

**UNIVERSIDAD NACIONAL DE INGENIERIA  
FACULTAD DE INGENIERIA MECANICA**



**“COSTO DEL SUB PROYECTO FABRICACION DE  
PARRALES PARA TUBERIAS EN LA ESTACION  
MALVINAS DEL PROYECTO GAS DE CAMISEA”**

**INFORME DE SUFICIENCIA**

**PARA OPTAR EL TITULO PROFESIONAL DE**

**INGENIERO MECANICO**

**MANUEL AUGUSTO RODRIGUEZ DE LAS CASAS**

**PROMOCION 1997-I**

**LIMA-PERU**

**2006**

## INDICE

1	INTRODUCCION.....	1
1.1	Nombre del Proyecto.....	2
1.2	Objetivo.....	3
2	ESTUDIO DE LAS BASES – NORMAS APLICABLES .....	4
2.1	Materiales.....	4
2.2	Soldadura .....	5
2.3	Uniones empernadas.....	5
2.4	Pernos de anclaje.....	5
2.5	Recubrimientos .....	6
2.6	Montaje .....	6
3	EVALUACION DE PLANOS – METRADOS .....	8
3.1	Metrado Parral Principal 1 .....	8
3.2	Metrado Parral Principal 2.....	12
3.3	Metrado Parral E – O Zona Turbocompresores.....	16
4	COSTO DE MATERIALES.....	19
4.1	Planilla Integrada de Costos.....	22
5	COSTO DE INGENIERIA DE DETALLE .....	29
6	COSTO DE HORAS HOMBRE DIRECTAS.....	30
7	CRONOGRAMA DE FABRICACION.....	35
8	COSTO DE EQUIPOS Y CONSUMIBLES.....	39
8.1	Costo de equipos .....	39
8.2	Costo de Consumibles.....	40

9	COSTO DEL TRATAMIENTO SUPERFICIAL.....	41
10	INTEGRACION DE COSTOS .....	43
11	COSTOS INDIRECTOS – GASTOS GENERALES.....	45
12	PRESENTACION FINAL.....	48
13	ALCANCES .....	51
	CONCLUSIONES.....	57
	BIBLIOGRAFIA .....	59
	PLANOS	
	APENDICE	

## CAPITULO I

### INTRODUCCION

Anteriormente a la realización de un Mega proyecto de extracción, se realizan muchas fases como son la exploración, desarrollo de la Ingeniería, construcción y finalmente explotación. Generalmente estas fases llamadas también proyectos, son Subdivididas en proyectos mas pequeños, los cuales pueden ser controlados fácilmente.

En nuestro caso nos ubicaremos dentro del contexto del Proyecto de Gas de Camisea. El cual se inicia en las instalaciones de los yacimientos de gas y condensado de San Martín y Cashirirari, ubicados en la cuenca del río Ucayali-Perú en el Departamento de Cusco.

Los elementos principales del proyecto incluyen:

- Desarrollo de las instalaciones de extracción en cada uno de los dos yacimientos
- Construcción de las líneas de tubería desde los campos de extracción hasta una planta de separación de NGL, situada en Las Malvinas.
- Líneas de reinyección de gas también serán construidas desde la planta de separación de NGL en Las Malvinas hasta los yacimientos
- Construcción de una planta de separación de NGL en Las Malvinas

- Construcción de líneas de gas destinadas a la venta de gas, desde Las Malvinas hasta Lima City Gate, incluyendo redes de distribución local.
- Construcción de una línea de líquidos desde Las Malvinas hasta una planta de fraccionamiento de NGL, localizada en Pisco, departamento de ICA.
- Construcción de una planta de fraccionamiento de NGL en Pisco, que incluye la construcción de un muelle marítimo para exportación y un sistema de carga de camiones en Pisco.

Ubicándonos en el proyecto de Camisea, tomaremos un Subproyecto dentro de la estación de Bombeo de Malvinas, en donde existe la necesidad de llevar un orden en las tuberías de gas y condensado. Dentro de este requerimiento, se encuentra la necesidad de llevar las tuberías a una altura determinada, para lo cual se necesitara la construcción de unos soportes de Tuberías. Dada la envergadura y la cantidad de estructuras de acero necesarias para cubrir esta necesidad es que se realizara el proyecto de construcción de las mismas.

El presente trabajo tiene por finalidad, realizar una evaluación económica, desde el punto de vista del contratista para el suministro de materiales, mano de obra calificada, supervisión, dirección, administración, materiales consumibles, herramientas y equipos para efectuar las Fabricaciones Metálicas de “Estructuras Metálicas para Parrales”, las cuales serán utilizadas en la estación Malvinas del Gasoducto Camisea

### 1.1 Nombre del Proyecto

CONSTRUCCION DE PARRALES METALICOS PARA LA ESTACION MALVINAS DEL GASODUCTO DE CAMISEA

### 1.2 Objetivo

- Desarrollo y Fabricación de Parrales para las tuberías de gas y Condensado de la estación Malvinas del gasoducto de Camisea
- Evaluación económica, desde el punto de vista del contratista para la elaboración y presentación de una propuesta a suma alzada por la construcción de dichas estructuras

## CAPITULO II

### ESTUDIO DE LAS BASES – NORMAS APLICABLES

De acuerdo a la documentación recibida, se deberán analizar las siguientes Normas Técnicas del diseñador-propietario:

PCAM-0100-ET-S-0004 Rev. A      CONSTRUCTION PRACTICE FOR STEEL  
FABRICATION AND ERECTION

La cual se refiere a los procedimientos estándares para la fabricación y montaje de estructuras. De acuerdo a esta norma podremos encontrar que nuestras estructuras deberán ser fabricadas utilizando:

#### 2.1 Materiales

Acero ASTM A-36, con certificados de fundición entregados por el proveedor del acero

## ESTUDIO DE LAS BASES – NORMAS APLICABLES

De acuerdo a la documentación recibida, se deberán analizar las siguientes Normas Técnicas del diseñador-propietario:

PCAM-0100-ET-S-0004 Rev. A          CONSTRUCTION PRACTICE FOR STEEL  
FABRICATION AND ERECTION

La cual se refiere a los procedimientos estándares para la fabricación y montaje de estructuras. De acuerdo a esta norma podremos encontrar que nuestras estructuras deberán ser fabricadas utilizando:

### 2.1 Materiales

Acero ASTM A-36, con certificados de fundición entregados por el proveedor del acero



## 2.2 Soldadura

Se utilizara soldadura E70XX, además de el empleo de soldadores calificados de acuerdo a AWS D 1.1, el método de inspección de soldaduras será a criterio del fabricante, para nuestro caso utilizaremos tintes penetrantes. Si hubiera algún defecto de soldadura, este deberá ser reparado y examinado posteriormente con placas radiográficas o ultrasonido a cuenta del fabricante.

## 2.3 Uniones Empernadas

- Uniones Primarias : Se utilizaran pernos ASTM 325-SC
- Uniones secundarias: Se utilizaran pernos ASTM 325-X

## 2.4 Pernos de Anclaje

Deberán ser fijados antes del curado del grout (no es parte del alcance). Para ambos casos se utilizaran arandelas endurecidas o extrafuertes a ambos lados de la unión

## 2.5 Recubrimientos

Todos los elementos que no sean galvanizados, deberán ser recubiertos de acuerdo a la especificación del propietario PCAM-0100-ET-X-0002 SELECTION AND APPLICATION OF PROTECTIVE COATINGS

De acuerdo a esta norma podremos encontrar que nuestras estructuras deberán seguir el siguiente proceso:

- Limpieza de Superficie: Arenado al metal casi blanco
- Base: Se utilizara un imprimante epóxico con un espesor de película seca que podrá variar entre 5 y 6 mils,
- Acabado: Se utilizara una pintura a base de poliuretano con un espesor de película seca que podrá variar entre 1.5 y 2 mils

## 2.6 Montaje

No forma parte del alcance

De acuerdo a estas Normas del fabricante, deberemos tener en cuenta lo siguiente para poder hacer nuestro cálculo económico:

- Emplear acero ASTM A 36
- Emplear soldadura E 70XX
- Utilizar tintes penetrantes
- Hacer notar en los alcances que no suministraremos ni instalaremos pernos de anclaje
- Utilizar pernos ASTM A325-SC y ASTM A325-X
- Utilizar Arenado al metal casi blanco cabe la posibilidad de utilizar granallas, dependiendo de la rueda de consultas y respuestas.
- Emplear imprimante epóxico (5 mils)
- Emplear Poliuretano para acabados (1.5 mils)

**CAPITULO III**  
**EVALUACION DE PLANOS – METRADOS**

De acuerdo a los planos podremos encontrar que las estructuras a fabricar constan de 3 bastidores o parrales para soportar tuberías. Dichos parrales contienen el material q se muestra a continuación:

**3.1 Metrado Parral Principal 1**

Los metrados se muestran en el grupo de tablas No 1:

Grupo de Tablas No 1

Descripción	Unidad	Cantidad
<b>Pórtico 1 al 9</b>	Unidad	9
W 8 x 18	m	49.50
W 8 x 24	m	49.50
W 10 x 33	m	49.50
W 8 x 31	m	122.40
W 6 x 15	m	18.45
Plancha 10	m <sup>2</sup>	3.60
Plancha 12.7	m <sup>2</sup>	3.51
Plancha 26	m <sup>2</sup>	9.00
Cartelas	kg	421.54
Pernos de Anclaje 1"	Unidad	72.00
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	216.00

Descripción	Unidad	Cantidad
<b>Pórtico 10 al 17</b>	<b>Unidad</b>	<b>8</b>
W 8 x 18	m	44.00
W 8 x 24	m	44.00
W 10 x 33	m	44.00
W 8 x 31	m	108.80
W 6 x 15	m	15.60
Plancha 10	m2	3.12
Plancha 12.7	m2	3.12
Plancha 26	m2	8.00
Cartelas	kg	373.95
Pernos de Anclaje 1"	Unidad	64.00
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	192.00

Descripción	Unidad	Cantidad
<b>Pórtico 18 al 24</b>	<b>Unidad</b>	<b>7</b>
W 8 x 18	m	38.50
W 8 x 24	m	38.50
W 10 x 33	m	38.50
W 8 x 31	m	95.20
W 6 x 15	m	12.95
Plancha 10	m2	2.73
Plancha 12.7	m2	2.73
Plancha 26	m2	7.00
Cartelas	kg	326.74
Pernos de Anclaje 1"	Unidad	56.00
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	168.00

Descripción	Unidad	Cantidad
<b>Pórtico 25</b>	<b>Unidad</b>	<b>1</b>
W 8 x 18	m	11.00
W 8 x 24	m	5.50
W 10 x 33	m	5.50
W 10 x 49	m	19.56
W 8 x 31	m	5.50
W 6 x 15	m	2.25
Plancha 10	m2	0.72
Plancha 12.7	m2	0.85
Plancha 26	m2	1.56
Cartelas	kg	88.56
Pernos de Anclaje 1"	Unidad	8.00
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	40.00

Descripción	Unidad	Cantidad
<b>Pórtico 26</b>	<b>Unidad</b>	<b>1</b>
W 8 x 18	m	5.50
W 8 x 24	m	5.50
W 10 x 33	m	0.00
W 10 x 49	m	17.40
W 8 x 31	m	5.50
W 6 x 15	m	2.15
Plancha 10	m2	0.41
Plancha 12.7	m2	0.58
Plancha 26	m2	1.10
Cartelas	kg	66.86
Pernos de Anclaje 1"	Unidad	8.00
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	24.00

Descripción	Unidad	Cantidad
<b>Pórticos 27 al 33</b>	<b>Unidad</b>	<b>7</b>
W 8 x 18	m	38.50
W 8 x 24	m	38.50
W 10 x 33	m	0.00
W 10 x 49	m	95.20
W 8 x 31	m	38.50
W 6 x 15	m	15.05
Plancha 10	m2	2.24
Plancha 12.7	m2	4.06
Plancha 26	m2	7.70
Cartelas	kg	408.11
Pernos de Anclaje 1"	Unidad	56.00
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	168.00

Descripción	Unidad	Cantidad
<b>Pórticos 34 al 41</b>	<b>Unidad</b>	<b>8</b>
W 8 x 18	m	44.00
W 8 x 24	m	44.00
W 10 x 33	m	0.00
W 10 x 49	m	108.80
W 8 x 31	m	44.00
W 6 x 15	m	16.40
Plancha 10	m2	2.56
Plancha 12.7	m2	4.64
Plancha 26	m2	8.80
Cartelas	kg	465.87
Pernos de Anclaje 1"	Unidad	64.00
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	192.00

Descripción	Unidad	Cantidad
<b>Pórticos 42 al 49</b>	Unidad	8
W 8 x 18	m	44.00
W 8 x 24	m	44.00
W 10 x 33	m	0.00
W 10 x 49	m	108.80
W 8 x 31	m	44.00
W 6 x 15	m	15.60
Plancha 10	m2	2.56
Plancha 12.7	m2	4.64
Plancha 26	m2	8.80
Cartelas	kg	465.34
Pernos de Anclaje 1"	Unidad	64.00
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	192.00

Descripción	Unidad	Cantidad
<b>Pórticos 50 al 56</b>	Unidad	7
W 8 x 18	m	38.50
W 8 x 24	m	38.50
W 10 x 33	m	0.00
W 10 x 49	m	95.20
W 8 x 31	m	38.50
W 6 x 15	m	12.95
Plancha 10	m2	2.24
Plancha 12.7	m2	4.06
Plancha 26	m2	7.70
Cartelas	kg	406.70
Pernos de Anclaje 1"	Unidad	56.00
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	168.00

Descripción	Unidad	Cantidad
<b>Puntales + Arriostres Laterales</b>	Glb	1
W 8 x 18	m	611.60
W 8 x 24	m	928.00
W 8 x 28	m	30.00
L 4 x 3/8"	m	518.40
Plancha 10	m2	17.35
Plancha 12.7	m2	7.68
Cartelas	kg	1,820.51
Pernos A325 Galv 3/4" x 3"	Unidad	1,320.00
Pernos A325 Galv 3/4" x 1 1/2"	Unidad	192.00

Descripción	Unidad	Cantidad
<b>Travesaños</b>	<b>Glb</b>	<b>1</b>
W 8 x 18	m	605.00
L 4 x 3/8"	m	57.20
Cartelas	kg	511.85
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	880.00

### 3.2 Metrado Parral Principal 2

Los metrados se muestran en el grupo de tablas No 2:

