (54) 341-4918639 - E-MAIL : info@soime.com.ar - WEB: www.soime.com.ar

[Signature]
Pomari WSE
20-10-12
EXHIBIT 9.1
REV.0



EXAMINATION AND INSPECTION PLAN
(PLAN DE EXAMEN E INSPECCION)

DATE (FECHA) 23/02/2010

Page (Página) 4 of 7

PLAN No: PEI-1654-01-A

(PLAN N°)

REV. No: B

(REV. N°)

TAG No: 31011 A

(EQUIPO N°)

| ITEM (NUMERO) | ACTIVITY DESCRIPTION (DESCRIPCION DE LA ACTIVIDAD) | CODE PARAGRAPH OR PROCEDURE APLICABLE (PARRAFO DEL CODIGO O PROCEDIMIENTO APLICABLE) | INSPECTION POINT (PUNTO DE INSPECCION) | | | SIGN AND DATES (NOTAS DE COMPRA) | | |
|------------------|---|---|---|----------|------|-------------------------------------|----------|-----------------|
| | | | SOIME | SUPPLIER | A.I. | SOIME | SUPPLIER | A.I. |
| 4 | INSPECCIONES Y PRUEBAS FINALES | | | | | | | |
| 4.1 | Control dimensional | DWG SOIME N°1638-01 | HP | | IV | | | |
| 4.2 | Inspeccion visual interna y externa | DWG SOIME N°1654-01 y ASME VIII Div. 1 | HP | | HP | | | hmm 01/10/10 |
| 4.4 | Prueba hidrostática | Procedimiento SOIME PEP-01 y DWG SOIME N° 1654-1-01 | HP | | HP | | | 26-10 |
| 5 | PINTURA | | | | | | | |
| 5.1 | Control de arenado y desengrasado | DWG SOIME N°1654-1-01 | R | | | | | |
| 5.2 | control de esquema y espesor de pintura | DWG SOIME N°1654-1-01 | R | | | | | |
| 6 | APROBACIONES FINALES | | | | | | | |
| 6.1 | Resolucion de NO CONFORMIDADES | SOIME QC Manual | HP | | RD | | | |
| 6.2 | Estampado de la placa de identificacion | SOIME QC Manual | HP | | HP | | | |
| 6.3 | Firma de Data Report | SOIME QC Manual | HP | | HP | | | |
| 6.4 | Control del Data Book | SOIME QC Manual | HP | | RD | | | |
| 6.5 | Embalaje para transporte | SOIME QC Manual | HP | | | | | |

ADDRESS (DIRECCION): **SOIME S.R.L.** - BORCHI 35 - (2156) FRAY LUIS BELTRÁN - PCIA. DE SANTA FE
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④ INTERNA 16/06. 01/10/10

20/10/10
Paraná Mac

EXHIBIT 9.1
REV.0

ANNEX "A" (BUTT JOINT)
ANEXO "A" (JUNTAS A TOPE)

PLAN No: PEI-1654-01-A

REV. No: 0

TAG No: 31011 A

| EQUIPMENT JOINT (UNTA DE EQUIPO) | CODE PARAGRAFO (PARAFAO DEL CODIGO) | BEVEL PREPARATION, FIT UP & TACK WELD V.E. | | | | | | VISUAL INSPECTION | | | | | | NDE | | | | | |
|----------------------------------|-------------------------------------|--|---------------|----------|----------|----------|----------|-------------------|----------|----------|----------|----------|----------|---------|----------|----------|----------|----------|-----------|
| | | LP. SOME | S&D SOME | LP. A.L. | S&D A.L. | LP. SOME | S&D SOME | LP. A.L. | S&D A.L. | LP. SOME | S&D SOME | LP. A.L. | S&D A.L. | NDE | LP. SOME | S&D SOME | LP. A.L. | S&D A.L. | |
| L1 | UW-31.32.35.51 | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | RT FULL | R | R | R | R | HP 0/25 |
| L3 | UW-31.32.35.51 | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | RT FULL | R | R | R | R | HP 0/25 |
| L4 | UW-31.32.35.51 | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | RT FULL | R | R | R | R | HP 0/25 |
| C1 | UW-31.32.35.51 | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | RT FULL | R | R | R | R | HP 7/0010 |
| C2 | UW-31.32.35.51 | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | RT FULL | R | R | R | R | HP 0/25 |
| C3 | UW-31.32.35.51 | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | RT FULL | R | R | R | R | HP 0/25 |
| C4 | UW-31.32.35.51 | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | HP | RT FULL | R | R | R | R | HP 0/25 |

ADDRESS (DIRECCION): SOIME S.R.L. - BORGI 35 - (7156) FRAY LUIS BELTRAN - PCJA. DE SANTA FE
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NOTES:

- * RT - RADIOGRAPHY (RADIOGRAFIA)
- * UT - ULTRASOUND (ULTRASONIDO)
- * PT - PENETRANT TINTS (TINTAS PENETRANTES)
- * MT - MAGNETIC PARTICLES (PARTICULAS MAGNETICAS)

EXHIBIT 9.1
REV.0
OUTPM IAC
20.10.13

EXAMINATION AND INSPECTION PLAN
(PLAN DE EXAMEN E INSPECCION)

DATE (FECHA) 02/12/2009

Page (Página) 6 of 7

ANNEX "B" (NOZZLE)
ANEXO "B" (CONEXION)

PLAN No: PEI-1654-01-A

REV. No: 0

TAG No: 31011A

EQUIPMENT JOINT (UNTA DE EQUIPO)

REV. No: (REV. N°)

TAG No: (EQUIPO N°)

| EQUIPMENT JOINT (UNTA DE EQUIPO) | CODE PARAGRAPH (PARRAFO DEL CODIGO) | BEVEL PREPARATION, FIT UP & TACK WELD V.E. | | | | | | VISUAL INSPECTION | | | | | | NDE | | | | | | |
|----------------------------------|-------------------------------------|--|-----------|-----------|----------|-----------|----------|-------------------|-----------|-----------|----------|------------|-----------|-----------|----------|------------|-----------|-----------|----------|--|
| | | I.P. SOIME | S&D SOIME | I.P. A.I. | S&D A.I. | I.P. A.I. | S&D A.I. | I.P. SOIME | S&D SOIME | I.P. A.I. | S&D A.I. | I.P. SOIME | S&D SOIME | I.P. A.I. | S&D A.I. | I.P. SOIME | S&D SOIME | I.P. A.I. | S&D A.I. | |
| V-C1 | UW-35,36&37 | W | | | | | | | | | | | | | | | | | | |
| V-C2 | UW-35,36&37 | W | | | | | | | | | | | | | | | | | | |
| V-C3 | UW-35,36&37 | W | | | | | | | | | | | | | | | | | | |
| P-C1 | UW-35,36&37 | W | | | | | | | | | | | | | | | | | | |
| A-C1 | UW-35,36&37 | W | | | | | | | | | | | | | | | | | | |
| A-C2 | UW-35,36&37 | W | | | | | | | | | | | | | | | | | | |
| UC-C1 | UW-35,36&37 | W | | | | | | | | | | | | | | | | | | |
| UC-C2 | UW-35,36&37 | W | | | | | | | | | | | | | | | | | | |
| UC-C3 | UW-35,36&37 | W | | | | | | | | | | | | | | | | | | |
| B-C1 | UW-35,36&37 | W | | | | | | | | | | | | | | | | | | |
| B-C2 | UW-35,36&37 | W | | | | | | | | | | | | | | | | | | |

ADDRESS (DIRECCION): SOIME S.R.L. - BORRICHES - (2156) FRAY LUIS BELTRAN - PCIA. DE SANTA FE

EXHIBIT 9.1
REV.0
20.12.10

- NOTES:
- RT - RADIOGRAPHY (RADIOGRAFIA)
 - UT - ULTRASONIC (ULTRASONIDO)
 - PT - PENETRANT TINTS (TINTAS PENETRANTES)
 - MT - MAGNETIC PARTICLES (PARTICULAS MAGNETICAS)

ANNEX "B" (NOZZLE)
ANEXO "B" (CONEXION)

PLAN No:
(PLAN N°) PEI-1654-01-A

REV. No:
(REV. N°) 0

TAG No:
(EQUIPO N°) 3101LA

| EQUIPMENT JOINT (UNTA DE EQUIPO) | CODE PARAGRAPH (PARAFO DEL CODIGO) | BEVEL PREPARATION, FIT UP & TACK WELD V.E. | | | | VISUAL INSPECTION | | | | NDE | | | | | | | | | |
|----------------------------------|------------------------------------|--|------------|-----------|----------|-------------------|------------|-----------|----------|-------------|------------|-----------|----------|--|--|--|--|--|--|
| | | I.P. SOIEME | S&D SOIEME | I.P. A.L. | S&D A.L. | I.P. SOIEME | S&D SOIEME | I.P. A.L. | S&D A.L. | I.P. SOIEME | S&D SOIEME | I.P. A.L. | S&D A.L. | | | | | | |
| D-C1 | UW-35,36&37 | W | W | W | W | HP | | | | | | | | | | | | | |
| D-C2 | UW-35,36&37 | W | W | W | W | HP | | | | | | | | | | | | | |
| D-C3 | UW-35,36&37 | W | W | W | W | HP | | | | | | | | | | | | | |
| C-C1 | UW-35,36&37 | W | W | W | W | HP | | | | | | | | | | | | | |
| C-C2 | UW-35,36&37 | W | W | W | W | HP | | | | | | | | | | | | | |
| C-C3 | UW-35,36&37 | W | W | W | W | HP | | | | | | | | | | | | | |
| C-C4 | UW-35,36&37 | W | W | W | W | HP | | | | | | | | | | | | | |
| PSV-C1 | UW-35,36&37 | W | W | W | W | HP | | | | | | | | | | | | | |
| PSV-C2 | UW-35,36&37 | W | W | W | W | HP | | | | | | | | | | | | | |
| PSV-C3 | UW-35,36&37 | W | W | W | W | HP | | | | | | | | | | | | | |