Grupo de Tablas No 2

Descripción	Unidad	Cantidad
<b>Pórtico 36 al 42</b>	<b>Unidad</b>	<b>7</b>
W 10 x 49	m	147.98
W 8 x 18	m	77.00
W 8 x 28	m	38.50
W 8 x 35	m	38.50
Plancha 10	m	2.10
Plancha 12.7	m2	5.04
Plancha 26	m2	8.68
C 4 x 5.4	m	96.60
W 8 x 31	m	0.00
Plancha 19	m2	0.00
L 4 x 3/8"	m	0.00
Cartelas	kg	590.06
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	224.00
Pernos de Anclaje 1"	Unidad	56.00
Pernos A325 Galv 3/4" x 1 1/2"	Unidad	56.00
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	0



Descripción	Unidad	Cantidad
<b>Pórtico 43 y 45</b>	<b>Unidad</b>	<b>2</b>
W 10 x 49	m	42.28
W 8 x 18	m	0.00
W 8 x 28	m	33.00
W 8 x 35	m	0.00
Plancha 10	m	0.78
Plancha 12.7	m <sup>2</sup>	2.40
Plancha 26	m <sup>2</sup>	2.48
C 4 x 5.4	m	27.60
W 8 x 31	m	22.00
Plancha 19	m <sup>2</sup>	0.40
L 4 x 3/8"	m	42.80
Cartelas	kg	215.54
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	80.00
Pernos de Anclaje 1"	Unidad	16.00
Pernos A325 Galv 3/4" x 1 1/2"	Unidad	16.00
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	24.00

Descripción	Unidad	Cantidad
<b>Pórtico 45 al 56</b>	<b>Unidad</b>	<b>12</b>
W 10 x 49	m	253.68
W 8 x 18	m	132.00
W 8 x 28	m	66.00
W 8 x 35	m	66.00
Plancha 10	m	3.60
Plancha 12.7	m <sup>2</sup>	8.64
Plancha 26	m <sup>2</sup>	14.88
C 4 x 5.4	m	165.60
W 8 x 31	m	0.00
Plancha 19	m <sup>2</sup>	0.00
L 4 x 3/8"	m	0.00
Cartelas	kg	1,011.52
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	384.00
Pernos de Anclaje 1"	Unidad	96.00
Pernos A325 Galv 3/4" x 1 1/2"	Unidad	96.00
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	0

Descripción	Unidad	Cantidad
<b>Pórtico 57 al 66</b>	<b>Unidad</b>	<b>10</b>
W 10 x 49	m	191.20
W 8 x 18	m	55.00
W 8 x 28	m	55.00
W 8 x 35	m	55.00
Plancha 10	m	2.10
Plancha 12.7	m2	6.30
Plancha 26	m2	10.40
C 4 x 5.4	m	63.00
W 8 x 31	m	0.00
Plancha 19	m2	0.00
L 4 x 3/8"	m	0.00
Cartelas	kg	719.36
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	400.00
Pernos de Anclaje 1"	Unidad	80.00
Pernos A325 Galv 3/4" x 1 1/2"	Unidad	40.00
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	0

Descripción	Unidad	Cantidad
<b>Pórtico 67 al 68</b>	<b>Unidad</b>	<b>2</b>
W 10 x 49	m	38.24
W 8 x 18	m	0.00
W 8 x 28	m	33.00
W 8 x 35	m	0.00
Plancha 10	m	0.60
Plancha 12.7	m2	1.26
Plancha 26	m2	2.08
C 4 x 5.4	m	12.60
W 8 x 31	m	11.00
Plancha 19	m2	0.40
L 4 x 3/8"	m	42.80
Cartelas	kg	181.62
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	96.00
Pernos de Anclaje 1"	Unidad	16.00
Pernos A325 Galv 3/4" x 1 1/2"	Unidad	8.00
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	0

Descripción	Unidad	Cantidad
<b>Puntales</b>	Glb	1
W 8 x 18	m	539.00
W 8 x 24	m	330.00
Plancha 10	m	11.52
L 2 1/2 x 1/4"	m	220.00
Cartelas	kg	857.21
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	1,536.00

Descripción	Unidad	Cantidad
<b>Arriostres Laterales</b>	Glb	1
Plancha 10	m	5.94
Plancha 12.7	m2	3.00
L 4 x 3/8"	m	477.60
Cartelas	kg	233.73
Pernos A325 Galv 3/4" x 2"	Unidad	232.00
Pernos A325 Galv 3/4" x 1 1/2"	Unidad	160.00

Descripción	Unidad	Cantidad
<b>Travesaños</b>	Glb	1
W 8 x 18	m	550.00
C 4 x 5.4	m	550.00
L 4 x 3/8"	m	52.00
Cartelas	kg	598.15
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	804.00

Descripción	Unidad	Cantidad
<b>Unión entre Pórticos 43 y 45</b>	Glb	1
L 4 x 5/16"	m	132.00
L 3 1/2 x 1/4"	m	44.00
L 2 x 1/4"	m	208.40
L 2 1/2 x 1/4"	m	124.20
C 4 x 5.4	m	69.00
Plancha 10	m	11.85
W 8 x 18	m2	55.00
L 4 x 3/8"	m2	6.76
W 8 x 28	m	44.00
Cartelas	kg	262.59
Pernos A325 Galv 3/4" x 2"	Unidad	336.00
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	208.00

Descripción	Unidad	Cantidad
<b>Unión entre Pórticos 67 y 68</b>	<b>Glb</b>	<b>1</b>
L 4 x 5/16"	m	132.00
L 2 x 1/4"	m	180.40
L 2 1/2 x 1/4"	m	209.60
C 4 x 5.4	m	4.00
Plancha 10	m	10.38
W 8 x 18	m2	55.00
L 4 x 3/8"	m2	6.76
W 8 x 28	m	44.00
Cartelas	kg	241.40
Pernos A325 Galv 3/4" x 2"	Unidad	232.00

### 3.3 Metrado Parral E-O Zona de Turbocompresores

Los metrados se muestran en el grupo de tablas No 3:

Grupo de Tablas No 3

Descripción	Unidad	Cantidad
<b>Pórtico D'</b>	<b>Unidad</b>	<b>1</b>
W 10 x 49	m	16.68
W 8 x 18	m	5.50
W 8 x 24	m	5.50
W 8 x 31	m	5.50
W 8 x 28	m	5.50
C 4 x 5.4	m	7.10
W 6 x 15	m	1.60
Plancha 10	m	0.53
Plancha 12.7	m2	1.33
Plancha 26	m2	1.24
L 4 x 1/2"	m	27.60
W 6 x 51	m	0.00
Plancha 19	m2	
Cartelas	kg	92.67
Pernos A325 Galv 3/4" x 2"	Unidad	20.00
Pernos de Anclaje 1"	Unidad	8.00
Pernos A325 Galv 3/4" x 1"	Unidad	8.00
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	32.00

Descripción	Unidad	Cantidad
<b>Pórtico C'</b>	<b>Unidad</b>	<b>1</b>
W 10 x 49	m	16.68
W 8 x 18	m	5.50
W 8 x 24	m	5.50
W 8 x 31	m	5.50
W 8 x 28	m	5.50
C 4 x 5.4	m	7.10
W 6 x 15	m	1.82
Plancha 10	m	0.53
Plancha 12.7	m2	1.33
Plancha 26	m2	1.24
L 4 x 1/2"	m	27.60
W 6 x 51	m	0.00
Plancha 19	m2	
Cartelas	kg	92.82
Pernos A325 Galv 3/4" x 2"	Unidad	16.00
Pernos de Anclaje 1"	Unidad	8.00
Pernos A325 Galv 3/4" x 1"	Unidad	8.00
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	32.00

Descripción	Unidad	Cantidad
<b>Pórticos AC-S</b>	<b>Unidad</b>	<b>11</b>
W 10 x 49	m	183.48
W 8 x 18	m	60.50
W 8 x 24	m	60.50
W 8 x 31	m	243.98
W 8 x 28	m	60.50
C 4 x 5.4	m	78.10
W 6 x 15	m	0.00
Plancha 10	m	2.42
Plancha 12.7	m2	8.91
Plancha 26	m2	13.64
L 4 x 1/2"	m	0.00
W 6 x 51	m	0.00
Plancha 19	m2	
Cartelas	kg	1,062.23
Pernos A325 Galv 3/4" x 2"	Unidad	0.00
Pernos de Anclaje 1"	Unidad	88.00
Pernos A325 Galv 3/4" x 1"	Unidad	88.00
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	352.00

Descripción	Unidad	Cantidad
<b>Pórticos J - F</b>	<b>Unidad</b>	<b>5</b>
W 10 x 49	m	83.40
W 8 x 18	m	27.50
W 8 x 24	m	58.75
W 8 x 31	m	27.50
W 8 x 28	m	27.50
C 4 x 5.4	m	35.50
W 6 x 15	m	8.00
Plancha 10	m	1.10
Plancha 12.7	m <sup>2</sup>	4.05
Plancha 26	m <sup>2</sup>	7.20
L 4 x 1/2"	m	0.00
W 6 x 51	m	11.00
Plancha 19	m <sup>2</sup>	
Cartelas	kg	437.25
Pernos A325 Galv 3/4" x 2"	Unidad	0.00
Pernos de Anclaje 1"	Unidad	60.00
Pernos A325 Galv 3/4" x 1"	Unidad	40.00
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	160.00

Descripción	Unidad	Cantidad
<b>Pórticos R - K</b>	<b>Unidad</b>	<b>8</b>
W 10 x 49	m	133.44
W 8 x 18	m	44.00
W 8 x 24	m	94.00
W 8 x 31	m	44.00
W 8 x 28	m	44.00
C 4 x 5.4	m	56.80
W 6 x 15	m	11.28
Plancha 10	m	1.76
Plancha 12.7	m <sup>2</sup>	6.48
Plancha 26	m <sup>2</sup>	11.52
L 4 x 1/2"	m	0.00
W 6 x 51	m	17.60
Plancha 19	m <sup>2</sup>	
Cartelas	kg	698.58
Pernos A325 Galv 3/4" x 2"	Unidad	0.00
Pernos de Anclaje 1"	Unidad	96.00
Pernos A325 Galv 3/4" x 1"	Unidad	64.00
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	256.00

Descripción	Unidad	Cantidad
<b>Puntales</b>	<b>Glb</b>	<b>1</b>
W 8 x 18	m	858.00
W 8 x 24	m	264.00
Plancha 10	m	12.24
Cartelas	kg	1,005.70
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	1,632.00

Descripción	Unidad	Cantidad
<b>Arriostres Laterales</b>	<b>Glb</b>	<b>1</b>
L 3 x 1/4"	m	14.00
Plancha 12.7	m2	2.10
L 4 x 5/16"	m	79.20
L 4 x 1/2"	m	180.00
Plancha 10	m2	2.70
Cartelas	kg	148.44
Pernos A325 Galv 3/4" x 2"	Unidad	128.00
Pernos A325 Galv 3/4" x 1 1/2"	Unidad	96.00

Descripción	Unidad	Cantidad
<b>Travesaños</b>	<b>Glb</b>	<b>1</b>
W 8 x 18	m	528.00
C 4 x 5.4	m	528.00
L 4 x 3/8"	m	49.92
Cartelas	kg	574.22
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	768.00

Descripción	Unidad	Cantidad
<b>Unión entre Pórticos C' - D'</b>	<b>Glb</b>	<b>1</b>
L 4 x 5/16"	m	144.00
L 3 x 3/16"	m	72.00
L 2 1/2 x 3/16"	m	34.60
L 2 1/2 x 1/4"	m	244.80
C 4 x 5.4	m	27.50
Plancha 10	m	13.25
W 8 x 18	m2	55.00
W 8 x 31	m3	16.50
Cartelas	kg	221.64
Pernos A325 Galv 3/4" x 2"	Unidad	192.00
Pernos A325 Galv 3/4" x 1 1/2"	Unidad	144.00
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	52.00

**CAPITULO IV**  
**COSTO DE MATERIALES**

De acuerdo a los metrados hallados anteriormente, podemos confeccionar la tabla de precios mostrada en la tabla No 4:



4

## COSTO DE MATERIALES

De acuerdo a los metrados hallados anteriormente, podemos confeccionar la tabla de precios mostrada en la tabla No 4:

Tabla No 4

DESCRIPCION	Unidad	Cantidad	Precio Unit US \$
Barra Redonda 1"	m	712.00	2.81
C 4 x 5.4	m	1,728.50	6.02
L 2 1/2 x 1/4"	m	798.60	5.91
L 2 1/2 x 3/16"	m	34.60	4.51
L 2 x 1/4"	m	388.80	4.55
L 3 1/2 x 1/4"	m	44.00	7.54
L 3 x 1/4"	m	14.00	6.87
L 3 x 3/16"	m	72.00	6.02
L 4 x 1/2"	m	235.20	14.04
L 4 x 3/8"	m	1,254.24	11.03
L 4 x 5/16"	m	487.20	10.53
Pernos A325 Galv 3/4" x 1 1/2"	unidad	808.00	0.90
Pernos A325 Galv 3/4" x 1"		208.00	1.22
Pernos A325 Galv 3/4" x 2 1/2"	unidad	5,904.00	2.10
Pernos A325 Galv 3/4" x 2"	unidad	1,156.00	1.75
Pernos A325 Galv 3/4" x 3"	unidad	1,320.00	1.80
Pernos A325 Galv 7/8" x 3 1/2"	unidad	2,016.00	2.11
Pernos A325 Galv 7/8" x 4 1/2"	unidad	1,360.00	3.61
Pernos de Anclaje 1"	Unidad	972.00	9.52
Plancha 10	m2	120.93	85.68
Plancha 12.7	m2	86.71	110.41
Plancha 19	m2	0.80	198.75
Plancha 26	m2	133.02	223.48
Tuercas A 307 x 1/4"	unidad	6,000.00	0.05
Tuercas A325 Galv 1"	unidad	712.00	1.65
W 10 x 33	m	137.50	49.29
W 10 x 49	m	1,552.02	73.19
W 6 x 15	m	134.10	22.44
W 6 x 51	m	28.60	76.28
W 8 x 18	m	4,577.10	26.89
W 8 x 24	m	2,054.25	35.85
W 8 x 28	m	486.50	41.82
W 8 x 31	m	878.38	46.31
W 8 x 35	m	159.50	52.28

#### 4.1 Planilla Integrada de Costos

De acuerdo a los precios unitarios mostrados en la tabla No 4, a los metrados obtenidos, rendimientos historicos de horas hombre, pesos de elementos, area unitaria de elementos y datos obtenidos de la rueda de preguntas y respuestas, podremos obtener las siguientes planillas totalizadas según:

- Tabla No 5 : Planilla correspondiente al Parral Principal 1
- Tabla No 6 : Planilla correspondiente al Parral Principal 2
- Tabla No 7 : Planilla correspondiente al Parral E – O Zona de Turbocompresores

Tabla No 5:

Descripción	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area a Pintar Totalmente	Area a Ignorar	No Tuerces a Utilizar	Peso Total Tuerces	Precio Total Tuerces	HH Total Tuerces	
<b>Portico 1 al 9</b>																			
W 8 x 18	m	49.50	28.82	28.89	0.95	2.24	14.266.84	16.968.12	392.20	3.418.82	1.07	10.42%	37.73	334.47	3.875.00	87.80	129.47	114.80	
W 8 x 24	m	49.50	35.76	35.85	0.95	2.55	1,327.59	1,330.92	47.03	110.63	1.00	17%	7.84	39.19	415.00	8.30	18.72	18.80	
W 10 x 33	m	49.50	49.17	49.29	1.12	3.61	1,770.12	1,774.56	47.03	126.44	1.00	17%	7.84	39.19	415.00	8.30	18.72	18.80	
W 8 x 31	m	122.40	46.19	46.31	1.22	3.30	2,433.52	2,440.02	55.44	173.85	1.00	17%	9.24	48.20	415.00	8.30	18.72	18.80	
W 8 x 15	m	18.45	22.38	22.44	0.91	1.87	6,653.58	6,667.83	149.33	403.93	1.00	0%	0.00	149.33	1,470.00	29.40	66.77	68.80	
Plancha 10	m2	3.90	87.50	85.88	2.00	5.83	412.91	413.95	16.79	34.41	1.00	17%	2.80	13.99	155.00	3.10	6.92	6.90	
Plancha 12.7	m2	3.51	97.87	110.41	2.00	6.52	315.00	308.45	8.20	21.90	0.88	10%	0.75	8.45	0.00	0.00	0.00	0.00	
Plancha 26	m2	9.00	199.39	223.48	2.00	11.73	343.52	387.55	7.02	22.80	1.13	10%	0.73	8.29	0.00	0.00	0.00	0.00	
Cartelas	kg	421.54	1.00	0.40	0.02	0.17	1,754.51	2,011.34	18.00	105.56	1.12	10%	1.88	18.12	0.00	0.00	0.00	0.00	
Pernos de Anclaje 1"	Unidad	72.00	3.97	8.52	0.08	0.68	421.54	158.61	8.61	70.26	0.40	10%	0.90	7.72	0.00	0.00	0.00	0.00	
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	215.00	0.64	3.61	0.00	0.00	285.84	685.35	5.76	47.64	2.40	100%	6.78	0.00	0.00	0.00	0.00	0.00	
<b>Peso Total</b>							<b>14.266.84</b>	<b>16.968.12</b>	<b>392.20</b>	<b>3.418.82</b>	<b>1.07</b>	<b>10.42%</b>	<b>37.73</b>	<b>334.47</b>	<b>3.875.00</b>	<b>87.80</b>	<b>129.47</b>	<b>114.80</b>	
<b>Portico 10 al 17</b>																			
W 8 x 18	m	44.00	28.82	28.89	0.95	2.24	12,180.08	14,188.78	321.08	880.39	1.07	10.40%	33.39	297.88	3,848.00	80.88	114.86	101.82	
W 8 x 24	m	44.00	35.76	35.85	0.95	2.55	1,180.08	1,183.94	41.80	98.34	1.00	17%	6.97	34.63	370.00	7.40	16.62	14.80	
W 10 x 33	m	44.00	49.17	49.29	1.12	3.51	1,573.44	1,577.38	41.80	112.39	1.00	17%	6.97	34.63	370.00	7.40	16.62	14.80	
W 8 x 31	m	108.80	46.19	46.31	1.22	3.30	2,153.48	2,159.90	49.20	154.53	1.00	17%	8.21	41.07	370.00	7.40	16.62	14.80	
W 8 x 15	m	15.50	22.38	22.44	0.91	1.87	5,035.47	5,038.07	132.74	358.98	1.00	0%	0.00	132.74	1,308.00	26.18	58.01	57.32	
W 8 x 31	m	3.12	87.50	85.88	2.00	5.83	348.13	350.00	14.20	29.09	1.00	17%	2.37	11.83	130.00	2.80	5.84	5.20	
Plancha 10	m2	3.12	87.50	85.88	2.00	5.83	273.00	267.32	6.24	16.20	0.98	10%	0.65	5.69	0.00	0.00	0.00	0.00	
Plancha 12.7	m2	3.12	97.87	110.41	2.00	6.52	305.35	344.49	6.24	20.36	1.13	10%	0.66	5.59	0.00	0.00	0.00	0.00	
Plancha 26	m2	8.00	199.39	223.48	2.00	11.73	1,695.12	1,787.86	16.00	1.12	10%	1.66	14.34	0.00	0.00	0.00	0.00		
Cartelas	kg	373.95	1.00	0.40	0.02	0.17	373.95	149.58	7.84	82.33	0.40	10%	0.79	8.85	0.00	0.00	0.00	0.00	
Pernos de Anclaje 1"	Unidad	84.00	3.97	8.52	0.08	0.68	284.08	809.20	5.12	42.36	2.40	100%	5.12	0.00	0.00	0.00	0.00	0.00	
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	192.00	0.64	3.61	0.00	0.00	122.80	692.93	0.00	0.00	6.84	0%	0.00	0.00	0.00	0.00	0.00	0.00	
<b>Peso Total</b>							<b>12,180.08</b>	<b>14,188.78</b>	<b>321.08</b>	<b>880.39</b>	<b>1.07</b>	<b>10.40%</b>	<b>33.39</b>	<b>297.88</b>	<b>3,848.00</b>	<b>80.88</b>	<b>114.86</b>	<b>101.82</b>	
<b>Portico 18 al 24</b>																			
W 8 x 18	m	38.50	28.82	28.89	0.95	2.24	11,047.80	13,331.78	290.29	882.20	1.07	10.28%	28.10	251.17	3,331.00	44.62	106.86	89.24	
W 8 x 24	m	38.50	35.76	35.85	0.95	2.55	1,032.57	1,035.16	35.58	88.05	1.00	17%	6.10	30.48	325.00	6.50	14.68	13.00	
W 10 x 33	m	38.50	49.17	49.29	1.12	3.51	1,378.78	1,360.21	35.58	98.34	1.00	17%	6.10	30.48	325.00	6.50	14.68	13.00	
W 8 x 31	m	95.20	46.19	46.31	1.22	3.30	1,893.05	1,897.78	43.12	135.22	1.00	17%	7.19	35.93	325.00	6.50	14.68	13.00	
W 8 x 15	m	12.95	22.38	22.44	0.91	1.87	4,397.29	4,408.31	116.14	314.09	1.00	0%	0.00	116.14	1,146.00	22.92	51.70	45.84	
W 8 x 31	m	2.73	87.50	85.88	2.00	5.83	289.82	290.55	11.78	24.15	1.00	17%	1.96	9.82	110.00	2.20	4.98	4.40	
Plancha 10	m2	2.73	87.50	85.88	2.00	5.83	238.88	233.91	5.46	15.93	0.99	10%	0.67	4.89	0.00	0.00	0.00	0.00	
Plancha 12.7	m2	2.73	97.87	110.41	2.00	6.52	287.19	301.43	5.46	17.81	1.13	10%	0.67	4.89	0.00	0.00	0.00	0.00	
Plancha 26	m2	7.00	199.39	223.48	2.00	11.73	1,395.73	1,564.38	14.00	87.10	1.12	10%	1.45	12.55	0.00	0.00	0.00	0.00	
Cartelas	kg	325.74	1.00	0.40	0.02	0.17	325.74	130.70	6.66	54.46	0.40	10%	0.69	5.89	0.00	0.00	0.00	0.00	
Pernos de Anclaje 1"	Unidad	56.00	3.97	8.52	0.08	0.68	222.32	533.05	4.48	37.05	2.40	100%	4.48	0.00	0.00	0.00	0.00	0.00	
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	168.00	0.64	3.61	0.00	0.00	107.62	606.32	0.00	0.00	6.84	0%	0.00	0.00	0.00	0.00	0.00	0.00	
<b>Peso Total</b>							<b>11,047.80</b>	<b>13,331.78</b>	<b>290.29</b>	<b>882.20</b>	<b>1.07</b>	<b>10.28%</b>	<b>28.10</b>	<b>251.17</b>	<b>3,331.00</b>	<b>44.62</b>	<b>106.86</b>	<b>89.24</b>	
<b>Portico 25</b>																			
W 8 x 18	m	11.00	28.82	28.89	0.95	2.24	3,097.78	3,390.97	89.03	230.29	1.06	48.88%	33.72	38.31	372.00	8.44	12.27	10.88	
W 8 x 24	m	5.50	35.76	35.85	0.95	2.55	295.02	295.76	10.45	24.59	1.00	100%	10.45	0.00	0.00	0.00	0.00	0.00	
W 10 x 33	m	5.50	49.17	49.29	1.12	3.51	198.88	197.17	5.23	14.05	1.00	100%	5.23	0.00	0.00	0.00	0.00	0.00	
W 10 x 49	m	19.56	73.01	73.19	1.52	5.22	270.44	271.11	8.18	19.32	1.00	17%	1.03	5.13	60.00	1.20	2.71	2.40	
W 8 x 31	m	5.50	46.19	46.31	1.22	3.30	1,428.08	1,431.85	29.73	102.01	1.00	33%	9.91	19.82	182.00	3.24	7.31	6.48	
W 8 x 15	m	2.25	22.38	22.44	0.91	1.87	254.05	254.88	8.71	18.15	1.00	17%	1.12	5.59	50.00	1.00	2.26	2.00	
W 8 x 31	m	0.72	87.50	85.88	2.00	5.83	60.36	60.48	2.05	4.20	1.00	100%	2.05	0.00	0.00	0.00	0.00	0.00	
Plancha 10	m2	0.72	87.50	85.88	2.00	5.83	83.00	81.89	1.44	4.20	0.88	49%	0.70	0.74	0.00	0.00	0.00	0.00	
Plancha 12.7	m2	0.85	97.87	110.41	2.00	6.52	83.19	93.85	1.70	5.55	1.13	49%	0.83	0.87	0.00	0.00	0.00	0.00	
Plancha 26	m2	1.58	199.39	223.48	2.00	11.73	311.05	348.83	3.12	18.30	1.12	49%	1.52	1.80	0.00	0.00	0.00	0.00	
Cartelas	kg	83.58	1.00	0.40	0.02	0.17	88.56	35.42	1.61	14.78	0.40	49%	0.88	0.93	0.00	0.00	0.00	0.00	
Pernos de Anclaje 1"	Unidad	8.00	3.97	8.52	0.08	0.68	31.78	75.15	0.64	6.29	2.40	0%	0.00	0.64	0.00	0.00	0.00	0.00	
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	40.00	0.64	3.61	0.00	0.00	26.80	144.38	0.00	0.00	6.84	0%	0.00	0.00	0.00	0.00	0.00	0.00	
<b>Peso Total</b>							<b>3,097.78</b>	<b>3,390.97</b>	<b>89.03</b>	<b>230.29</b>	<b>1.06</b>	<b>48.88%</b>	<b>33.72</b>	<b>38.31</b>	<b>372.00</b>	<b>8.44</b>	<b>12.27</b>	<b>10.88</b>	
<b>Portico 26</b>																			
W 8 x 18	m	5.50	26.82	26.89	0.95	2.24	147.51	147.85	5.23	12.29	1.00	17%	0.87	4.36	50.00	1.00	2.26	2.00	
W 8 x 24	m	5.50	35.76	35.85	0.95	2.55	198.88	197.17	5.23	14.05	1.00	17%	0.87	4.36	50.00	1.00	2.26	2.00	
W 10 x 49	m	17.40	73.01	73.19	1.52	5.22	1,270.37	1,273.56	26.45	90.74	1.00	0%	0.00	26.45	210.00	4.20	9.47	8.40	
W 8 x 31	m	5.50	46.19	46.31	1.22	3.30	254.05	254.85	8.71	18.15	1.00	17%	1.12	5.59	50.00	1.00	2.26	2.00	
W 8 x 15	m	2.15																	

Descripción	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unifaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area a Pintar Totalmente	Area a Ignorar	No Tuerzas A Utilizar	Peso Total Tuerzas	Precio Total Tuerzas	HH Total Tuerzas	
<b>Partidos 27 al 33</b>	Unidad	<b>7.00</b>					<b>34,341.82</b>	<b>16,167.41</b>	<b>3,18.34</b>	<b>1,070.88</b>	<b>1.00</b>	<b>0.47%</b>	<b>30.32</b>	<b>288.02</b>	<b>2,117.00</b>	<b>44.34</b>	<b>100.00</b>	<b>88.88</b>	
W 8 x 18	m	35.50	26.82	26.89	0.95	2.24	1,032.57	1,035.16	35.58	85.05	1.00	17%	8.10	30.48	325.00	6.50	14.68	13.00	
W 8 x 24	m	38.50	35.76	35.85	0.95	2.55	1,376.78	1,380.21	36.58	96.34	1.00	17%	8.10	30.48	325.00	6.50	14.68	13.00	
W 10 x 49	m	95.20	73.01	73.19	1.52	5.22	6,950.55	6,967.97	144.70	496.47	1.00	0%	0.00	144.70	1,146.00	22.92	51.70	45.84	
W 8 x 31	m	38.50	46.19	46.31	1.22	3.30	1,778.32	1,782.77	46.97	127.02	1.00	17%	7.83	39.14	325.00	6.50	14.68	13.00	
W 8 x 15	m	15.05	22.38	22.44	0.91	1.87	339.82	337.06	13.70	28.07	1.00	50%	0.65	6.85	96.00	1.92	4.33	3.44	
Plancha 10	m2	2.24	87.50	85.88	2.00	6.83	198.00	191.92	4.48	13.07	0.98	0%	0.43	0.00	0.00	0.00	0.00	0.00	
Plancha 12.7	m2	4.06	97.87	110.41	2.00	6.52	397.35	448.28	8.12	26.49	1.13	0%	0.77	7.35	0.00	0.00	0.00	0.00	
Plancha 26	m2	7.70	199.39	223.48	2.00	11.73	1,535.30	1,720.81	15.40	90.31	1.12	0%	1.46	13.94	0.00	0.00	0.00	0.00	
Cartelas	kg	406.11	1.00	0.40	0.02	0.17	406.11	162.68	8.31	67.78	0.40	0%	0.79	7.52	0.00	0.00	0.00	0.00	0.00
Pernos de Anclaje 1"	Unidad	56.00	3.97	9.52	0.08	0.68	222.32	533.05	4.48	37.05	2.40	0%	0.00	4.48	0.00	0.00	0.00	0.00	
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	168.00	0.84	3.81	0.00	0.00	107.88	806.32	0.00	0.00	5.84	0%	0.00	0.00	0.00	0.00	0.00	0.00	