ADRESS (DIRECCION): SOIME S.R.L. - BORGHINI 35 - (2156) FRAY LUIS BELTRAN - PCIA. DE SANTA FE
TE / FAX: (54) 341-4918600 / (54) 341-4918639 - E-MAIL: info@soime.com.ar - WEB: www.soime.com.ar

[Signature]
Permanente
20-10-12

EXHIBIT 9.1
REV.0

- NOTES:
- RT - RADIOGRAPHY (RADIOGRAFIA)
 - UT - ULTRASONND (ULTRASONIDO)
 - PT - PENETRAT TINTS (TINTAS PENETRANTES)
 - MT - MAGNETIC PARTICLES (PARTICULAS MAGNETICAS)

EXAMINATION AND INSPECTION PLAN

(PLAN DE EXAMEN E INSPECCION)

DATE (FECHA) 02/12/2009

Page (Página) 8 of 8



ANNEX "B" (NOZZLE)
ANEXO "B" (CONEXION)

PLAN No: PEI-1654-01-A

(PLAN N°)

REV. No: 0

(REV. N°)

TAG No: 31011A

(EQUIPO N°)

| JOINT (JUNTA DE EQUIPO) | PARAGRAPH (PARRAFO DEL) | BEVEL PREPARATION, FIT UP & TACK WELD | | | VISUAL INSPECTION | | | NDE | | |
|----------------------------|----------------------------|---------------------------------------|-----|------|-------------------|-----|------|-----|------|-----|
| | | I.F. | S&D | I.P. | I.F. | S&D | I.P. | S&D | I.P. | S&D |
| | | | | | | | | | | |
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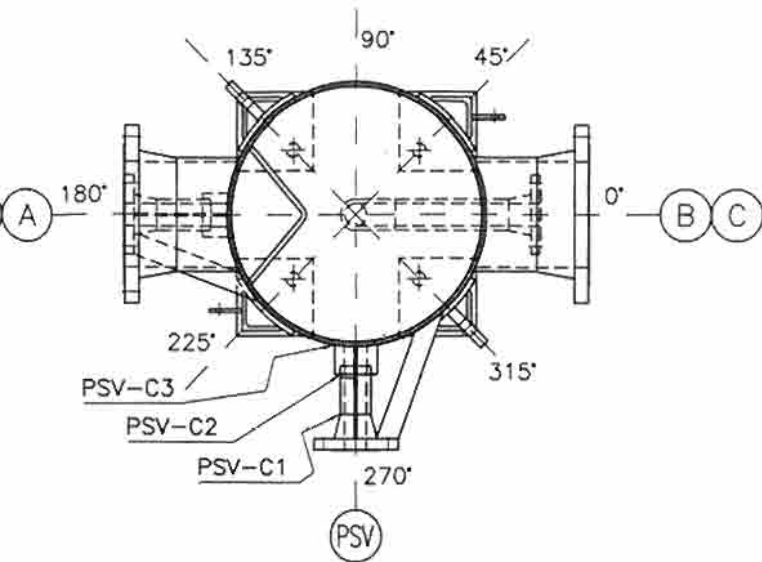
ADRESS (DIRECCION): SOIME S.R.L. - BORGHINI 35 - (2156) FRAY LUIS BELTRÁN - PCIA. DE SANTA FE
TE / FAX: (54) 341-4918600 / (54) 341-4918639 - E-MAIL : info@soime.com.ar - WEB: www.soime.com.ar

NOTES:

- RT - RADIOGRAPHY (RADIOGRAFIA)
- UT - ULTRASOUND (ULTRASONIDO)
- PT - PENETRAT TINTS (TINTAS PENETRANTES)
- MT - MAGNETIC PARTICLES (PARTICULAS MAGNETICAS)

EXHIBIT 9.1
REV.0





CORTE B

| COST | SOLD | WPS-REV | OBSERVACIONES |
|--------|------|---------------|---------------|
| L1 | | 164-4 (170-4) | |
| L3 | | 170-4 | |
| L4 | | 170-4 | |
| C1 | | 164-4 (170-4) | |
| C2 | | 164-4 (170-4) | |
| C3 | | 170-4 | |
| A-C1 | | 177-4 | |
| A-C2 | | 177-4 | |
| B-C1 | | 177-4 | |
| B-C2 | | 177-4 | |
| C-C1 | | 177-4 | |
| C-C2 | | 177-4 | |
| C-C3 | | 177-4 | |
| C-C4 | | 177-4 | |
| D-C1 | | 177-4 | |
| D-C2 | | 170-4 | |
| D-C3 | | 177-4 | |
| P-C1 | | 177-4 | |
| PSV-C1 | | 177-4 | |
| PSV-C2 | | 170-4 | |
| PSV-C3 | | 177-4 | |
| UC-C1 | | 177-4 | |
| UC-C2 | | 170-4 | |
| UC-C3 | | 177-4 | |
| V-C1 | | 177-4 | |
| V-C2 | | 170-4 | |
| V-C3 | | 177-4 | |

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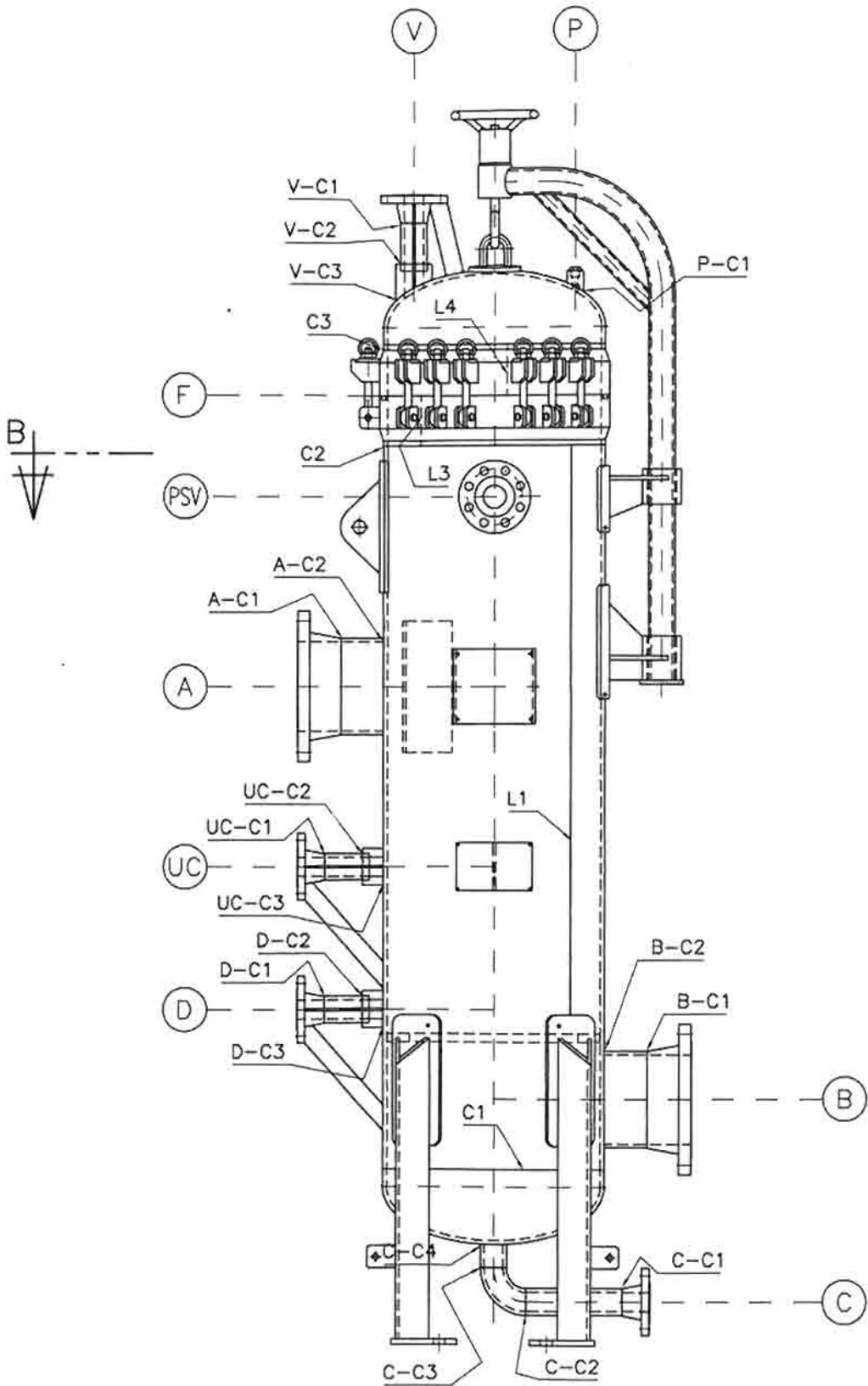
[Handwritten Signature]
 Paredi, Msc
 20-10-12

| | | | | | |
|-------------------------------|-----------------------------|----------|--------------------|--------------------------------|------------|
| 1 | ENVOLVENTE UNA SOLA COSTURA | G.G.F. | G.A.M. | 28/05/10 | |
| 0 | PARA CONSTRUCCION | G.G.F. | G.A.M. | 20/04/10 | |
| N° | DESCRIPCION / DESCRIPTION | DIB/DRW | REV/CHK | APR | FECHA/DATE |
| REVISIONES / REVISIONS | | | | | |
| ARCHIVO: 1654-3101L-WM-1.WG | FECHA | NOMBRE | CLIENTE / CUSTOMER | | |
| | DATE | NAME | METPOR S.A. | | |
| | DIB / DRAWN | 20/04/10 | G.G.F. | | |
| | REV / CHEK'D | 20/04/10 | G.A.M. | O.C.N°: 3124528938 | |
| APR / APPR'D | | | | | |
| ESCALA | FILTRO 3101L A/B | | | UBICACION OBRA / SITE LOCATION | |
| SCALE | | | | | |
| 1:10 | WELDING MAP | | | PLANO N°: / DRAWING N°: | |
| | | | | 1654-WM-02 | |
| | | | | REVISION | |

3

100 MILIMETROS

D UC A



ELEVACION

ES E DOCUMENTO ES PROPIEDAD DE SOMME S.r.l. Y SE
 EN LE EXCLUSIVAMENTE PARA CUMPLIR CON SUS FINES
 ES: EDIFICIOS.
 NO SE ESTA HABILITADO PARA REPRODUCIRLO.
 NO SE ESTA AUTORIZADO CON OTRO FIN SIN QUE
 SE RESERVA EL DERECHO DE SOMME S.r.l.
 SE RESERVA LOS DERECHOS LEGALES.



PRESSURE TEST REPORT
(REPORTE DE ENSAYO DE PRESIÓN)

DATE (FECHA): 06/08/2010

Page (Página) 1 of 1

JOB No: 1654
(OBRA N°)

CUSTOMER: METPOR
(CLIENTE)

CUSTOMER'S REF.: BACK FLUSH FILTERS TAG 3101LB
(REFERENCIA DEL CLIENTE)

SOIME'S REF.:
(REFERENCIA DE SOIME)

TAG No: 3101L B
(EQUIPO N°)

ASME CODE SECTION: ASME SECCION VIII EDITION: 2007 ADDENDA: 2009
(SECCION DEL CODIGO ASME) (EDICION) (ADENDA)

| DESCRIPTION (DESCRIPCION) | INFORMATION AND MEASURES (INFORMACION Y MEDIDAS) |
|---|---|
| MAXIMUM ALLOWANCE WORKING PRESSURE (PRESION MAXIMA ADMISIBLE DE TRABAJO) | |
| DESIGN TEMPERATURE (TEMPERATURA DE DISEÑO) | -3/150°C |
| INSPECTION PRESSURE (PRESION DE INSPECCION) | 24 Kg/cm2 (2,35 MPa) |
| TEST FLUID (FLUIDO DE ENSAYO) | Agua Industrial |
| INSPECTION PERIOD (TIEMPO DE INSPECCION) | 20 min. |
| METAL TEMPERATURE (TEMPERATURA DEL METAL) | AMBIENTE (3 A 40 °c) |
| FLUID TEMPERATURE (TEMPERATURA DEL FLUIDO) | AMBIENTE (3 A 40 °c) |
| MANOMETER RANGE AND TYPE (RANGO Y TIPO DE MANOMETRO) | 0-40 Kg/cm2 - PR-024 |
| VESSEL LOCATION (VERTICAL / HORIZONTAL) (UBICACION DEL RECIPIENTE (VERICAL /HORIZONTAL)) | VERTICAL |
| MANOMETER LOCATION (UPPER/MIDDLE/BOTTOM) (UBICACION DEL MANOMETRO (SUPERIOR/MEDIA/INFERIOR)) | SUPERIOR |
| HIGH POINTS PURGED (YES/NO) (PUNTOS ALTOS PURGADOS (SI/NO)) | Si |
| SOAPSUDS PRELIMINARY LEAK TEST IN REINFORCED PLATES OF NOZZLES ATTACHED TO THE OUTSIDE (ENSAYO PRELIMINAR DE FALLA POR SAPONIFICACION EN LOS REFUERZOS DE CONEXIONES ADJUNTAS AL EXTERIOR) | Si |
| CONTROL OF DEFORMATION (CONTROL DE DEFORMACIONES) | Si |

TEST COMMENTS (COMENTARIOS DE ENSAYO): Se realizo el ensayo dando como resultado satisfactorio

| I. C. INSPECTOR SIGN (FIRMA DEL INSPECTOR DE I.C.) | DATE (FECHA) | I. C. CHIEF SIGN (FIRMA DEL JEFE DE C.C.) | DATE (FECHA) | AUTHORIZED INSPECT. SIGN (FIRMA DEL INSP. AUTORIZADO) | DATE (FECHA) | CUSTOMER SIGN (FIRMA DEL CLIENTE) | DATE (FECHA) |
|---|-----------------|--|-----------------|--|-----------------|--------------------------------------|-----------------|
| | 06/08/10 | | 06/08/10 | | 06-08-10 | | |

ADDRESS (DIRECCION): SOIME S.R.L. - BORGHINI 35 - (2156) FRAY LUIS BELTRÁN - PCIA. DE SANTA FE
TE / FAX: (54) 341-4918600 / (54) 341-4918639 - E-MAIL : info@soime.com.ar - WEB: www.soime.com.ar

EXHIBIT 9.2
REV.0
PAGE 1 OF 1



PRESSURE TEST REPORT
(REPORTE DE ENSAYO DE PRESIÓN)

DATE (FECHA): 06/08/2010

Page (Página) 1 of 1

JOB No: 1654
(OBRA N°)

CUSTOMER: METPOR
(CLIENTE)

CUSTOMER'S REF.: BACK FLUSH FILTERS TAG 3101LA
(REFERENCIA DEL CLIENTE)

SOIME'S REF.:
(REFERENCIA DE SOIME)

TAG No: 3101L A
(EQUIPO N°)

ASME CODE SECTION: ASME SECCION VIII EDITION: 2007 ADDENDA: 2009
(SECCION DEL CODIGO ASME) (EDICION) (ADENDA)

| DESCRIPTION (DESCRIPCION) | INFORMATION AND MEASURES (INFORMACION Y MEDIDAS) |
|---|---|
| MAXIMUM ALLOWANCE WORKING PRESSURE (PRESION MAXIMA ADMISIBLE DE TRABAJO) | |
| DESIGN TEMPERATURE (TEMPERATURA DE DISEÑO) | -3/150 °C |
| INSPECTION PRESSURE (PRESION DE INSPECCION) | 24 Kg./cm2 (2,35 MPa) |
| TEST FLUID (FLUIDO DE ENSAYO) | Agua Industrial |
| INSPECTION PERIOD (TIEMPO DE INSPECCION) | 20 min. |
| METAL TEMPERATURE (TEMPERATURA DEL METAL) | AMBIENTE (3 A 40 °c) |
| FLUID TEMPERATURE (TEMPERATURA DEL FLUIDO) | AMBIENTE (3 A 40 °c) |
| MANOMETER RANGE AND TYPE (RANGO Y TIPO DE MANOMETRO) | 0-50 Kg/cm2 - PR-042 |
| VESSEL LOCATION (VERTICAL / HORIZONTAL) (UBICACION DEL RECIPIENTE (VERTICAL /HORIZONTAL)) | VERTICAL |
| MANOMETER LOCATION (UPPER/MIDDLE/BOTTOM) (UBICACION DEL MANOMETRO (SUPERIOR/MEDIA/INFERIOR)) | SUPERIOR |
| HIGH POINTS PURGED (YES/NO) (PUNTOS ALTOS PURGADOS (SI/NO)) | SI |
| SOAPSUDS PRELIMINARY LEAK TEST IN REINFORCED PLATES OF NOZZLES ATTACHED TO THE OUTSIDE (ENSAYO PRELIMINAR DE FALLA POR SAPONIFICACION EN LOS REFUERZOS DE CONEXIONES ADJUNTAS AL EXTERIOR) | SI |
| CONTROL OF DEFORMATION (CONTROL DE DEFORMACIONES) | SI |

TEST COMMENTS (COMENTARIOS DE ENSAYO): Se realizo el ensayo dando como resultado satisfactorio

| I.C. INSPECTOR SIGN (FIRMA DEL INSPECTOR DE I.C.) | DATE (FECHA) | I.C. CHIEF SIGN (FIRMA DEL JEFE DE I.C.) | DATE (FECHA) | AUTORIZED INSPECT. SIGN (FIRMA DEL INSP. AUTORIZADO) | DATE (FECHA) | CUSTOMER SIGN (FIRMA DEL CLIENTE) | DATE (FECHA) |
|--|-----------------|---|-----------------|---|-----------------|--------------------------------------|-----------------|
| | 06/08 | | 06/08 | | 06/08 | | |