Descripción	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unifaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area a Pintar Totalmente	Area a Ignorar	No Tuerzas A Utilizar	Peso Total Tuerzas	Precio Total Tuerzas	HH Total Tuerzas
<b>Partidos 34 al 41</b>	Unidad	<b>8.00</b>					<b>18,371.88</b>	<b>17,314.02</b>	<b>384.22</b>	<b>1,222.28</b>	<b>1.00</b>	<b>0.41%</b>	<b>34.29</b>	<b>329.84</b>	<b>2,884.00</b>	<b>61.68</b>	<b>117.02</b>	<b>103.78</b>
W 8 x 18	m	44.00	26.82	26.89	0.95	2.24	1,180.08	1,183.04	41.80	86.34	1.00	17%	6.97	34.83	370.00	7.40	16.89	14.60
W 8 x 24	m	44.00	35.76	35.85	0.95	2.56	1,573.44	1,577.38	41.80	112.39	1.00	17%	6.97	34.83	370.00	7.40	16.89	14.60
W 10 x 49	m	108.80	73.01	73.19	1.52	5.22	7,943.49	7,963.40	165.38	667.39	1.00	0%	0.00	165.38	1,308.00	26.18	59.01	52.32
W 8 x 31	m	44.00	46.19	46.31	1.22	3.30	2,032.36	2,037.45	63.98	145.17	1.00	17%	8.96	44.73	444.00	8.88	20.00	17.88
W 8 x 15	m	16.80	22.38	22.44	0.91	1.87	375.25	370.65	14.92	30.99	1.00	50%	0.46	7.46	102.00	2.94	6.49	4.98
Plancha 10	m2	2.56	87.50	85.88	2.00	6.83	224.00	219.34	5.12	14.93	0.98	0%	0.49	4.83	0.00	0.00	0.00	0.00
Plancha 12.7	m2	4.64	97.87	110.41	2.00	6.52	454.12	512.32	9.28	30.27	1.13	0%	0.88	8.40	0.00	0.00	0.00	0.00
Plancha 26	m2	8.80	199.39	223.48	2.00	11.73	1,764.63	1,968.64	17.60	103.21	1.12	0%	1.67	15.93	0.00	0.00	0.00	0.00
Cartelas	kg	485.87	1.00	0.40	0.02	0.17	485.87	196.13	9.51	77.56	0.40	0%	0.90	8.61	0.00	0.00	0.00	0.00
Pernos de Anclaje 1"	Unidad	84.00	3.97	9.52	0.08	0.68	334.08	809.20	5.12	42.65	2.40	0%	0.00	5.12	0.00	0.00	0.00	0.00
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	192.00	0.64	3.81	0.00	0.00	122.88	892.83	0.00	0.00	6.84	0%	0.00	0.00	0.00	0.00	0.00	0.00

Descripción	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unifaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area a Pintar Totalmente	Area a Ignorar	No Tuerzas A Utilizar	Peso Total Tuerzas	Precio Total Tuerzas	HH Total Tuerzas
<b>Partidos 42 al 48</b>	Unidad	<b>8.00</b>					<b>18,983.54</b>	<b>17,297.85</b>	<b>383.49</b>	<b>1,220.71</b>	<b>1.00</b>	<b>0.33%</b>	<b>33.92</b>	<b>329.58</b>	<b>2,614.00</b>	<b>66.28</b>	<b>113.41</b>	<b>100.68</b>
W 8 x 18	m	44.00	26.82	26.89	0.95	2.24	1,180.08	1,183.04	41.80	86.34	1.00	17%	6.97	34.83	370.00	7.40	16.89	14.60
W 8 x 24	m	44.00	35.76	35.85	0.95	2.55	1,573.44	1,577.38	41.80	112.39	1.00	17%	6.97	34.83	370.00	7.40	16.89	14.60
W 10 x 49	m	108.80	73.01	73.19	1.52	5.22	7,943.49	7,963.40	165.38	667.39	1.00	0%	0.00	165.38	1,308.00	26.18	59.01	52.32
W 8 x 31	m	44.00	46.19	46.31	1.22	3.30	2,032.36	2,037.45	63.98	145.17	1.00	17%	8.96	44.73	370.00	7.40	16.89	14.60
W 8 x 15	m	16.80	22.38	22.44	0.91	1.87	375.25	370.65	14.92	30.99	1.00	50%	0.46	7.46	102.00	2.94	6.49	4.98
Plancha 10	m2	2.56	87.50	85.88	2.00	6.83	224.00	219.34	5.12	14.93	0.98	0%	0.49	4.83	0.00	0.00	0.00	0.00
Plancha 12.7	m2	4.84	97.87	110.41	2.00	6.52	454.12	512.32	9.28	30.27	1.13	0%	0.88	8.40	0.00	0.00	0.00	0.00
Plancha 26	m2	8.80	199.39	223.48	2.00	11.73	1,764.63	1,968.64	17.60	103.21	1.12	0%	1.67	15.93	0.00	0.00	0.00	0.00
Cartelas	kg	485.87	1.00	0.40	0.02	0.17	485.87	196.13	9.51	77.56	0.40	0%	0.90	8.61	0.00	0.00	0.00	0.00
Pernos de Anclaje 1"	Unidad	84.00	3.97	9.52	0.08	0.68	334.08	809.20	5.12	42.65	2.40	0%	0.00	5.12	0.00	0.00	0.00	0.00
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	192.00	0.64	3.81	0.00	0.00	122.88	892.83	0.00	0.00	6.84	0%	0.00	0.00	0.00	0.00	0.00	0.00

Descripción	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unifaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area a Pintar Totalmente	Area a Ignorar	No Tuerzas A Utilizar	Peso Total Tuerzas	Precio Total Tuerzas	HH Total Tuerzas
<b>Partidos 49 al 56</b>	Unidad	<b>7.00</b>					<b>14,393.21</b>	<b>18,116.73</b>	<b>317.40</b>	<b>1,086.74</b>	<b>1.00</b>	<b>0.25%</b>	<b>29.38</b>	<b>288.04</b>	<b>2,188.00</b>	<b>43.98</b>	<b>85.20</b>	<b>87.38</b>
W 8 x 18	m	38.50	26.82	26.89	0.95	2.24	1,032.57	1,035.16	35.58	85.05	1.00	17%	8.10	30.48	325.00	6.50	14.68	13.00
W 8 x 24	m	38.50	35.76	35.85	0.95	2.55	1,376.78	1,380.21	36.58	96.34	1.00	17%	8.10	30.48	325.00	6.50	14.68	13.00
W 10 x 49	m	95.20	73.01	73.19	1.52	5.22	6,950.55	6,967.97	144.70	496.47	1.00	0%	0.00	144.70	1,146.00	22.92	51.70	45.84
W 8 x 31	m	38.50	46.19	46.31	1.22	3.30	1,778.32	1,782.77	46.97	127.02	1.00	17%	7.83	39.14	325.00	6.50	14.68	13.00
W 8 x 15	m	12.95	22.38	22.44	0.91	1.87	289.82	290.55	11.79	24.15	1.00	50%	0.69	5.89	76.00	1.96	3.57	3.12
Plancha 10	m2	2.24	87.50	85.88	2.00	6.83	198.00	191.92	4.48	13.07	0.98	0%	0.43	4.05	0.00	0.00	0.00	0.00
Plancha 12.7	m2	4.06	97.87	110.41	2.00	6.52	397.35	448.28	8.12	26.49	1.13	0%	0.77	7.35	0.00	0.00	0.00	0.00
Plancha 26	m2	7.70	199.39	223.48	2.00	11.73	1,535.30	1,720.81	15.40	90.31	1.12	0%	1.46	13.94	0.00	0.00	0.00	0.00
Cartelas	kg	406.70	1.00	0.40	0.02	0.17	406.70	162.68	8.31	67.78	0.40	0%	0.79	7.52	0.00	0.00	0.00	0.00
Pernos de Anclaje 1"	Unidad	56.00	3.97	9.52	0.08	0.68	222.32	533.05	4.48	37.05	2.40	0%	0.00	4.48	0.00	0.00	0.00	0.00
Pernos A325 Galv 7/8" x 4 1/2"	Unidad	168.00	0.84	3.81	0.00	0.00	107.52	806.32	0.00	0.00	5.84	0%	0.00	0.00	0.00	0.00	0.00	0.00

Descripción	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unifaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area a Pintar Totalmente	Area a Ignorar	No Tuerzas A Utilizar	Peso Total Tuerzas	Precio Total Tuerzas	HH Total Tuerzas
<b>Puntales y Arriostres Librados</b>	Ob	<b>1.00</b>					<b>69,048.25</b>	<b>82,302.03</b>	<b>1,816.28</b>	<b>4,812.59</b>	<b>0.99</b>	<b>37.92%</b>	<b>606.78</b>	<b>1,308.50</b>	<b>13,085.00</b>	<b>281.70</b>	<b>880.30</b>	<b>623.40</b>
W 8 x 18	m	611.60	26.82	26.89	0.95	2.24	16,403.11	16,444.22	661.02	1,366.93	1.00	17%	99.84	484.18	5,100.00	102.00	230.08	204.00
W 8 x 24	m	928.00	35.76	35.85	0.95	2.55	33,185.28	33,288.45	891.60	2,370.36	1.00	17%	148.93	734.87	7,735.00	154.70	348.95	309.40
W 8 x 38	m	32.00	41.72	41.82	1.07	2.93	1,351.80	1,354.74	32.10	89.40	1.00	17%	5.35	28.78	250.00	5.08	11.91	10.08
L 4 x 3/8"	m	518.40	14.61	11.03														

Tabla No 6:

Descripción	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura a Total	Area a Pintar Totalmente	Area a Ignifugar	No Tuercas a Utilizar	Peso Total Tuercas	Precio Total Tuercas	HH Total Tuercas
<b>Portico 38 al 42</b>	Unidad	7					<b>20,822.00</b>	<b>21,072.94</b>	<b>473.45</b>	<b>1,549.09</b>	<b>1.02</b>	<b>83.88%</b>	<b>265.48</b>	<b>217.99</b>	<b>1,537.00</b>	<b>30.74</b>	<b>69.34</b>	<b>61.48</b>
W 10 x 49	m	147.88	73.01	73.19	1.52	6.22	10,804.02	10,831.10	224.93	771.72	1.00	32%	71.75	153.18	1,212.00	24.24	54.68	48.48
W 8 x 18	m	77.00	28.82	28.89	0.95	2.24	2,065.14	2,070.32	73.16	172.10	1.00	100%	73.16	0.00	0.00	0.00	0.00	0.00
W 8 x 28	m	38.50	41.72	41.82	1.07	2.98	1,608.22	1,610.25	41.20	114.73	1.00	100%	41.20	0.00	0.00	0.00	0.00	0.00
W 8 x 35	m	38.50	52.15	52.28	1.23	3.73	2,007.78	2,012.81	47.36	143.41	1.00	17%	7.69	39.48	325.00	8.50	14.68	13.00
Plancha 10	m	2.10	87.50	85.98	2.00	5.83	183.75	179.93	4.20	12.25	0.98	52%	2.20	2.00	0.00	0.00	0.00	0.00
Plancha 12.7	m2	5.04	97.87	110.41	2.00	6.52	493.26	556.49	10.08	32.88	1.13	52%	5.27	4.81	0.00	0.00	0.00	0.00
Plancha 26	m2	6.66	199.39	223.49	2.00	11.73	1,730.71	1,939.83	17.38	101.81	1.12	52%	8.08	6.28	0.00	0.00	0.00	0.00
C 4 x 5.4	m	96.60	8.05	8.02	0.40	0.87	777.83	581.05	38.64	84.80	0.75	100%	38.64	0.00	0.00	0.00	0.00	0.00
Carbales	kg	590.08	1.00	0.40	0.02	0.17	590.08	236.02	12.08	98.34	0.40	52%	8.31	6.75	0.00	0.00	0.00	0.00
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	224.00	0.68	2.11	0.00	0.00	125.44	471.68	0.00	0.00	3.78	0%	0.00	0.00	0.00	0.00	0.00	0.00
Pernos de Anclaje 1"	Unidad	58.00	3.97	9.52	0.08	0.88	222.32	633.05	4.48	37.05	2.40	0%	0.00	4.48	0.00	0.00	0.00	0.00
Pernos A325 Galv 3/4" x 1 1/2"	Unidad	58.00	0.28	0.90	0.00	0.00	15.88	50.53	0.00	0.00	3.22	0%	0.00	0.00	0.00	0.00	0.00	0.00

Descripción	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area a Pintar Totalmente	Area a Ignifugar	No Tuercas a Utilizar	Peso Total Tuercas	Precio Total Tuercas	HH Total Tuercas
<b>Portico 43 y 45</b>	Unidad	2 (no hay portico 44)					<b>7,521.23</b>	<b>7,568.97</b>	<b>174.82</b>	<b>981.38</b>	<b>1.01</b>	<b>56.62%</b>	<b>89.82</b>	<b>78.70</b>	<b>688.00</b>	<b>11.58</b>	<b>26.62</b>	<b>22.72</b>
W 10 x 49	m	42.28	73.01	73.19	1.52	6.22	3,086.88	3,094.80	64.27	220.49	1.00	32%	20.50	43.78	348.00	6.98	15.70	13.92
W 8 x 18	m	33.00	41.72	41.82	1.07	2.98	1,378.78	1,380.21	35.31	98.34	1.00	34%	11.83	23.40	220.00	4.40	9.92	8.80
W 8 x 28	m	0.78	87.50	85.98	2.00	5.83	68.25	66.83	1.58	4.55	0.98	57%	0.88	0.88	0.00	0.00	0.00	0.00
W 8 x 35	m	2.40	97.87	110.41	2.00	6.52	234.89	264.99	4.80	15.88	1.13	57%	2.72	2.08	0.00	0.00	0.00	0.00
Plancha 10	m	0.78	87.50	85.98	2.00	5.83	68.25	66.83	1.58	4.55	0.98	57%	0.88	0.88	0.00	0.00	0.00	0.00
Plancha 12.7	m2	2.40	97.87	110.41	2.00	6.52	234.89	264.99	4.80	15.88	1.13	57%	2.72	2.08	0.00	0.00	0.00	0.00
Plancha 26	m2	2.48	199.39	223.48	2.00	11.73	494.49	554.24	4.98	28.09	1.12	57%	2.81	2.15	0.00	0.00	0.00	0.00
C 4 x 5.4	m	27.80	8.05	8.02	0.40	0.87	222.18	166.02	11.04	18.52	0.75	100%	11.04	0.00	0.00	0.00	0.00	0.00
W 8 x 31	m	22.00	48.19	48.31	1.22	3.30	1,016.18	1,018.73	26.84	72.58	1.00	100%	26.84	0.00	0.00	0.00	0.00	0.00
Plancha 19	m2	0.40	149.54	168.75	2.00	6.80	59.82	78.50	0.80	3.52	1.33	57%	0.45	0.35	0.00	0.00	0.00	0.00
L 4 x 3/8"	kg	42.80	14.81	11.03	0.45	1.22	625.31	471.98	19.28	52.11	0.75	100%	19.28	0.00	0.00	0.00	0.00	0.00
Carbales	kg	215.54	1.00	0.40	0.02	0.17	215.54	86.22	4.40	35.92	0.40	57%	2.49	1.91	0.00	0.00	0.00	0.00
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	80.00	0.58	2.11	0.00	0.00	44.80	168.42	0.00	0.00	3.78	0%	0.00	0.00	0.00	0.00	0.00	0.00
Pernos de Anclaje 1"	Unidad	18.00	3.97	9.52	0.08	0.88	63.52	152.30	1.28	10.66	2.40	0%	0.00	1.28	0.00	0.00	0.00	0.00
Pernos A325 Galv 3/4" x 1 1/2"	Unidad	18.00	0.28	0.90	0.00	0.00	4.48	14.44	0.00	0.00	3.22	0%	0.00	0.00	0.00	0.00	0.00	0.00
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	24.00	0.34	2.10	0.00	0.00	8.16	60.40	0.00	0.00	6.18	0%	0.00	0.00	0.00	0.00	0.00	0.00