ADDRESS (DIRECCION): SOIME S.R.L. - BORGHINI 35 - (2156) FRAY LUIS BELTRÁN - PCIA. DE SANTA FE
TE / FAX: (54) 341- 4918600 / (54) 341- 4918639 - E-MAIL : info@soime.com.ar - WEB: www.soime.com.ar

EXHIBIT 9.2
REV.0
PAGE 1 OF 1

20-10-10



SOIME SRL

RECORD OF CONTROL REGISTRO DE CONTROL

| | | | |
|----------------------|-------------------------|----------------------------|------------|
| Instrumento: | Manometro Cimpa | Certificado de Control N°: | PR042-03 |
| Rango: | 0-50Kg/cm ² | Fecha de Control: | 12/04/2010 |
| N° de Serie: | PR 042 | Frecuencia: | 6 meses |
| Resolución: | | Cond. de calibración: | Temp amb |
| Clase / Tolerancia: | +/- 2% o menor división | Instructivo: | IDA 5.05.6 |
| Patrones de Control: | PA 008 | | |

| Puntos de Control | Lecturas | | | | Error de Indicación |
|-------------------|----------|--------------------|-------------|--------------------|---------------------|
| | Patrón | | Instrumento | | |
| | Valor | Unidad | Valor | Unidad | |
| 1 | 0,072 | Kg/cm ² | 0 | Kg/cm ² | -0,072 |
| 2 | 12,162 | Kg/cm ² | 12 | Kg/cm ² | -0,162 |
| 3 | 25,165 | Kg/cm ² | 25 | Kg/cm ² | -0,165 |
| 4 | 36,724 | Kg/cm ² | 37 | Kg/cm ² | 0,276 |
| 5 | 49,627 | Kg/cm ² | 50 | Kg/cm ² | 0,373 |
| 5 | 49,004 | Kg/cm ² | 50 | Kg/cm ² | 0,996 |
| 4 | 36,529 | Kg/cm ² | 37 | Kg/cm ² | 0,471 |
| 3 | 24,774 | Kg/cm ² | 25 | Kg/cm ² | 0,226 |
| 2 | 12,009 | Kg/cm ² | 12 | Kg/cm ² | -0,009 |
| 1 | 0,089 | Kg/cm ² | 0 | Kg/cm ² | -0,089 |
| 1 | 0,078 | Kg/cm ² | 0 | Kg/cm ² | -0,078 |
| 2 | 11,815 | Kg/cm ² | 12 | Kg/cm ² | 0,185 |
| 3 | 25,129 | Kg/cm ² | 25 | Kg/cm ² | -0,129 |
| 4 | 36,818 | Kg/cm ² | 37 | Kg/cm ² | 0,182 |
| 5 | 49,918 | Kg/cm ² | 50 | Kg/cm ² | 0,082 |
| 5 | 49,773 | Kg/cm ² | 50 | Kg/cm ² | 0,227 |
| 4 | 36,344 | Kg/cm ² | 37 | Kg/cm ² | 0,656 |
| 3 | 24,776 | Kg/cm ² | 25 | Kg/cm ² | 0,224 |
| 2 | 12,253 | Kg/cm ² | 12 | Kg/cm ² | -0,253 |
| 1 | 0,123 | Kg/cm ² | 0 | Kg/cm ² | -0,123 |

Fuentes Gonzalo
Firma Q.C.I

Para Use
20-10-10

DIRECCIÓN / ADDRESS : **SOIME SRL** - BORGHI 35 - (2156) FRAY LUIS BELTRÁN - PCIA. DE SANTA
TE / FAX: (54) 341-4918600 / (54) 341-4918639 - E-MAIL : info@soime.com.ar - WEB: www.soime.com.ar



SOIME SRL

RECORD OF CONTROL REGISTRO DE CONTROL

Instrumento: Manometro Berim Certificado de Control N°: **PR 024-05**
Rango: 0 - 40 Kg/cm² Fecha de Control: 17/02/2010
N° de Serie: PR 024 Frecuencia: 6 meses
Resolución: Cond. de calibración: 23,2°C / 54,6%
Clase / Tolerancia: +/- 2% (0,80) Instructivo: IDA 5.05.06
Patrones de Control: PA 008

| Puntos de Control | Lecturas | | | | Error de Indicación |
|-------------------|----------|--------|-------------|--------|---------------------|
| | Patrón | | Instrumento | | |
| | Valor | Unidad | Valor | Unidad | |
| 1 | 0,063 | Kg/Cm2 | 0 | Kg/cm2 | -0,063 |
| 2 | 9,635 | Kg/Cm2 | 10 | Kg/cm2 | 0,365 |
| 3 | 19,980 | Kg/Cm2 | 20 | Kg/cm2 | 0,020 |
| 4 | 30,153 | Kg/Cm2 | 30 | Kg/cm2 | -0,153 |
| 5 | 39,995 | Kg/Cm2 | 40 | Kg/cm2 | 0,005 |
| 5 | 39,997 | Kg/Cm2 | 40 | Kg/cm2 | 0,003 |
| 4 | 29,916 | Kg/Cm2 | 30 | Kg/cm2 | 0,084 |
| 3 | 20,113 | Kg/Cm2 | 20 | Kg/cm2 | -0,113 |
| 2 | 10,038 | Kg/Cm2 | 10 | Kg/cm2 | -0,038 |
| 1 | 0,072 | Kg/Cm2 | 0 | Kg/cm2 | -0,072 |
| 1 | 0,081 | Kg/Cm2 | 0 | Kg/cm2 | -0,081 |
| 2 | 9,845 | Kg/Cm2 | 10 | Kg/cm2 | 0,155 |
| 3 | 20,170 | Kg/Cm2 | 20 | Kg/cm2 | -0,170 |
| 4 | 29,845 | Kg/Cm2 | 30 | Kg/cm2 | 0,155 |
| 5 | 39,853 | Kg/Cm2 | 40 | Kg/cm2 | 0,147 |
| 5 | 39,650 | Kg/Cm2 | 40 | Kg/cm2 | 0,350 |
| 4 | 30,145 | Kg/Cm2 | 30 | Kg/cm2 | -0,145 |
| 3 | 20,198 | Kg/Cm2 | 20 | Kg/cm2 | -0,198 |
| 2 | 9,991 | Kg/Cm2 | 10 | Kg/cm2 | 0,009 |
| 1 | 0,092 | Kg/Cm2 | 0 | Kg/cm2 | -0,092 |

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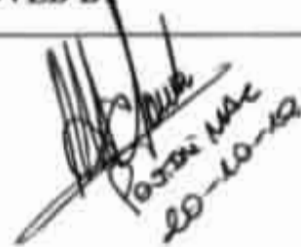

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Berim Max

DIRECCIÓN / ADDRESS : **SOIME SRL** - BORGHÍ 33 - (2156) PRAY LUIS BELTRÁN - PCIA. DE SANTA FE
TE / FAX: (54) 341- 4918600/ (54) 341-4918639 - E-MAIL: info@soime.com.ar - WEB: www.soime.com.ar