Descripción	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area a Pintar Totalmente	Area a Ignifugar	No Tuercas a Utilizar	Peso Total Tuercas	Precio Total Tuercas	HH Total Tuercas
<b>Portico 46 al 58</b>	Unidad	12					<b>58,382.00</b>	<b>58,125.04</b>	<b>811.62</b>	<b>2,858.59</b>	<b>1.02</b>	<b>64.14%</b>	<b>458.40</b>	<b>372.23</b>	<b>2,826.00</b>	<b>62.52</b>	<b>118.47</b>	<b>105.04</b>
W 10 x 49	m	253.88	73.01	73.19	1.52	6.22	18,621.18	18,587.80	385.69	1,322.94	1.00	32%	123.00	282.59	2,076.00	41.52	92.85	83.04
W 8 x 18	m	132.00	41.72	41.82	1.07	2.98	5,496.24	5,548.11	125.40	296.02	1.00	100%	125.40	0.00	0.00	0.00	0.00	0.00
W 8 x 28	m	68.00	41.72	41.82	1.07	2.98	2,753.52	2,780.42	70.82	198.88	1.00	100%	70.82	0.00	0.00	0.00	0.00	0.00
W 8 x 35	m	68.00	52.15	52.28	1.23	3.73	3,441.80	3,450.53	81.18	245.85	1.00	17%	13.53	67.65	650.00	11.00	24.81	22.00
Plancha 10	m	3.80	87.50	85.98	2.00	5.83	315.00	308.45	7.20	21.00	0.98	54%	3.80	3.30	0.00	0.00	0.00	
Plancha 12.7	m2	8.84	97.87	110.41	2.00	6.52	845.80	953.98	17.28	68.37	1.13	54%	8.37	7.91	0.00	0.00	0.00	
Plancha 26	m2	14.88	199.39	223.48	2.00	11.73	2,999.02	3,325.42	28.78	174.52	1.12	54%	16.13	13.83	0.00	0.00	0.00	
C 4 x 5.4	m	185.80	8.05	8.02	0.40	0.87	1,333.08	996.09	68.24	111.09	0.75	100%	68.24	0.00	0.00	0.00	0.00	
Carbales	kg	1,011.52	1.00	0.40	0.02	0.17	1,011.52	404.81	20.87	168.58	0.40	54%	11.20	9.47	0.00	0.00	0.00	
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	384.00	0.58	2.11	0.00	0.00	215.04	608.42	0.00	0.00	3.78	0%	0.00	0.00	0.00	0.00	0.00	
Pernos de Anclaje 1"	Unidad	98.00	3.97	9.52	0.08	0.88	381.12	913.80	7.88	63.52	2.40	0%	0.00	7.88	0.00	0.00	0.00	
Pernos A325 Galv 3/4" x 1 1/2"	Unidad	98.00	0.28	0.90	0.00	0.00	26.88	88.82	0.00	0.00	3.22	0%	0.00	0.00	0.00	0.00	0.00	

Descripción	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area a Pintar Totalmente	Area a Ignifugar	No Tuercas a Utilizar	Peso Total Tuercas	Precio Total Tuercas	HH Total Tuercas
<b>Portico 67 al 69</b>	Unidad	10					<b>28,250.78</b>	<b>28,158.25</b>	<b>853.27</b>	<b>1,878.23</b>	<b>1.04</b>	<b>46.12%</b>	<b>221.87</b>	<b>331.30</b>	<b>2,248.00</b>	<b>44.98</b>	<b>101.41</b>	<b>85.82</b>
W 10 x 49	m	191.20	73.01	73.19	1.52	6.22	13,958.51	13,994.50	290.82	997.11	1.00	32%	92.71	197.01	1,584.00	31.32	70.65	62.84
W 8 x 18	m	55.00	41.72	41.82	1.07	2.98	2,278.60	2,294.80	56.85	163.90	1.00	100%	56.85	0.00	0.00	0.00	0.00	0.00
W 8 x 28	m	55.00	41.72	41.82	1.07	2.98	2,278.60	2,294.80	56.85	163.90	1.00	33%	19.82	39.23	222.00	4.44	10.02	8.88
W 8 x 35	m	55.00	52.15	52.28	1.23	3.73	2,886.26	2,875.44	67.65	204.88	1.00	17%	11.28	56.38	480.00	9.20	20.75	18.40
Plancha 10	m	2.10	87.50	85.98	2.00	5.83	183.75	179.93	4.20	12.25	0.98	40%	1.88	2.52	0.00	0.00	0.00	
Plancha 12.7	m2	6.30	97.87	110.41	2.00	6.52	616.58	695.61	12.60	41.11	1.13	40%	5.04	7.58	0.00	0.00	0.00	
Plancha 26	m2	10.40	199.39	223.48	2.00	11.73	2,073.98	2,324.22	20.80	121.88	1.12	40%	6.32	12.48	0.00	0.00	0.00	
C 4 x 5.4	m	83.00	8.05	8.02	0.40	0.87	667.15	378.95	25.20	42.29	0.75	100%	25.20	0.00	0.00	0.00	0.00	
Carbales	kg	719.38	1.00	0.40	0.02	0.17	719.38	287.74	14.70	119.89	0.40	40%	5.88	8.82	0.00	0.00	0.00	
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	400.00	0.58	2.11	0.00	0.00	224.00	642.11	0.00	0.00	3.78	0%	0.00	0.00	0.00	0.00	0.00	
Pernos de Anclaje 1"	Unidad	80.00	3.97	9.52	0.08	0.88	317.80	781.50	6.40	52.83								

Descripcion	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit
<b>Partic 67 al 68</b>						
Unidad 2						
W 10 x 49	m	38.24	73.01	73.19	1.62	5.22
W 8 x 28	m	33.00	41.72	41.82	1.07	2.98
Plancha 10	m	0.80	87.60	86.88	2.00	5.83
Plancha 12.7	m2	1.29	97.87	110.41	2.00	6.52
Plancha 28	m2	2.08	189.38	223.48	2.00	11.73
C 4 x 5.4	m	12.80	8.05	6.02	0.40	0.87
W 8 x 31	m	11.00	46.19	46.31	1.22	3.30
Plancha 19	m2	0.40	149.54	198.76	2.00	6.80
L 4 x 3/8"	m	42.80	14.61	11.03	0.46	1.22
Carbolos	kg	181.82	1.00	0.40	0.02	0.17
Pernos A326 Galv 7/8" x 3 1/2"	Unidad	98.00	0.68	2.11	0.00	0.00
Pernos de Anclaje 1"	Unidad	18.00	3.97	9.62	0.08	0.66
Pernos A326 Galv 3/4" x 1 1/2"	Unidad	8.00	0.28	0.90	0.00	0.00

Peso Total	Precio Total	Area Total	HH Total	US \$ / kg
6,354.89	8,405.39	144.83	475.11	1.01
2,791.90	2,798.80	58.12	199.42	1.00
1,376.76	1,380.21	35.31	98.34	1.00
62.50	61.41	1.20	3.60	0.99
123.32	139.12	2.52	8.22	1.13
414.73	484.84	4.16	24.40	1.12
101.43	75.79	5.04	8.45	0.75
608.09	609.38	13.42	38.29	1.00
69.82	79.60	0.60	3.52	1.33
825.31	471.88	18.28	62.11	0.75
181.82	72.85	3.71	30.27	0.40
63.78	202.11	0.00	0.00	3.78
83.52	162.30	1.28	10.59	2.40
2.24	7.22	0.00	0.00	3.22

%Pintura Total	Area a Pintar Totalmente	Area a Ignifugar	No Tuercas A Utilizar	Peso Total Tuercas	Precio Total Tuercas	HH Total Tuercas
58.02%	79.89	65.14	488.00	9.78	22.02	18.62
32%	18.54	39.58	318.00	6.38	14.35	12.72
50%	17.88	17.88	170.00	3.40	7.87	6.80
47%	0.50	0.64	0.00	0.00	0.00	0.00
47%	1.17	1.35	0.00	0.00	0.00	0.00
47%	1.94	2.22	0.00	0.00	0.00	0.00
100%	6.04	0.00	0.00	0.00	0.00	0.00
100%	13.42	0.00	0.00	0.00	0.00	0.00
47%	0.37	0.43	0.00	0.00	0.00	0.00
100%	18.28	0.00	0.00	0.00	0.00	0.00
47%	1.73	1.98	0.00	0.00	0.00	0.00
0%	0.00	0.00	0.00	0.00	0.00	0.00
0%	0.00	1.28	0.00	0.00	0.00	0.00
0%	0.00	0.00	0.00	0.00	0.00	0.00

Descripcion	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit
<b>Puercas</b>						
Glb 1						
W 8 x 18	m	539.00	26.82	26.89	0.96	2.24
W 8 x 24	m	330.00	35.76	35.86	0.96	2.55
Plancha 10	m	11.62	87.60	86.88	2.00	5.83
L 2 1/2 x 1/4"	m	220.00	5.95	5.91	0.28	0.99
Carbolos	kg	867.21	1.00	0.40	0.02	0.17
Pernos A326 Galv 3/4" x 2 1/2"	Unidad	1,638.00	0.34	2.10	0.00	0.00

Peso Total	Precio Total	Area Total	HH Total	US \$ / kg
29,893.23	32,177.85	827.71	2,478.81	1.07
14,456.98	14,492.21	612.05	1,204.87	1.00
11,800.80	11,830.36	313.50	842.91	1.00
1,008.00	987.04	23.04	67.20	0.98
1,309.00	1,299.83	81.80	218.17	0.99
867.21	342.89	17.52	142.87	0.40
622.24	3,226.80	0.00	0.00	6.18

%Pintura Total	Area a Pintar Totalmente	Area a Ignifugar	No Tuercas A Utilizar	Peso Total Tuercas	Precio Total Tuercas	HH Total Tuercas
70.25%	652.12	278.58	2,760.00	55.00	124.06	110.00
100%	612.05	0.00	0.00	0.00	0.00	0.00
17%	62.25	281.25	2,760.00	55.00	124.06	110.00
65%	14.80	6.14	0.00	0.00	0.00	0.00
100%	81.80	0.00	0.00	0.00	0.00	0.00
65%	11.33	6.19	0.00	0.00	0.00	0.00
0%	0.00	0.00	0.00	0.00	0.00	0.00

Descripcion	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit
<b>Arriostree Laterales</b>						
Glb 1						
Plancha 10	m	5.94	87.50	85.88	2.00	5.83
Plancha 12.7	m2	3.00	97.87	110.41	2.00	6.52
L 4 x 3/8"	m	477.80	14.61	11.03	0.46	1.22
Carbolos	kg	233.73	1.00	0.40	0.02	0.17
Pernos A326 Galv 3/4" x 2"	Unidad	232.00	0.31	1.75	0.00	0.00
Pernos A326 Galv 3/4" x 1 1/2"	Unidad	190.00	0.28	0.90	0.00	0.00

Peso Total	Precio Total	Area Total	HH Total	US \$ / kg
8,141.55	8,750.81	237.56	874.88	0.83
519.75	509.94	11.88	34.65	0.98
293.81	331.24	6.00	18.57	1.13
9,977.74	5,288.77	214.92	661.48	0.75
233.73	93.49	4.78	38.99	0.40
71.92	408.00	0.00	0.00	5.85
44.80	144.36	0.00	0.00	3.22

%Pintura Total	Area a Pintar Totalmente	Area a Ignifugar	No Tuercas A Utilizar	Peso Total Tuercas	Precio Total Tuercas	HH Total Tuercas
100.00%	237.56	0.00	0.00	0.00	0.00	0.00
100%	11.88	0.00	0.00	0.00	0.00	0.00
100%	6.00	0.00	0.00	0.00	0.00	0.00
100%	214.92	0.00	0.00	0.00	0.00	0.00
100%	4.78	0.00	0.00	0.00	0.00	0.00
100%	0.00	0.00	0.00	0.00	0.00	0.00
100%	0.00	0.00	0.00	0.00	0.00	0.00

Descripcion	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit
<b>Travesaños</b>						
Glb 1						
W 8 x 18	m	560.00	26.82	26.89	0.96	2.24
C 4 x 5.4	m	560.00	8.05	6.02	0.40	0.87
L 4 x 3/8"	m	62.00	14.61	11.03	0.46	1.22
Carbolos	kg	698.15	1.00	0.40	0.02	0.17
Pernos A326 Galv 3/4" x 2 1/2"	Unidad	804.00	0.34	2.10	0.00	0.00

Peso Total	Precio Total	Area Total	HH Total	US \$ / kg
20,809.73	20,887.33	778.12	1,761.21	0.99
14,751.00	14,787.97	522.50	1,229.26	1.00
4,427.50	3,308.27	220.00	388.98	0.75
769.72	673.43	23.40	83.31	0.75
698.15	239.28	12.22	99.69	0.40
273.38	1,888.40	0.00	0.00	6.18

%Pintura Total	Area a Pintar Totalmente	Area a Ignifugar	No Tuercas A Utilizar	Peso Total Tuercas	Precio Total Tuercas	HH Total Tuercas
100.00%	778.12	0.00	0.00	0.00	0.00	0.00
100%	522.50	0.00	0.00	0.00	0.00	0.00
100%	220.00	0.00	0.00	0.00	0.00	0.00
100%	23.40	0.00	0.00	0.00	0.00	0.00
100%	12.22	0.00	0.00	0.00	0.00	0.00
100%	0.00	0.00	0.00	0.00	0.00	0.00