FILTROS 3101L A Y B - PROCEDIMIENTO PWHT

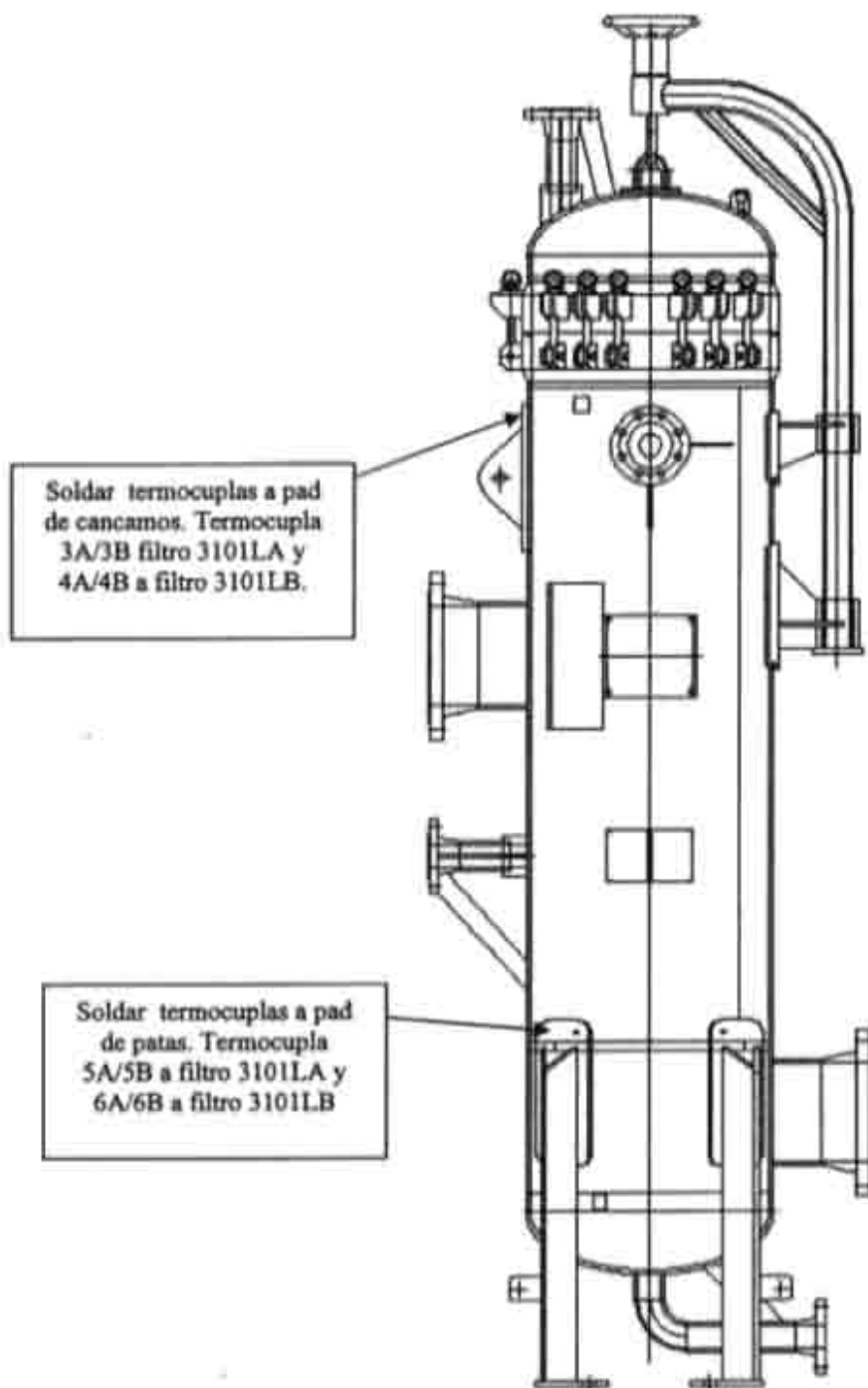
| | | |
|---|-------------------------------|---|
| SOIME SRL | PWHT INSTRUCTION SHEET | DATE: 15-07-10 JOB No.: PWHT-1654-02 |
| <p><u>PWHT PROCEDURE N°:</u> PWHT 01-Edición N°0-Rev. N° 0</p> <p><u>MATERIAL SPECIFICATION:</u> SA516 Gr.70</p> <p><u>NOMINAL THICKNESS:</u> 9.52mm</p> | | |
| <p>DISPOSICION DE TERMOCULAS EN FILTROS 3101L A y B, VER CROQUIS PAGINA 2</p> | | |
| <p><u>HEATING RATE ABOVE 425°C:</u> la rampa de calentamiento no será mayor que 222 °C/hs. Durante el periodo de la rampa de calentamiento y del mantenimiento, la atmosfera del horno será controlada para evitar la oxidación excesiva de la superficie de las virolas, el choque directo de la llama en las virolas se prohíbe.</p> <p><u>HOLDING TEMPERATURE:</u> será de 600°C (-0 +25°C) durante un periodo de 1 horas como mínimo. Durante este período la atmósfera deberá ser controlada por una excesiva oxidación.</p> <p><u>COOLING RATE UP TO 425°C:</u> se realizado en horno cerrado, con un rango de descenso no mayor que 278 °C/hs. Desde 425 °C las virolas se pueden enfriar fuera del horno a un ambiente con aire calmo.</p> <p><u>REMARKS:</u> Serán enviados los filtros completos de acuerdo al plano sin bridas ciegas.</p> | | |
|  <hr/> <p>PREPARED BY</p> | | <hr/> <p>APPROVED BY</p> |

EXHIBIT N° PHT1

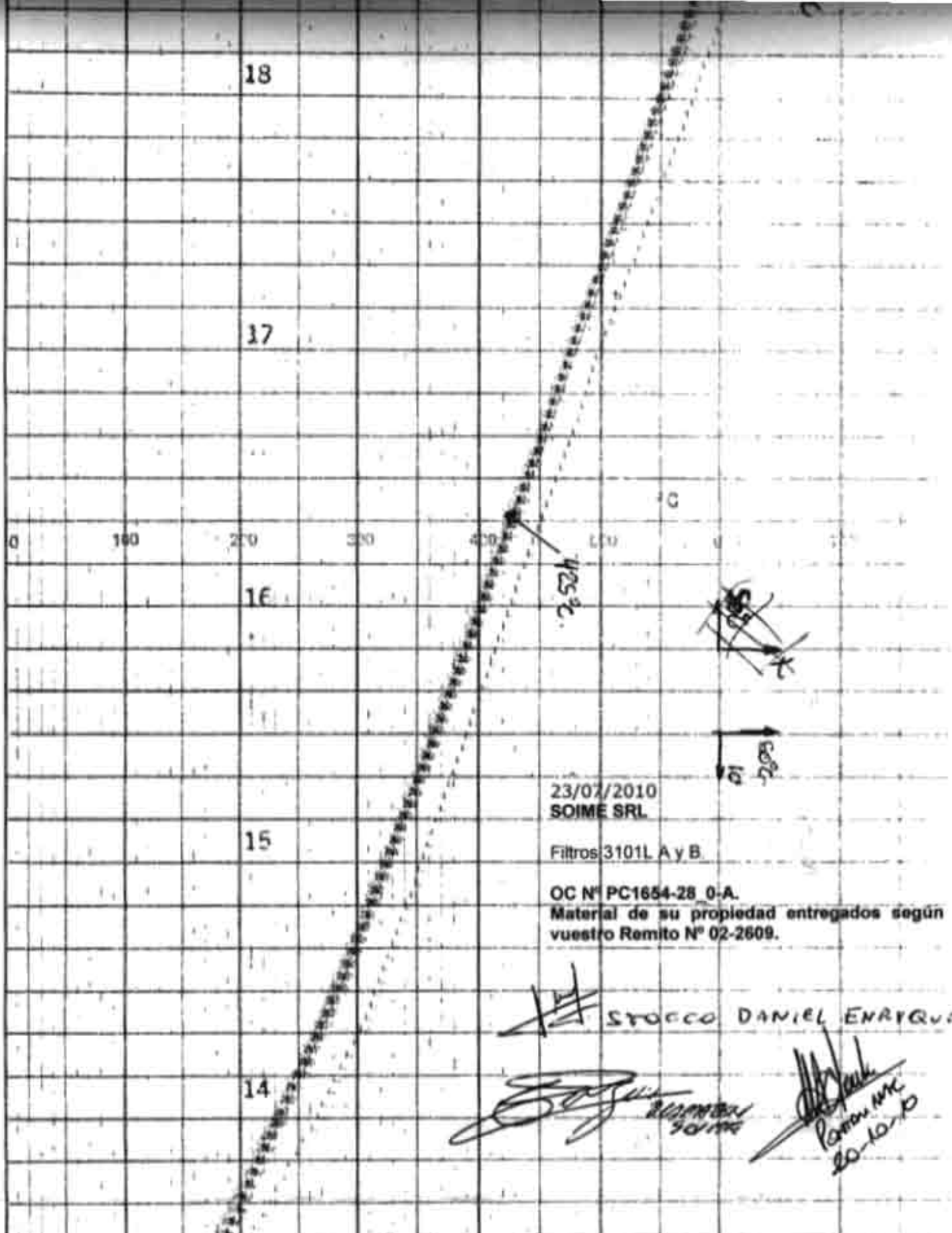


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FILTROS 3101L A Y B - PROCEDIMIENTO PWHT



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23/07/2010
SOIME SRL

Filtros 3101L A y B.

OC N° PC1654-28 0-A.
Material de su propiedad entregados según
vuestro Remito N° 02-2609.

[Signature] STOCCO DANIEL ENRIQUE

[Signature]
20/10/10
SOIME

[Signature]
Remito N° C
20-10-10



Stocco Hermanos S.A.

Telefono (54 11) 4755-5661
E-mail: info@stoccohnos.com.ar
ventas@stoccohnos.com.ar
Website: www.stoccohnos.com.ar

Calle 28 N° 4140 Hipolito Yrigoyen
01650/FL San Martin
Pcia. de Buenos Aires
Argentina

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23/07/2010
SOIME SRL

Filtros 3101L A y B.

OC N° PC1654-28 0-A.
Material de su propiedad entregados según
vuestro Remito N° 02-2609.

 STOCCO DANIEL ENRIQUE


20/10/10
SOIME


Remito MAC
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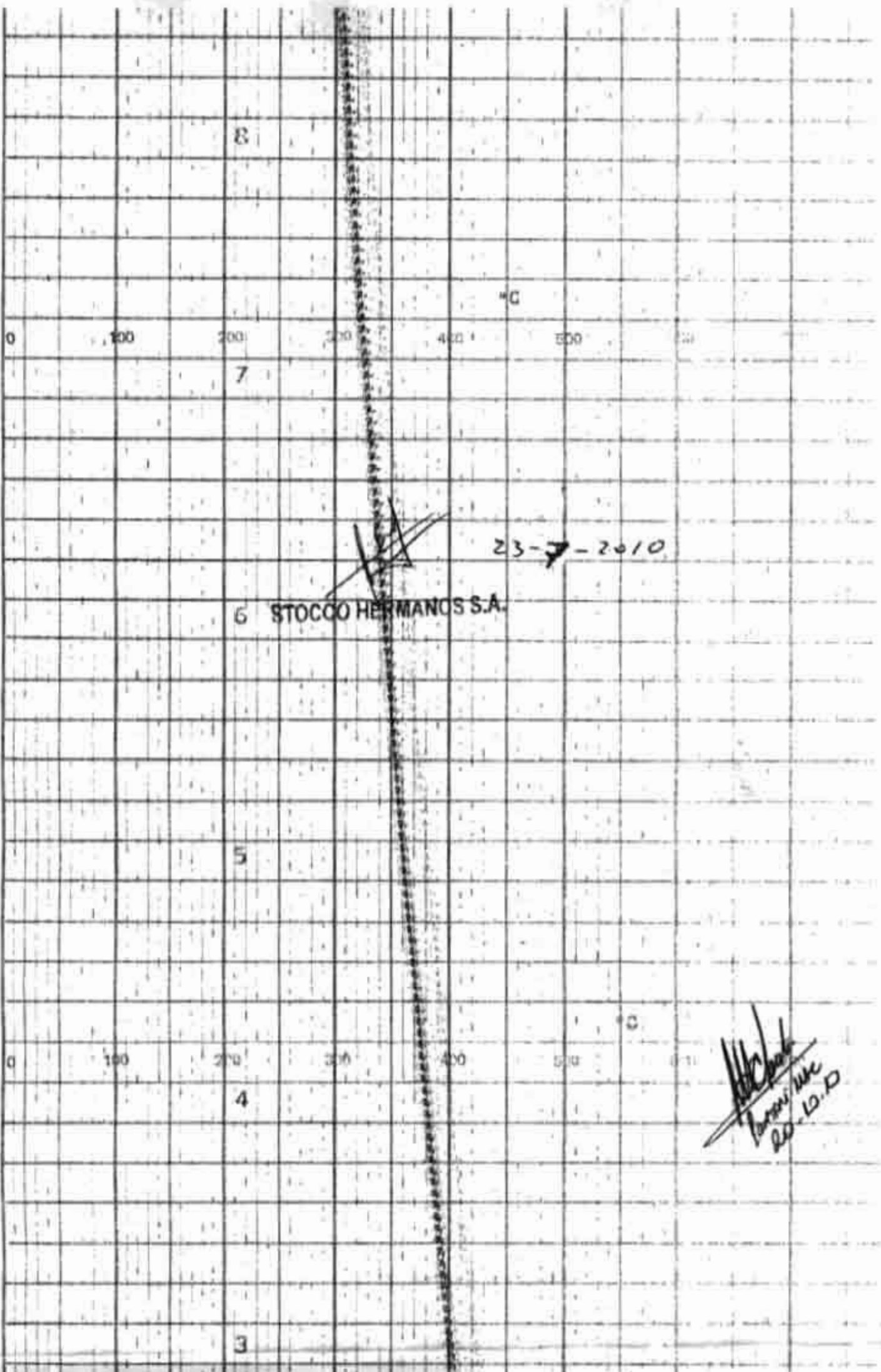
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23-7-2010

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RD-L.D.

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LABORATORIO DE CALIBRACIONES TERMOMOLAR S.A.C.I.F.
 PTE. LUIS SÁENZ PEÑA 1877 (C1138 ABM) BUENOS AIRES TEL: 4309-8530/7016 FAX: 4309-9626
 E-mail: labtermo@termomolar.com.ar Web site: www.termomolar.com.ar

CERTIFICADO ÚNICO DE CALIBRACIÓN N°: 48878

CLIENTE: STOCO HNO3. OBJETO: TERMOCUPLA TIPO KX. NORMA: ASTM E 230
 DIRECCIÓN: CALLE 28 N° 4146 / SAN MARTÍN / PROV. BS. AS. N° DE SERIE: 3A / 18. TOLERANCIA: CLASE B7D

METODO DE CALIBRACION

EL SENSOR OBJETO FUE CALIBRADO INTRODUCIÉNDOLO JUNTO CON EL SENSOR PATRÓN EN UN HORNO CALIBRADOR EN UN HORNO CILÍNDRICO DE ELECCIÓN DE ELECCIÓN, CUYA TEMPERATURA SE ESTABLECió EN LOS VALORES SOLICITADOS A UNA PROFUNDIDAD DE INMERSIÓN DE 10 MM. SE MIDIERON LAS INDICACIONES DE LOS SENSORES CON UN INSTRUMENTO PATRÓN Y UNA JUNTA FRÍA DE REFERENCIA A 0°C. A PARTIR DE LAS MEDICIONES CORRESPONDIENTES AL PATRÓN Y SENSOR OBJETO SE CALCULO LA TEMPERATURA DE LA JUNTA CALIENTE DE MEDICIÓN.

RESULTADO DE LAS MEDICIONES

| MEASUREMENT (°C) | MEASUREMENT OBJECT (°C) | ERROR OBJECT (°C) | UNCERTAINTY (°C) | TOLERANCE (°C) |
|----------------------|-------------------------|-------------------|------------------|----------------|
| TEMPERATURA AMBIENTE | 855,34 | 848,82 | -6,52 | 4,30 |
| 18,8 °C | 899,26 | 846,11 | -53,15 | 4,08 |

| PATRONES UTILIZADOS | IDENTIFICACION | N° CERTIFICADO |
|---------------------|----------------|----------------|
| SENSOR TERMOCUPLA | 2 | 10-4923-08 |
| MULTIMETRO DIGITAL | 5 | 01-8801-08 |

OBSERVACIONES

TERMOMOLAR S.A.C.I.F. CERTIFICA QUE EL INSTRUMENTAL UTILIZADO PARA ESTA MEDICIÓN, HA SIDO CALIBRADO Y TESTEADO PARA CUMPLIR CON LA LEGISLACIÓN VIGENTE, LAS CUALES REPRESENTAN A LAS UNIDADES FISICAS EN CONCORDANCIA CON EL SISTEMA INTERNACIONAL DE UNIDADES SI. LOS PATRONES QUE SE UTILIZARON EN ESTA CALIBRACION SON TRAZABLES A TRAVES DEL IN.TI. Y S.I.C.E. ARGENTINA. LA INCERTIDUMBRE DE MEDICION EXPONIDA INFORMADA FUE CALCULADA MULTIPLICANDO LA INCERTIDUMBRE ESTANDAR POR UN FACTOR DE COBERTURA K=2, QUE CORRESPONDE A UN NIVEL APROXIMADO DE COMPANIA DEL 95% EN LA DISTRIBUCION NORMAL. EN LA INCERTIDUMBRE SE INCLUYEN LAS PROVISIONES DEL HORNO CALIBRADOR, INSTRUMENTO PATRÓN, SENSOR PATRÓN Y OBJETO EN EL INSTANTE DE LA CALIBRACION. NO SE INDICA EL COMPORTAMIENTO A LARGO PLAZO DEL OBJETO CALIBRADO. LAS TEMPERATURAS INDICADAS CORRESPONDEN A LA ESCALA INTERNACIONAL DE TEMPERATURA DE 1990 REFERENCIA "METROLOGIA" 27.3-19 1990. LOS RESULTADOS CONTENIDOS EN EL PRESENTE CERTIFICADO SE REFIEREN A LAS CONDICIONES EN QUE SE REALIZO LAS MEDICIONES. EL USUARIO ES RESPONSABLE DE LA CALIBRACION DEL OBJETO A INTERVALOS APROPIADOS. CERTIFICADOS DE CALIBRACION SIN FIRMA Y ACLARACION, NO SERAN VALIDOS. ESTE CERTIFICADO NO PODRA SER REPRODUCCION SIN QUE SE HAYA OBTENIDO PREVIAMENTE PERMISO POR ESCRITO DE TERMOMOLAR S.A.C.I.F. LOS RESULTADOS CONSIGNADOS SE REFIEREN EXCLUSIVAMENTE A LA MUESTRA REFERIDA. TERMOMOLAR S.A.C.I.F. DECLARA TODA RESPONSABILIDAD POR EL USO INCORRECTO O INCORRECTO QUE SE HICIERE DE ESTE CERTIFICADO ÚNICO DE CALIBRACION Y DE LOS SENSORES Y/O INSTRUMENTOS CALIBRADOS.

FECHA CALIBRACION: 02/05/2008. NBI 10.23 Revisión 3. INTERVENIO: TEMOMOLAR S.A.C.I.F.

Handwritten signature and date: 10-01-08

LABORATORIO DE CALIBRACIONES TERMOCOPLA S.A.C.I.F.
 PVE. LUIS MÁGNE PEÑA 1577 (C1128 ASM) BUENOS AIRES TD: 4389-8287/414 FAX: 4308-6638
 E-mail: labtermo@comcast.net Web: www.labtermo.com.ar

CERTIFICADO ÚNICO DE CALIBRACIÓN N°: 48278

CLIENTE: STOCO PNOB. OBJETO: TERMOCOPLA TIPO KX NORMA: ASTM E 230
 DIRECCIÓN: CALLE 38 N°4148 / PROV. BS. AS. N° DE SERIE: 4A / 48 TOLERANCIA: CLASE S1D

METODO DE CALIBRACION

EL SENSOR OBJETO FUE CALIBRADO INTRODUCIÉNDOLO JUNTO CON EL SENSOR PATRÓN EN UN HORNO EQUILIZADOR EN UN HORNO CILÍNDRICO DE EJE VERTICAL, CUYA TEMPERATURA SE ESTABILIZÓ EN LOS VALORES SOLICITADOS A UNA PROFUNDIDAD DE INMERSIÓN DE 80 MM. SE MEDIERON LAS INDICACIONES DE LOS SENSORES CON UN INSTRUMENTO PATRÓN Y UNA JUNTA FRÍA DE REFERENCIA A 0°C. A PARTIR DE LAS MEDICIONES CORRESPONDIENTES AL PATRÓN Y SENSOR OBJETO SE CALCULO LA TEMPERATURA DE LA JUNTA CALIENTE DE MEDICIÓN.