Descripcion	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit
<b>Union entre Porticos 43 y 48</b>						
Glb 1						
L 4 x 5/16"	m	132.00	12.23	10.53	0.46	1.02
L 3 1/2 x 1/4"	m	44.00	8.84	7.54	0.45	0.82
L 2 x 1/4"	m	208.00	4.83	4.55	0.22	0.77
L 2 1/2 x 1/4"	m	124.20	5.95	5.91	0.28	0.99
C 4 x 5.4	m	89.00	8.05	6.02	0.40	0.87
Plancha 10	m	11.85	87.50	85.88	2.00	5.83
W 8 x 18	m2	55.00	26.82	26.89	0.96	2.24
L 4 x 3/8"	m2	6.78	14.61	11.03	0.46	1.22
W 8 x 20	m	44.00	41.72	41.82	1.07	2.98
Carbolos	kg	282.59	1.00	0.40	0.02	0.17
Pernos A326 Galv 3/4" x 2"	Unidad	336.00	0.31	1.75	0.00	0.00
Pernos A326 Galv 3/4" x 1 1/2"	Unidad	208.00	0.34	2.10	0.00	0.00

Peso Total	Precio Total	Area Total	HH Total	US \$ / kg
8,180.84	9,386.84	318.86	878.04	1.02
1,814.38	1,389.47	59.40	134.53	0.88
432.98	331.81	19.80	38.08	0.77
984.89	948.22	46.85	180.82	0.98
738.99	733.82	34.78	123.17	0.99
555.45	415.04	27.80	48.28	0.75
1,038.88	1,015.32	23.79	89.13	0.98
1,475.10	1,478.80	62.25	122.93	1.00
98.78	74.55	3.04	8.23	0.75
1,835.88	1,840.28	47.08	131.12	1.00
282.59	105.04	5.37	43.77	0.40
104.16	588.00	0.00	0.00	5.85
70.72	436.80	0.00	0.00	6.18

%Pintura Total	Area a Pintar Totalmente	Area a Ignifugar	No Tuercas A Utilizar	Peso Total Tuercas	Precio Total Tuercas	HH Total Tuercas
88.21%	274.91	43.88	370.00	7.40	18.69	14.89
100%	59.40	0.00	0.00	0.00	0.00	0.00
100%	19.80	0.00	0.00	0.00	0.00	0.00
100%	46.85	0.00	0.00	0.00	0.00	0.00
100%	34.78	0.00	0.00	0.00	0.00	0.00
100%	27.80	0.00	0.00	0.00	0.00	0.00
84%	19.85	3.85	0.00	0.00	0.00	0.00
100%	62.25	0.00	0.00	0.00	0.00	0.00
100%	3.04	0.00	0.00	0.00	0.00	0.00
17%	7.85	39.23	370.00	7.40	18.69	14.89
84%	4.49	0.87	0.00	0.00	0.00	0.00
100%	0.00	0.00	0.00	0.00	0.00	0.00
100%	0.00	0.00	0.00	0.00	0.00	0.00

Descripcion	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit
<b>Union entre Porticos 67 y 68</b>						
Glb 1						
L 4 x 5/16"	m	132.00	12.23	10.53	0.46	1.02
L 2 x 1/4"	m					

Tabla No 7:

Descripción	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaire	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area e Piliar Totalmente	Area e Ignigraje	No Tuerca A Utilizar	Peso Total Tuerca	HH Total Tuerca	
Pancho 6"	Unidad	1																
W 10 x 49	m	10,68	73,01	773,19	1,52	6,22	3.239,83	3.231,22	23,55	297,00	3.269,97	47,05%	2.822,96	38,87	284,00	6,49	72,31	
W 8 x 16	m	6,90	26,92	208,89	0,95	2,24	1.271,81	1.270,80	25,35	86,99	1.358,79	15%	3,90	21,98	174,00	3,48	7,95	
W 8 x 24	m	6,90	35,78	285,51	1,22	2,55	147,81	147,80	6,23	12,79	160,59	100%	14,96	0,00	0,00	0,00	0,00	
W 8 x 31	m	6,90	46,19	46,31	1,72	3,30	264,95	264,89	19,17	6,23	14,05	100%	5,23	0,00	0,00	0,00	0,00	
W 8 x 38	m	6,90	41,72	41,82	1,07	2,06	284,65	284,48	6,71	15,15	1,00	100%	0,00	9,31	66,00	1,16	2,48	
W 8 x 45	m	7,10	8,05	8,02	0,40	0,81	229,40	229,04	6,60	10,30	1,00	100%	0,00	6,99	55,00	1,10	2,48	
W 8 x 15	m	1,90	22,36	22,44	0,91	1,87	57,18	57,18	2,84	4,78	0,75	100%	2,84	0,00	0,00	0,00	0,00	
Pancho 10	m	0,63	87,90	65,68	2,00	5,63	36,81	36,90	1,69	2,09	1,00	100%	1,49	0,00	0,00	0,00	0,00	
Pancho 12,7	m	1,33	97,97	110,41	2,00	6,52	46,39	46,41	1,09	2,09	1,00	47%	0,50	0,50	0,00	0,00	0,00	
Pancho 26	m2	1,24	199,39	223,48	2,00	11,73	130,17	140,86	2,89	8,05	1,13	47%	1,25	1,41	0,00	0,00	0,00	
L x 1 1/2"	m	27,60	19,09	14,04	0,45	1,59	247,24	277,12	2,48	14,54	1,12	17%	19,42	43,91	0,00	0,00	0,00	
Cantiles	kg	62,67	1,00	0,40	0,02	0,17	626,85	367,37	12,42	43,91	0,74	100%	19,42	0,00	0,00	0,00	0,00	
Pancho AS26 Galv 3/8" x 2"	Unidad	20,00	0,31	1,75	0,00	0,00	6,20	34,90	0,00	0,00	6,85	0%	0,00	0,00	0,00	0,00	0,00	
Pancho de Arriete 1"	Unidad	8,00	3,97	8,52	0,08	0,89	31,78	78,15	0,84	5,28	2,40	0%	0,00	0,00	0,00	0,00	0,00	
Pancho AS26 Galv 7/8" x 3 1/2"	Unidad	8,00	0,25	1,22	0,00	0,00	2,00	8,75	0,00	0,00	4,88	0%	0,00	0,00	0,00	0,00	0,00	
Pancho AS26 Galv 7/8" x 3 1/2"	Unidad	32,00	0,96	2,11	0,00	0,00	17,82	87,37	0,00	0,00	3,79	0%	0,00	0,00	0,00	0,00	0,00	

Descripción	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaire	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area e Piliar Totalmente	Area e Ignigraje	No Tuerca A Utilizar	Peso Total Tuerca	HH Total Tuerca	
Pancho 6"	Unidad	1																
W 10 x 49	m	18,68	73,01	73,19	1,52	6,22	3.243,82	3.209,32	23,55	297,00	3.540,32	69,44%	37,39	39,70	274,00	8,49	12,31	
W 8 x 16	m	10,68	26,92	26,80	0,95	2,24	1.271,81	1.270,80	25,35	86,99	1.358,79	15%	3,90	21,98	174,00	3,48	7,95	
W 8 x 24	m	6,90	35,78	36,85	1,22	2,55	147,81	147,86	6,23	12,79	1,00	100%	5,23	0,00	0,00	0,00	0,00	
W 8 x 31	m	6,90	46,19	46,31	1,72	3,30	199,86	197,17	6,23	14,05	1,00	100%	5,23	0,00	0,00	0,00	0,00	
W 8 x 38	m	6,90	41,72	41,82	1,07	2,06	264,95	264,89	6,71	15,15	1,00	100%	0,00	6,59	60,00	1,00	2,29	
W 8 x 45	m	7,10	8,05	8,02	0,40	0,81	279,48	279,04	6,69	16,39	1,00	100%	0,00	2,84	0,00	0,00	0,00	
W 8 x 15	m	1,82	22,36	22,44	0,91	1,87	40,79	40,83	1,99	3,39	1,00	100%	1,99	0,00	0,00	0,00	0,00	
Pancho 10	m	0,63	87,90	65,68	2,00	5,63	46,39	46,41	1,09	3,08	0,98	59%	0,53	0,00	0,00	0,00	0,00	
Pancho 12,7	m	1,33	97,97	110,41	2,00	6,52	104,11	116,26	1,34	8,94	1,19	59%	1,34	1,32	0,00	0,00	0,00	
Pancho 26	m2	1,24	199,39	223,48	2,00	11,73	247,34	277,12	2,48	14,54	1,13	17%	19,42	1,22	0,00	0,00	0,00	
L x 1 1/2"	m	27,60	19,09	14,04	0,45	1,59	327,34	367,37	12,42	43,91	0,74	100%	19,42	0,00	0,00	0,00	0,00	
Cantiles	kg	62,67	1,00	0,40	0,02	0,17	626,85	367,37	12,42	43,91	0,74	100%	19,42	0,00	0,00	0,00	0,00	
Pancho AS26 Galv 3/8" x 2"	Unidad	18,00	0,31	1,75	0,00	0,00	5,58	28,60	0,00	0,00	6,85	0%	0,00	0,00	0,00	0,00	0,00	
Pancho de Arriete 1"	Unidad	8,00	3,97	8,52	0,08	0,89	31,78	78,15	0,84	5,29	2,40	0%	0,00	0,00	0,00	0,00	0,00	
Pancho AS26 Galv 7/8" x 3 1/2"	Unidad	8,00	0,25	1,22	0,00	0,00	2,00	8,75	0,00	0,00	4,88	0%	0,00	0,00	0,00	0,00	0,00	
Pancho AS26 Galv 7/8" x 3 1/2"	Unidad	32,00	0,96	2,11	0,00	0,00	17,82	87,37	0,00	0,00	3,79	0%	0,00	0,00	0,00	0,00	0,00	

Descripción	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaire	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area e Piliar Totalmente	Area e Ignigraje	No Tuerca A Utilizar	Peso Total Tuerca	HH Total Tuerca	
Pancho 6"	Unidad	11																
W 10 x 49	m	183,48	73,01	73,19	1,52	6,22	37.038,35	33.263,20	235,55	2.970,00	37.008,20	31,18%	2.376,30	406,97	2.403,00	103,64	1.968,00	
W 8 x 16	m	119,48	26,92	26,80	0,95	2,24	13.306,97	13.979,40	279,99	658,95	14.065,86	100%	41,93	237,96	1.872,00	37,44	2.843,00	
W 8 x 24	m	80,68	35,78	36,85	1,22	2,55	2.193,81	1.828,98	97,49	134,32	1.00	100%	97,49	0,00	0,00	0,00	0,00	
W 8 x 31	m	243,98	46,19	46,31	1,72	3,30	21.299,44	11.297,89	207,69	654,99	1.00	100%	60,86	249,99	2.025,00	46,50	81,36	
W 8 x 38	m	60,50	41,72	41,82	1,07	2,06	2.624,00	2.630,39	94,74	190,29	1,00	100%	10,79	53,95	605,00	10,10	27,78	
C x 1 x 1,4	m	78,10	8,05	8,02	0,40	0,81	629,71	489,77	31,24	52,39	0,76	100%	31,24	3,10	0,00	0,00	0,00	
Pancho 10	m	2,49	87,90	65,68	2,00	5,63	211,75	207,35	4,84	14,12	0,80	38%	1,74	3,10	0,00	0,00	0,00	
Pancho 12,7	m	5,91	97,97	110,41	2,00	6,52	472,02	663,79	17,82	58,13	1,13	38%	6,42	11,40	0,00	0,00	0,00	
Pancho 26	m2	13,94	199,39	223,48	2,00	11,73	2.719,99	3.048,30	2,78	19,99	1,12	38%	9,82	17,45	0,00	0,00	0,00	
Pancho de Arriete 1"	Unidad	1.962,28	1,00	0,40	0,02	0,17	1.929,20	424,89	21,71	177,04	0,40	38%	7,61	13,89	0,00	0,00	0,00	
Pancho AS26 Galv 3/8" x 2"	Unidad	88,00	0,31	1,75	0,00	0,00	349,38	637,85	7,04	98,23	2,40	0%	0,00	0,00	0,00	0,00		
Pancho AS26 Galv 7/8" x 3 1/2"	Unidad	1.350,00	0,25	1,22	0,00	0,00	340,00	1.078,50	0,00	0,00	4,88	0%	0,00	0,00	0,00	0,00		
Pancho AS26 Galv 7/8" x 3 1/2"	Unidad	352,38	0,96	2,11	0,00	0,00	197,16	741,68	0,00	0,00	3,79	0%	0,00	0,00	0,00	0,00		

Descripción	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaire	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area e Piliar Totalmente	Area e Ignigraje	No Tuerca A Utilizar	Peso Total Tuerca	HH Total Tuerca	
Pancho 6"	Unidad	9																
W 10 x 49	m	63,40	73,01	73,19	1,52	6,22	18.390,12	18.887,72	142,05	1.543,64	19,04	15%	166,12	187,15	882,00	23,92	83,95	
W 8 x 16	m	21,60	26,92	26,80	0,95	2,24	6.099,93	6.194,29	129,77	434,03	1,00	100%	10,92	101,75	692,00	17,94	38,44	
W 8 x 24	m	14,76	35,78	36,85	1,22	2,55	2.737,95	2.739,46	29,13	81,46	1,00	100%	29,13	0,00	0,00	0,00	0,00	
W 8 x 31	m	58,76	46,19	46,31	1,72	3,30	21.000,90	11.297,89	56,91	150,00	1,00	100%	56,91	0,00	0,00	0,00	0,00	
W 8 x 38	m	21,60	41,72	41,82	1,07	2,06	2.727,20	1.273,41	31,95	90,73	1,00	100%	31,95	0,00	0,00	0,00	0,00	
C x 1 x 1,4	m	33,50	8,05	8,02	0,40	0,81	1.147,35	1.193,18	29,43	61,96	0,91	17%	4,99	24,02	250,00	4,60	10,38	
Pancho 10	m	8,00	22,36	22,44	0,91	1,87	179,44	173,23	14,20	23,51	0,75	100%	14,20	0,00	0,00	0,00	0,00	
Pancho 12,7	m	11,0	97,97	110,41	2,00	6,52	99,25	84,35	2,70	6,42	0,99	52%	1,41	2,00	0,00	0,00		
Pancho 26	m2	11,0	87,90	65,68	2,00	5,63	390,37	447,18	8,10	28,12	1,13	52%	4,21	3,99	0,00	0,00		
Pancho de Arriete 1"	Unidad	4,08	3,97	8,52	0,08	0,89	1.620,00	1.620,00	14,00	84,16	1,12	52%	8,81	0,00	0,00	0,00	0,00	
Pancho AS26 Galv 3/8" x 2"	m2	7,20	199,39	223,48	2,00	11,73	1.435,91	1.609,07	14,00	84,16	1							