RESULTADO DE LAS MEDICIONES

| SENSOR PATRÓN (°C) | MEASUREMENT (°C) | BIAS (°C) | INCERTIDUMBRE (°C) | TOLERANCIA (°C) | 44 |
|--------------------|------------------|-----------|--------------------|-----------------|----|
| 883,38 | 845,92 | -4,44 | 1,34 | 4,36 | |
| 889,36 | 845,39 | -4,37 | 1,34 | 4,36 | 48 |

| PATRONES UTILIZADOS | CERTIFICACION | N° CERTIFICADO |
|---------------------|---------------|----------------|
| SENSOR TERMOCOPLA | 2 | 12-0823-08 |
| MULTIMETRO DIGITAL | 5 | 01-0821-08 |

OBSERVACIONES

TERMOCOPLA S.A.C.I.F. CERTIFICA QUE EL INSTRUMENTAL UTILIZADO PARA ESTA MEDICIÓN, HA SIDO CALIBRADO Y TESTEADO PARA CUMPLIR CON LA LEGISLACION VIGENTE, LAS CUALES REPRESENTAN A LAS UNIDADES FIECAS EN CONCORDANCIA CON EL SISTEMA INTERNACIONAL DE UNIDADES EL CUAL SE UTILIZO EN ESTA CALIBRACION SON TRAZABLES A TRAVES DEL INT.1 Y S.I.C.B. ARGENTINA. LA INCERTIDUMBRE DE MEDICION EXPANDIDA INFORMADA FUE CALCULADA MULTIPLICANDO LA INCERTIDUMBRE ESTIMADA POR UN FACTOR DE COBERTURA K=2, QUE CORRESPONDE A UN NIVEL APROXIMADO DE CONFIANZA DEL 95% EN LA DISTRIBUCION NORMAL. EN LA INCERTIDUMBRE SE INCLUYEN LAS PROVENIENCIAS DEL HORNO CALIBRADOR, INSTRUMENTO PATRÓN, SENSOR PATRÓN Y OBJETO EN EL INSTANTE DE LA CALIBRACION NO SE INDICA EL COMPORTAMIENTO A LARGO PLAZO DEL OBJETO CALIBRADO. LAS TEMPERATURAS INDICADAS CORRESPONDEN A LA ESCALA INTERNACIONAL DE TEMPERATURA DE 1990 REFERENCIA "METROLOGIA" 27.3-19 1990. LOS RESULTADOS CONTENDOS EN EL PRESENTE CERTIFICADO SE REFIEREN A LAS CONDICIONES EN QUE SE REALIZARON LAS MEDICIONES. EL USUARIO ES RESPONSABLE DE LA CALIBRACION DEL OBJETO A INTERVALOS APROPIADOS. CERTIFICACION DE CALIBRACION (SE FIRMA Y ACJANACION, NO SERAN VALIDOS. ESTE CERTIFICADO NO PODRA SER REPRODUCIDO SIN QUE SE HAYA OBTENIDO PREVIAMENTE PERMISO POR ESCRITO DE TERMOCOPLA S.A.C.I.F. LOS RESULTADOS CONSIGNADOS SE REFIEREN EXCLUSIVAMENTE A LA MUESTRA REFERIDA. TERMOCOPLA S.A.C.I.F. DECLINA TODA RESPONSABILIDAD POR EL USO INCORRECTO O INOCORRECTO QUE SE HICIERE DE ESTE CERTIFICADO ÚNICO DE CALIBRACION Y DE LOS SENSORES Y/O INSTRUMENTOS CALIBRADOS.

FECHA CALIBRACION: 22/06/2008 EN 10.33 Revolucion 3 INTERVALO: 12 meses TEMPERATURA S.A.C. - 20°C

[Handwritten signature and date]
 10-2008
 20-10-12

LABORATORIO DE CALIBRACIONES TERMOCOPAR S.A.C.I.F.
 PPE. LUIS BÁNEZ PÉREZ 1877 (C1122 ABM) BURENOS AJRES TE: 4306-82879918 FAX: 4306-6628
 E-mail: labcal@termocopar.com.ar. Visita nuestra web en www.termocopar.com.ar

CERTIFICADO TIPO DE CALIBRACION N°: 4893

CLIENTE: STOCO H&C. OBJETO: TERMOCOPLA TIPO KK. NORMA: ASTM E 335
 DIRECCIÓN: CALLE 28 N° 4140 / SAN MARTÍN / PROV. BS. AS. N° DE SERIE: SA / 08 TOLERANCIA: CLASE STD

MÉTODO DE CALIBRACIÓN

EL SENSOR OBJETO FUE CALIBRADO INTRODUCIÉNDOLO JUNTO CON EL SENSOR PATRÓN EN UN HORNO CALIBRADO EN UN HORNO CALIBRADO DE EJE VERTICAL, CUYA TEMPERATURA SE ESTABLECE EN LOS VALORES SOLICITADOS A UNA PROFUNDIDAD DE INMERSIÓN DE 80 MM. SE MEDIERON LAS INDIACIONES DE LOS SENSORES CON UN INSTRUMENTO PATRÓN Y UNA JUNTA FRÍA DE REFERENCIA A 0°C. A PARTIR DE LAS MEDICIONES CORRESPONDIENTES AL PATRÓN Y SENSOR OBJETO SE CALCULO LA TEMPERATURA DE LA JUNTA CALIENTE DE MEDICIÓN.

RESULTADO DE LAS MEDICIONES

| SEÑAL PATRÓN (°C) | SEÑAL OBJETO (°C) | ERROR OBJETO (°C) | INCERTIDUMBRE (°C) | TOLENCIA (°C) |
|-------------------|-------------------|-------------------|--------------------|---------------|
| 640,28 | 640,41 | -0,13 | 1,34 | 4,00 |
| 640,28 | 640,38 | -0,10 | 1,34 | 4,00 |

TEMPERATURA AMBIENTE

19,9 °C

HUMEDAD AMBIENTE

69,9 %

| PATRONES UTILIZADOS | CERTIFICACION | N° CERTIFICADO |
|---------------------|---------------|----------------|
| SENSOR TERMOCOPLA | 2 | 15-6975-08 |
| MULTIMETRO DIGITAL | 5 | 01-5021-08 |

OBSERVACIONES

TERMOCOPAR S.A.C.I.F. CERTIFICA QUE EL INSTRUMENTAL UTILIZADO PARA ESTA MEDICIÓN HA SIDO CALIBRADO Y TESTEADO PARA CUMPLIR CON LA LEGISLACIÓN VIGENTE, LAS CUALES REPRESENTAN A LAS UNIDADES FISICAS EN CONCORDANCIA CON EL SISTEMA INTERNACIONAL DE UNIDADES. EL USUARIO DEBE VERIFICAR LA INCERTIDUMBRE EN ESTA CALIBRACION SON TRAZABLES A TRAVES DEL U.T.I. Y S.I.C.E. ARGENTINA, LA INCERTIDUMBRE DE MEDICION EXPANDIDA INFORMADA FUE CALCULADA MULTIPLICANDO LA INCERTIDUMBRE ESTANDAR POR UN FACTOR DE COBERTURA K=2, QUE CORRESPONDE A UN NIVEL APROXIMADO DE CONFIANZA DEL 95% EN LA DISTRIBUCION NORMAL. EN LA INCERTIDUMBRE SE INCLUYEN LAS PROVENIENTES DEL HORNO CALIBRADOR, INSTRUMENTO PATRÓN, SENSOR PATRÓN Y OBJETO EN EL INSTANTE DE LA CALIBRACION, NO SE INDICA EL COMPORTAMIENTO A LARGO PLAZO DEL OBJETO CALIBRADO. LAS TEMPERATURAS INDICADAS CORRESPONDEN A LA ESCALA INTERNACIONAL DE TEMPERATURA DE 1990 REFERENCIA "METROLOGIA" 273-15 1990. LOS RESULTADOS CONTENDOS EN EL PRESENTE CERTIFICADO SE REFIEREN A LAS CONDICIONES EN QUE SE REALIZARON LAS MEDICIONES. EL USUARIO ES RESPONSABLE DE LA CALIBRACION DEL OBJETO A INTERVALOS APROPIADOS. CERTIFICADOS DE CALIBRACION SIN FIRMA Y ACLARACION, NO SERÁN VALIDOS. ESTE CERTIFICADO NO PODRÁ SER REPRODUCIDO SIN QUE SE HAYA OBTENIDO PREVIAMENTE PERMISO POR ESCRITO DE TERMOCOPAR S.A.C.I.F. LOS RESULTADOS COMPARADOS SE REFIEREN EXCLUSIVAMENTE A LA MUESTRA REFERENCIA TERMOCOPAR S.A.C.I.F. DECLAMA TODA RESPONSABILIDAD POR EL USO INCORRECTO O INCORRECTO QUE SE HICIERE DE ESTE CERTIFICADO O DE LA CALIBRACION Y DE LOS SENSORES O INSTRUMENTOS CALIBRADOS.