Descripcion	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area a Pintar Totalmente	Area a Ignifugar	No Tuercas A Utilizar	Peso Total Tuercas	Precio Total Tuercas	HH Total Tuercas
<b>Porticos R - K</b>	Unidad	8					<b>24,626.16</b>	<b>25,385.83</b>	<b>645.87</b>	<b>1,828.68</b>	<b>1.04</b>	<b>82.38%</b>	<b>2,985.95</b>	<b>269.81</b>	<b>1,888.00</b>	<b>39.72</b>	<b>89.59</b>	<b>76.44</b>
W 10 x 40	m	133.44	73.01	73.19	1.62	5.22	9,742.45	9,768.87	202.63	699.89	1.00	15%	30.42	172.40	1,382.00	27.24	61.44	54.48
W 8 x 16	m	44.00	26.82	26.89	0.95	2.24	1,180.08	1,183.04	41.80	68.34	1.00	100%	41.80	0.00	0.00	0.00	0.00	0.00
W 8 x 24	m	94.00	35.78	35.85	0.95	2.65	3,381.44	3,389.89	89.30	240.10	1.00	100%	89.30	0.00	0.00	0.00	0.00	0.00
W 8 x 31	m	44.00	48.19	48.31	1.22	3.30	2,032.36	2,037.45	53.68	146.17	1.00	100%	53.68	0.00	0.00	0.00	0.00	0.00
W 8 x 28	m	44.00	41.72	41.82	1.07	2.99	1,835.68	1,840.28	47.08	131.12	1.00	100%	47.08	0.00	0.00	0.00	0.00	0.00
C 4 x 5.4	m	66.80	8.05	8.02	0.40	0.87	457.24	341.85	22.72	38.10	0.75	100%	22.72	0.00	0.00	0.00	0.00	0.00
W 6 x 16	m	11.28	22.38	22.44	0.91	1.87	252.45	253.08	10.26	21.04	1.00	100%	10.26	0.00	0.00	0.00	0.00	0.00
Plancha 10	m2	1.78	87.60	85.86	2.00	5.83	154.00	150.90	3.52	10.27	0.98	50%	1.78	1.74	0.00	0.00	0.00	0.00
Plancha 12.7	m2	8.48	97.87	110.41	2.00	6.52	824.20	1,155.48	12.98	42.28	1.13	50%	8.48	8.42	0.00	0.00	0.00	0.00
Plancha 26	m2	11.52	199.38	223.48	2.00	11.73	2,298.97	2,574.52	23.04	135.12	1.12	50%	11.52	11.42	0.00	0.00	0.00	0.00
W 6 x 51	m	17.90	78.09	78.28	0.95	6.07	1,339.22	1,342.58	16.72	89.28	1.00	100%	17.90	17.90	0.00	0.00	0.00	0.00
Cerchas	kg	698.58	1.00	0.40	0.02	0.17	698.58	279.43	14.28	118.43	0.40	50%	7.20	7.08	0.00	0.00	0.00	0.00
Pernos de Anclaje 1"	Unidad	98.00	3.97	9.52	0.08	0.98	381.12	913.80	7.88	63.52	2.40	0%	0.00	7.88	0.00	0.00	0.00	0.00
Pernos A325 Galv 3/4" x 1"	Unidad	84.00	0.25	1.22	0.00	0.00	18.00	78.03	0.00	0.00	4.88	0%	0.00	0.00	0.00	0.00	0.00	0.00
Pernos A325 Galv 7/8" x 3 1/2"	Unidad	258.00	0.58	2.11	0.00	0.00	143.38	538.95	0.00	0.00	3.78	0%	0.00	0.00	0.00	0.00	0.00	0.00

Descripcion	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area a Pintar Totalmente	Area a Ignifugar	No Tuercas A Utilizar	Peso Total Tuercas	Precio Total Tuercas	HH Total Tuercas
<b>Purtales</b>	Glb	1					<b>28,089.78</b>	<b>37,411.74</b>	<b>1,118.83</b>	<b>2,830.88</b>	<b>1.87</b>	<b>61.73%</b>	<b>688.82</b>	<b>428.11</b>	<b>4,280.00</b>	<b>85.80</b>	<b>193.53</b>	<b>171.60</b>
W 8 x 16	m	658.00	28.82	28.89	0.95	2.24	23,011.58	23,089.23	615.10	1,917.83	1.00	50%	407.55	407.55	4,280.00	85.80	193.53	171.60
W 8 x 24	m	284.00	35.78	35.85	0.95	2.65	9,440.84	9,484.30	269.80	674.33	1.00	100%	269.80	0.00	0.00	0.00	0.00	0.00
Plancha 10	m2	12.24	87.60	85.86	2.00	5.83	1,071.00	1,048.73	24.48	71.40	0.98	61%	14.93	9.55	0.00	0.00	0.00	0.00
Cerchas	kg	1,005.70	1.00	0.40	0.02	0.17	1,005.70	402.28	20.55	167.82	0.40	61%	12.54	8.02	0.00	0.00	0.00	0.00
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	1,832.00	0.34	2.10	0.00	0.00	654.68	3,427.20	0.00	0.00	6.18	100%	0.00	0.00	0.00	0.00	0.00	0.00

Descripcion	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area a Pintar Totalmente	Area a Ignifugar	No Tuercas A Utilizar	Peso Total Tuercas	Precio Total Tuercas	HH Total Tuercas
<b>Arriostres Laterales</b>	Glb	1					<b>5,193.10</b>	<b>4,239.43</b>	<b>134.03</b>	<b>438.18</b>	<b>0.83</b>	<b>100.00%</b>	<b>134.03</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
L 3 x 1/4"	m	14.00	7.25	6.87	0.34	1.21	101.80	96.23	4.78	16.92	0.95	100%	4.78	0.00	0.00	0.00	0.00	0.00
Plancha 12.7	m2	2.10	97.87	110.41	2.00	6.52	205.53	231.87	4.20	13.70	1.13	100%	4.20	0.00	0.00	0.00	0.00	0.00
L 4 x 5/16"	m	79.20	12.23	10.53	0.45	1.03	969.82	833.88	35.84	89.72	0.98	100%	35.84	0.00	0.00	0.00	0.00	0.00
L 4 x 1/2"	m	180.00	19.09	14.04	0.45	1.56	3,438.20	2,528.32	81.00	288.35	0.74	100%	81.00	0.00	0.00	0.00	0.00	0.00
Plancha 10	m2	2.70	87.60	85.86	2.00	5.83	238.25	231.34	5.40	15.76	0.98	100%	5.40	0.00	0.00	0.00	0.00	0.00
Cerchas	kg	148.44	1.00	0.40	0.02	0.17	148.44	59.38	3.03	24.74	0.40	100%	3.03	0.00	0.00	0.00	0.00	0.00
Pernos A325 Galv 3/4" x 2"	Unidad	128.00	0.31	1.76	0.00	0.00	39.88	224.00	0.00	0.00	6.85	100%	0.00	0.00	0.00	0.00	0.00	0.00
Pernos A325 Galv 3/4" x 1 1/2"	Unidad	98.00	0.28	0.90	0.00	0.00	28.88	88.62	0.00	0.00	3.22	100%	0.00	0.00	0.00	0.00	0.00	0.00

Descripcion	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area a Pintar Totalmente	Area a Ignifugar	No Tuercas A Utilizar	Peso Total Tuercas	Precio Total Tuercas	HH Total Tuercas
<b>Travesaños</b>	Glb	1					<b>19,878.09</b>	<b>18,786.38</b>	<b>747.00</b>	<b>1,898.74</b>	<b>0.99</b>	<b>77.66%</b>	<b>678.82</b>	<b>471.38</b>	<b>1,768.00</b>	<b>38.30</b>	<b>79.82</b>	<b>70.60</b>
W 8 x 16	m	628.00	28.82	28.89	0.95	2.24	14,189.08	14,188.45	601.80	1,800.06	1.00	87%	334.40	187.20	1,785.00	35.30	78.62	70.60
C 4 x 5.4	m	628.00	8.06	8.02	0.40	0.87	4,250.40	3,175.94	211.20	354.20	0.75	100%	211.20	0.00	0.00	0.00	0.00	0.00
L 4 x 3/8"	m	48.92	14.61	11.03	0.45	1.22	729.33	550.60	22.48	60.78	0.75	100%	22.48	0.00	0.00	0.00	0.00	0.00
Cerchas	kg	674.22	1.00	0.40	0.02	0.17	674.22	229.89	11.73	95.70	0.40	64%	7.55	4.18	0.00	0.00	0.00	0.00
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	768.00	0.34	2.10	0.00	0.00	261.12	1,812.60	0.00	0.00	6.18	100%	0.00	0.00	0.00	0.00	0.00	0.00

Descripcion	Unidad	Cantidad	Peso Unitario	Precio Unit	Area Unitaria	HH Unit	Peso Total	Precio Total	Area Total	HH Total	US \$ / kg	%Pintura Total	Area a Pintar Totalmente	Area a Ignifugar	No Tuercas A Utilizar	Peso Total Tuercas	Precio Total Tuercas	HH Total Tuercas
<b>Union entre Porticos C' - D'</b>	Glb	1					<b>7,727.25</b>	<b>7,768.83</b>	<b>281.92</b>	<b>791.63</b>	<b>1.90</b>	<b>84.96%</b>	<b>238.38</b>	<b>43.54</b>	<b>140.00</b>	<b>2.80</b>	<b>8.32</b>	<b>6.80</b>
L 4 x 5/16"	m	144.00	12.23	10.53	0.45	1.02	1,761.12	1,515.79	64.80	148.78	0.98	67%	43.20	21.80	0.00	0.00	0.00	0.00
L 3 x 3/16"	m	72.00	5.51	6.02	0.34	0.92	398.72	433.98	24.48	68.12	1.09	100%	24.48	0.00	0.00	0.00	0.00	0.00
L 2 1/2 x 3/16"	m	34.80	4.50	4.51	0.28	0.75	155.70	158.09	9.89	25.95	1.00	100%	9.89	0.00	0.00	0.00	0.00	0.00
L 2 1/2 x 1/4"	m	244.80	5.95	5.91	0.28	0.99	1,458.56	1,448.38	69.54	242.78	0.99	100%	69.54	0.00	0.00	0.00	0.00	0.00
C 4 x 5.4	m	27.80	8.05	8.02	0.40	0.87	221.38	165.41	11.00	18.45	0.75	100%	11.00	0.00	0.00	0.00	0.00	0.00
Plancha 10	m2	13.25	87.60	85.86	2.00	5.83	1,158.38	1,135.27	28.60	77.29	0.98	83%	22.09	4.41	0.00	0.00	0.00	0.00
W 8 x 16	m2	55.00	28.82	28.89	0.95	2.24	1,475.10	1,478.80	52.25	122.93	1.00	100%	52.25	0.00	0.00	0.00	0.00	0.00
W 8 x 31	m3	18.50	48.19	48.31	1.22	3.30	762.14	784.05	20.13	54.44	1.00	100%	18.50	18.50	140.00	2.80	6.32	5.60
Cerchas	kg	221.84	1.00	0.40	0.02	0.17	221.84	88.88	4.53	38.94	0.40	83%	3.78	0.75	0.00	0.00	0.00	0.00
Pernos A325 Galv 3/4" x 2"	Unidad	192.00	0.31	1.76	0.00	0.00	59.52	338.00	0.00	0.00	6.85	100%	0.00	0.00	0.00	0.00	0.00	0.00
Pernos A325 Galv 3/4" x 1 1/2"	Unidad	144.00	0.28	0.90	0.00	0.00	40.32	129.92	0.00	0.00	3.22	100%	0.00	0.00	0.00	0.00	0.00	0.00
Pernos A325 Galv 3/4" x 2 1/2"	Unidad	52.00	0.34	2.10	0.00	0.00	17.68	106.20	0.00	0.00	6.18	100%	0.00	0.00	0.00	0.00	0.00	0.00

**CAPITULO V**  
**COSTO DE INGENIERIA DE DETALLE**

Una vez Calculados los costos de materiales, procederemos a efectuar los cálculos de la ingeniería de Detalle según la tabla 8:

Tabla No 8

DESCRIPCION	Ton	Toneladas por Plano	No Planos	hh/plano	Total HH	Precio
Parral Principal 1	187.38	3.00	63.00	12.00	756.00	6,945.04
Parral Principal 2	171.56	3.00	58.00	12.00	696.00	6,393.84
Parral E-O Zona Turbocompresores	150.71	3.00	51.00	10.00	510.00	4,685.14
	<b>509.65</b>		<b>172.00</b>		<b>1,962.00</b>	<b>18,024.02</b>

<b>Sueldo Dibujante</b>	
<b>US \$ (Inc Leyes)</b>	1,488.73
<b>Costo hh</b>	6.21
<b>No Dibujantes</b>	6.00
<b>Meses</b>	1.20

<b>Consolidado de Precios</b>	
Proyectista	4,000.00
Mano Obra	12,184.02
Materiales	688.00
Computadora	1,152.00
<b>Total</b>	<b>18,024.02</b>

**CAPITULO VI**  
**COSTO DE HORAS HOMBRE DIRECTAS**

Para establecer los precios de mano de obra, se deberán utilizar las tablas de Jornales establecidas por el Régimen de Construcción Civil o el Régimen Común. En nuestro caso, como se trata de una empresa de Fabricaciones Metálicas y no una empresa contratista, utilizaremos el régimen común.

Dentro de nuestros precios deberemos también incluir algunos costos adicionales inherentes a la mano de obra directa según la tabla 9, mostrada a continuación:

**Tabla No 9**

<b>Descripción</b>	<b>Ctd Mensual</b>	<b>Precio Unit (\$)</b>	<b>Precio Total</b>
Uniforme	0.10	16.25	\$1.63
Arnés + Línea de Vida	0.00	186.67	\$0.00
Casco	0.10	6.85	\$0.69
Botas Cuero	0.10	13.50	\$1.35
Botas Jebe	0.00	11.00	\$0.00
Chompa+Capotín	0.00	18.60	\$0.00
Respiradores	0.10	16.40	\$1.64
Chaleco Reflectivo	0.10	1.58	\$0.16
Lentes + Tapones	1.00	2.73	\$2.73
Guantes	1.00	1.50	\$1.50
<b>Total Persona por mes (S/.)</b>			<b>32.21</b>

De acuerdo a esta tabla, obtenemos un precio mensual en implementos de seguridad, el cual se adicionara a los precios obtenidos en la cartilla de jornales del Régimen Común.