FECHA CALIBRACION: 26/02/08
 FECHA CALIBRACION: 26/02/08
 INTENTIVO: MATIAS MARTIN

TERMOCOPAR S.A.C.I.F.
 SAN MARTIN

Handwritten signature and date: 15-07-08

LABORATORIO DE CALIBRACIONES TERMOCOLAR S.A.C.I.F.
 PTE. LUIS SÁENZ PEÑA 1877 (C1139 ABB) BUENOS AIRES TE: 4344-8226/7018 FAX: 4304-9434
 E-mail: labcal@termocolar.com.ar. Visite nuestro web en www.termocolar.com.ar

CERTIFICADO ÚNICO DE CALIBRACIÓN N°: 46678

CLIENTE: SITOCO HNDS. OBJETO: TERMOCUPLA TIPO XX NORMA: ASTM E 230
 DIRECCIÓN: CALLE 38 N°1460 / SAN MARTÍN / PROV. BS. AS. N° DE SERIE: SA / 68 TOLERANCIA: CLASE STD

METODO DE CALIBRACION

EL SENSOR OBJETO FUE CALIBRADO INTRODUCIÉNDOLO JUNTO CON EL SENSOR PATRÓN EN UN BLOQUE ECUALIZADOR EN UN HORNO CILÍNDRICO DE EJE VERTICAL. CUVA TEMPERATURA SE ESTABLEZCO EN LOS VALORES SOLICITADOS A UNA PROFUNDIDAD DE INMERSIÓN DE 80 MM. SE MEDICION LAS INDICACIONES DE LOS SENSORES CON UN INSTRUMENTO PATRÓN Y UNA JUNTA FINA DE REFERENCIA A 0°C. A PARTIR DE LAS MEDICIONES CORRESPONDIENTES AL PATRÓN Y SENSOR OBJETO SE CALCULO LA TEMPERATURA DE LA JUNTA CALIENTE DE MEDICIÓN.

RESULTADO DE LAS MEDICIONES

| MEZCLA PATRÓN (°C) | MEZCLA OBJETO (°C) | ERROR OBJETO (°C) | INCERTIDUMBRE (°C) | TOLERANCIA (°C) |
|--------------------|--------------------|-------------------|--------------------|-----------------|
| 800,38 | 848,35 | -4,13 | 1,34 | 4,98 |
| 650,38 | 648,08 | -4,37 | 1,34 | 4,98 |

| PATRONES UTILIZADOS | IDENTIFICACION | N° CERTIFICADO |
|---------------------|----------------|----------------|
| SENSOR TERMOCUPLA | 2 | 10-6623-08 |
| MULTIMETRO DIGITAL | 8 | 01-5221-08 |

OBSERVACIONES

TERMOCOLAR S.A.C.I.F. CERTIFICA QUE EL INSTRUMENTAL UTILIZADO PARA ESTA MEDICIÓN, HA SIDO CALIBRADO Y TESTEADO PARA CUMPLIR CON LA LEGISLACIÓN VIGENTE, LAS CUJAS REPRESENTAN A LAS UNIDADES FÍSICAS EN CONCORDANCIA CON EL SISTEMA INTERNACIONAL DE UNIDADES SI. LOS PATRONES QUE SE UTILIZARON EN ESTA CALIBRACION SON TRAZABLES A TRAVÉS DEL I.N.T.I. Y S.I.C.E. ARGENTINA. LA INCERTIDUMBRE DE MEDICIÓN EXPANIDA INFORMADA FUE CALCULADA MULTIPLICANDO LA INCERTIDUMBRE ESTIMADA POR UN FACTOR DE COBERTURA K=2, QUE CORRESPONDE A UN NIVEL APROXIMADO DE CONFIANZA DEL 95% EN LA DISTRIBUCIÓN NORMAL. EN LA INCERTIDUMBRE SE INCLUYEN LAS PROVENIENTES DEL HORNO CALIBRADOR, INSTRUMENTO PATRÓN, SENSOR PATRÓN Y OBJETO EN EL INSTANTE DE LA CALIBRACIÓN. NO SE INDICA EL COMPORTAMIENTO A LARGO PLAZO DEL OBJETO CALIBRADO. LAS TEMPERATURAS INDICADAS CORRESPONDEN A LA ESCALA INTERNACIONAL DE TEMPERATURA DE 1990 REFERENCIA "METROLOGÍA" 27.3-19 1990. LOS RESULTADOS CONTENIDOS EN EL PRESENTE CERTIFICADO SE REFIEREN A LAS CONDICIONES EN QUE SE REALIZARON LAS MEDICIONES. EL USUARIO ES RESPONSABLE DE LA CALIBRACIÓN DEL OBJETO A INTERVALOS APROPIADOS. CERTIFICADOS DE CALIBRACIÓN SIN FIRMA Y ACLARACIÓN, NO SERÁN VÁLIDOS. ESTE CERTIFICADO NO PODRÁ SER REPRODUCIDO SIN QUE SE HAYA OBTENIDO PREVIAMENTE PERMISO POR ESCRITO DE TERMOCOLAR S.A.C.I.F. LOS RESULTADOS CONSIDERADOS SE REFIEREN EXCLUSIVAMENTE A LA MUESTRA REFERENCIA TERMOCOLAR S.A.C.I.F. DECLAMA TODA RESPONSABILIDAD POR EL USO MEDICIÓN O INCORRECTO QUE SE HICIERE DE ESTE CERTIFICADO ÚNICO DE CALIBRACIÓN Y DE LOS SENSORES Y/O INSTRUMENTOS CALIBRADOS.

FECHA CALIBRACIÓN: 02/05/2008 RW 10.83 Revistas: 3 INTERVENIO: MATIAS

TERMOCOLAR S.A.C.I.F.

Handwritten signature and date: 27/05/08

CERTIFICADO DE CALIBRACION

Número: 1001-011/001

Página: 1 de 1

Cliente: STOCO HNOS. S.A.
Calle 38 Nº 4140 - (1850) - San Martín - Buenos Aires - Argentina

Id. instrumento: 85073155
Descripción: REGISTRADOR DE TEMPERATURA
Tipo: BANDA ANCHA A TC "K"
Marca y modelo: LER, 112
Nº de Serie: 85073155
Equipo, ubicación: -

Fecha de calibración: 14/01/2010
Lugar: Domicilio del Cliente
Cond. ambientales: (28 ± 2) °C

Método:

Por inyección de la señal eléctrica correspondiente con instrumento patrón y lectura directa de la indicación/registro del instrumento a calibrar, según procedimiento T-REGI-1.

Tolerancia: ±5 °C

Resultados obtenidos:

Instrumento sin ajustar

| Pto. | Unidad | Referencia | Instrumento | Obs. | Set-Point | I.T.E. | Notas |
|------|--------|------------|-------------|------|-----------|--------|---------------|
| 1 | °C | 100,00 | 100,0 | --- | --- | 2,5 | En tolerancia |
| 2 | °C | 400,00 | 400,0 | --- | --- | 2,5 | En tolerancia |
| 3 | °C | 800,00 | 800,0 | --- | --- | 2,5 | En tolerancia |
| 4 | °C | 1100,00 | 1100,0 | --- | --- | 2,5 | En tolerancia |

Patrones utilizados:

| Código | Descripción | # Serie | Certificado | Entidad | Vencimiento |
|--------|----------------------------------|---------|-------------|-------------|-------------|
| C057 | Calibrador de Proceso Flux 741 B | 896008 | OTS403 | VallenorNTI | 12/08/2011 |

Observaciones:

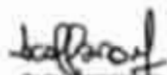
NOTA

Los valores informados corresponden al promedio de las mediciones realizadas.

La incertidumbre total expandida (I.T.E.) fue calculada utilizando un factor de cobertura $k=2$, que corresponde a un nivel de confianza de aproximadamente 95%, bajo distribución normal, incluyendo las contribuciones provenientes del método y del comportamiento del elemento calibrado en el momento de la calibración.

Los resultados contenidos en el presente certificado son trazables al Sistema Internacional de Unidades (S.I.) a través de la calibración de las referencias y patrones de medida involucrados con patrones nacionales e internacionales, y se refieren al momento y condiciones en que se realizaron las mediciones.

El laboratorio de calibración que emite este certificado no se responsabiliza por los perjuicios que puedan derivarse del uso inadecuado de este certificado ni de los instrumentos calibrados. El usuario es responsable de la recalibración a intervalos apropiados. Los certificados de calibración sin firmas en todas sus páginas no serán válidos.


Carlos Scapellato
Lab. de Calibraciones


Graciela E. López
Aseg. Calidad


Enrique A. Giugliardi
Lk. Cc. Financ.
Director


Parner Hme
20-10-10

SOIME SRL BORGHI 35 - (2156) FRAY LUIS BELTRAN
PCIA. DE SANTA FE - ARGENTINA - TE/FAX: 54-341-4918600 y 4918639
E-mail: info@soime.com.ar Web: www.soime.com.ar

DATA BOOK

OBRA N°: FECHA:

ORDEN DE COMPRA O CONTRATO N°:

COMITENTE:

PROYECTO N°:

UBICACIÓN:

COMPONENTE (TAG N°):

4

REGISTRO E INFORMES DE END.