De acuerdo a esta cartilla podremos obtener los precios mostrados en la tabla 10, mostrada a continuación

Tabla No 10

Tabla de Jornales del Régimen Común

N°	Cargo	Jornal Básico	Seguridad	Adicionales Diarios	Días Trabaj	Permiso	Días Altura	H.Ext. Simp.	H.Ext. Doble domingo	INGRESOS DEL TRABAJADOR					TOTAL INGRESO	LEYES SOCIALES				TOTAL APORTES	BENEFICIOS SOCIALES			TOTAL BENEF	COSTO REAL
										Total Jornales	Dominic.	Hor.Ext. Simples	Hor Ext. Doble	Bonific.		PSS	9%	I.E.S 5%	SCTR 1,23%		Gratific.	CTS	Vacac. Truncas		
1	Supervisor A	100.00	1.07	1.07	6.00		0	0	0	600.00	100.00	0.00	0.00	6.4	706.44	63.00	35.00	8.61	106.61	116.67	58.33	58.33	233.33	1,046.38	
2	Supervisor B	85.00	1.07	1.07	6.00		0	0	0	510.00	85.00	0.00	0.00	6.4	601.44	53.55	29.75	7.32	90.62	99.17	49.58	49.58	198.33	890.39	
3	Operador Grúa	80.00	1.07	1.07	6.00		0	0	0	480.00	80.00	0.00	0.00	6.4	566.44	50.40	28.00	6.89	85.29	93.33	46.67	46.67	186.67	838.40	
4	Op. I Soldador 4G	70.00	1.07	1.07	6.00		0	0	0	420.00	70.00	0.00	0.00	6.4	496.44	44.10	24.50	6.03	74.63	81.67	40.83	40.83	163.33	734.40	
5	Op. I Soldador 4F	50.00	1.07	1.07	6.00		0	0	0	300.00	50.00	0.00	0.00	6.4	356.44	31.50	17.50	4.31	53.31	58.33	29.17	29.17	116.67	526.42	
6	Operador Hiab	50.00	1.07	1.07	6.00		0	0	0	300.00	50.00	0.00	0.00	6.4	356.44	31.50	17.50	4.31	53.31	58.33	29.17	29.17	116.67	526.42	
7	Calderero	35.00	1.07	1.07	6.00		0	0	0	210.00	35.00	0.00	0.00	6.4	251.44	22.05	12.25	3.01	37.31	40.83	20.42	20.42	81.67	370.42	
8	Tubero	40.00	1.07	1.07	6.00		0	0	0	240.00	40.00	0.00	0.00	6.4	286.44	25.20	14.00	3.44	42.64	46.67	23.33	23.33	93.33	422.41	
9	Armador	40.00	1.07	1.07	6.00		0	0	0	240.00	40.00	0.00	0.00	6.4	286.44	25.20	14.00	3.44	42.64	46.67	23.33	23.33	93.33	422.41	
10	Electricista A	35.00	1.07	1.07	6.00		0	0	0	210.00	35.00	0.00	0.00	6.4	251.44	22.05	12.25	3.01	37.31	40.83	20.42	20.42	81.67	370.42	
15	Electricista B	25.00	1.07	1.07	6.00		0	0	0	150.00	25.00	0.00	0.00	6.4	181.44	15.75	8.75	2.15	26.65	29.17	14.58	14.58	58.33	266.42	
11	Pintor	30.00	1.07	1.07	6.00		0	0	0	180.00	30.00	0.00	0.00	6.4	216.44	18.90	10.50	2.58	31.98	35.00	17.50	17.50	70.00	318.42	
12	Oxigenista	25.00	1.07	1.07	6.00		0	0	0	150.00	25.00	0.00	0.00	6.4	181.44	15.75	8.75	2.15	26.65	29.17	14.58	14.58	58.33	266.42	
13	Arenador	25.00	1.07	1.07	6.00		0	0	0	150.00	25.00	0.00	0.00	6.4	181.44	15.75	8.75	2.15	26.65	29.17	14.58	14.58	58.33	266.42	
14	Almacenero	25.00	1.07	1.07	6.00		0	0	0	150.00	25.00	0.00	0.00	6.4	181.44	15.75	8.75	2.15	26.65	29.17	14.58	14.58	58.33	266.42	
16	Of. Soldador	20.00	1.07	1.07	6.00		0	0	0	120.00	20.00	0.00	0.00	6.4	146.44	12.60	7.00	1.72	21.32	23.33	11.67	11.67	46.67	214.43	
17	Of. Calderero	20.00	1.07	1.07	6.00		0	0	0	120.00	20.00	0.00	0.00	6.4	146.44	12.60	7.00	1.72	21.32	23.33	11.67	11.67	46.67	214.43	
18	Of. Tubero	20.00	1.07	1.07	6.00		0	0	0	120.00	20.00	0.00	0.00	6.4	146.44	12.60	7.00	1.72	21.32	23.33	11.67	11.67	46.67	214.43	
19	Ayudantes	15.00	1.07	1.07	6.00		0	0	0	90.00	15.00	0.00	0.00	6.4	111.44	9.45	5.25	1.29	15.99	17.50	8.75	8.75	35.00	162.43	
					20	114	0	0	0.00	4,740.00	790.00	0.00	0.00	122.36	5,652.36	497.70	276.50	68.00	842.20	921.67	460.83	460.83	1,843.33		

Con los precios establecidos en la tabla 10 y considerando una jornada semanal de 48 horas, podremos hallar el costo de la hora hombre para cada categoría el que se muestra en la tabla 11:

Tabla No 11

Jornada		48.00	Hr/Sem		
Nº	Cargo	Costo Real S/.	Horas	Costo h/h S/.	Costo h/h US\$
1	Supervisor A	1,046.38	48	21.80	6.56
2	Supervisor B	890.39	48	18.55	5.58
3	Operador Grúa	838.40	48	17.47	5.25
4	Soldador	734.40	48	15.30	4.60
5	Apuntalador	526.42	48	10.97	3.30
6	Operador Hiab	526.42	48	10.97	3.30
7	Calderero	370.42	48	7.72	2.32
8	Tubero	422.41	48	8.80	2.65
9	Armador	422.41	48	8.80	2.65
10	Electricista A	370.42	48	7.72	2.32
15	Electricista B	266.42	48	5.55	1.67
11	Pintor	318.42	48	6.63	2.00
12	Oxigenista	266.42	48	5.55	1.67
13	Arenador	266.42	48	5.55	1.67
14	Almacenero	266.42	48	5.55	1.67
16	Of. Soldador	214.43	48	4.47	1.34
17	Of. Calderero	214.43	48	4.47	1.34
18	Of. Tubero	214.43	48	4.47	1.34
19	Ayudantes	162.43	48	3.38	1.02

Con la ayuda de la tabla No 11 podremos hallar los costos por categoría incluyendo beneficios sociales y adicionales.

Ahora con los costos de hora hombre calculados, deberemos considerar un costo de hora hombre promedio, para lo cual consideraremos una cuadrilla típica, de donde se obtienen los costos mostrados en la tabla 12

Tabla No 12

<b>Descripción</b>	<b>Cantidad</b>	<b>Total Diario Unit (US \$)</b>	<b>Total Diario por Ocupación (US \$)</b>
Capataz de Fabricación	1/3	52.45	17.48
Armadores	1	18.57	18.57
Soldador	1	36.81	36.81
Apuntalador	1	26.39	26.39
Ayudantes	4	8.14	32.57
<b>TOTALES</b>	<b>7.33</b>		<b>131.82</b>
Horas Diarias	8		
HH PROMEDIO (US \$)	2.25		

Por lo que obtendremos un costo promedio de hora hombre de US \$ 2.25

CAPITULO VII  
CRONOGRAMA DE FABRICACION

Con la planilla de metrados totales y los rendimientos históricos de la planta para mano de obra hallaremos la cantidad total de horas hombre a emplear, la cantidad de cuadrillas a considerar y según esto la cantidad de días que nos tomara este trabajo.

Según la cartilla de metrados totales (Tablas 5, 6 y 7), encontramos que para realizar este trabajo utilizaremos 42,550 hh. Teniendo en cuenta que la capacidad de nuestra planta es de 300 Ton/mes, podemos hacer la tabla 13 para hallar la cantidad de cuadrillas, además de los días que emplearemos

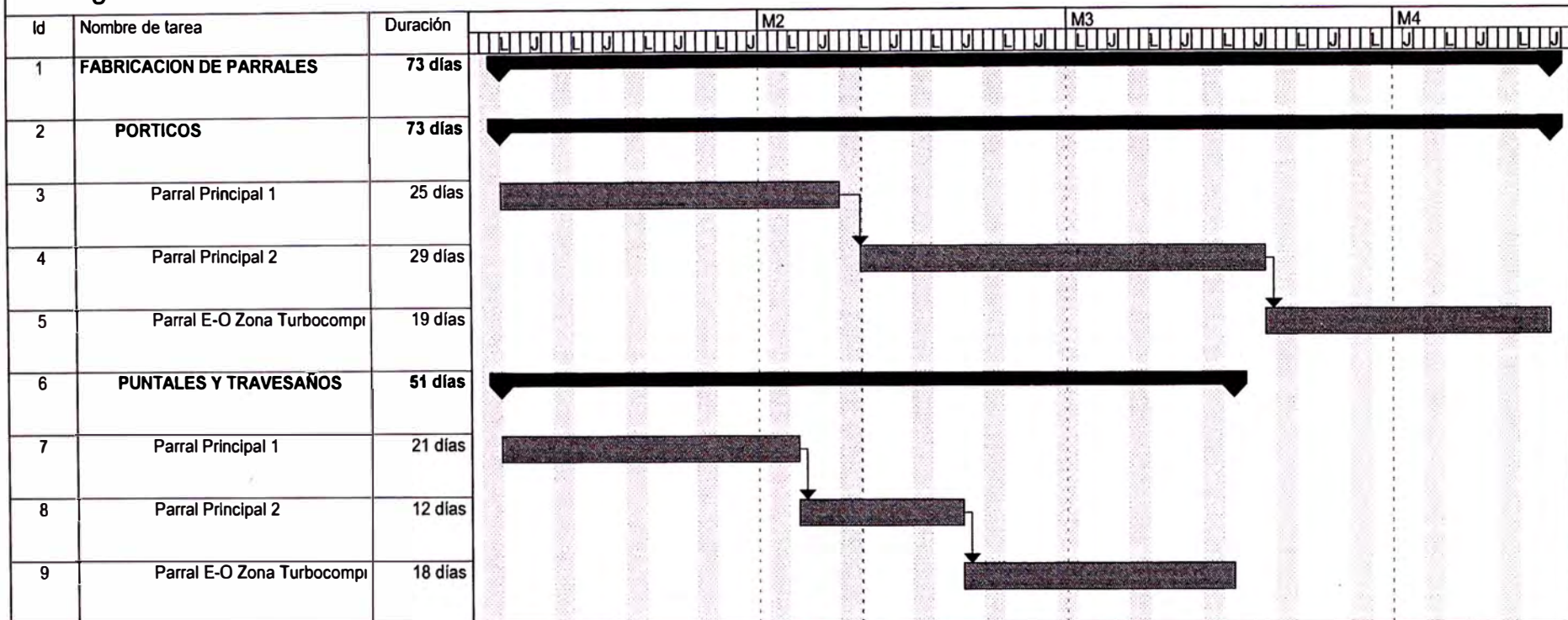
Tabla 13

Descripción Trabajos	HH	Horas Día	No Cuad	Hom x Cuad	No Hom	Días de Trabajo	Meses	Peso Ton
<b>Parral Principal 1</b>								
Pórticos	8,670.78	8.00	6.00	7.33	44.00	25.00	0.83	106.82
Puntales y Travesaños	7,144.92	8.00	6.00	7.33	44.00	21.00	0.70	81.28
						<b>25.00</b>	<b>0.83</b>	<b>188.0</b>
<b>Parral Principal 2</b>								
Pórticos	10,004.88	8.00	6.00	7.33	44.00	29.00	0.97	125.26
Puntales y Travesaños	4,188.84	8.00	6.00	7.33	44.00	12.00	0.40	46.52
						<b>29.00</b>	<b>0.97</b>	<b>171.8</b>
<b>Parral Principal E - O Zona Turbocompresores</b>								
Pórticos	6,541.19	8.00	6.00	7.33	44.00	19.00	0.63	83.56
Puntales y Travesaños	5,999.35	8.00	6.00	7.33	44.00	18.00	0.60	68.07
						<b>19.00</b>	<b>0.63</b>	<b>151.6</b>



Con los datos y tiempos obtenidos en la tabla 13, podremos efectuar nuestro cronograma de trabajos, el cual se muestra en el cronograma 1, a continuación:

# Cronograma No 1



Proyecto: Fabricacion de Parrales	Tarea		Hito		Tareas externas	
	División		Resumen		Hito externo	
	Progreso		Resumen del proyecto		Fecha límite	

Según el cronograma resultante tenemos que para efectuar este trabajo utilizaremos 73 días, por lo q podremos completar la tabla 13, con la casilla correspondiente a las toneladas por mes, según la tabla 14, mostrada a continuación

Tabla 14

Descripción Trabajos	HH	Horas Día	No Cuadri	Hom x Cuadri	No Homb	Días de Trabajo	Meses	Peso Ton	Ton/mes
<b>Parral Principal 1</b>									
Pórticos	8,670.78	8.00	6.00	7.33	44.00	25.00	0.83	106.82	128.18
Puntales y Travesaños	7,144.92	8.00	6.00	7.33	44.00	21.00	0.70	81.28	116.12
						<b>25.00</b>	<b>0.83</b>	<b>188.0</b>	<b>225.72</b>
<b>Parral Principal 2</b>									
Pórticos	10,004.88	8.00	6.00	7.33	44.00	29.00	0.97	125.26	129.58
Puntales y Travesaños	4,188.84	8.00	6.00	7.33	44.00	12.00	0.40	46.52	116.29
						<b>29.00</b>	<b>0.97</b>	<b>171.8</b>	<b>177.70</b>
<b>Parral Principal E - O Zona Turbocompresores</b>									
Pórticos	6,541.19	8.00	6.00	7.33	44.00	19.00	0.63	83.56	131.94
Puntales y Travesaños	5,999.35	8.00	6.00	7.33	44.00	18.00	0.60	68.07	113.46
						<b>19.00</b>	<b>0.63</b>	<b>151.6</b>	<b>239.42</b>
<b>TOTALES</b>	<b>42,550</b>					<b>73.00</b>	<b>2.43</b>	<b>511.5</b>	<b>210.21</b>

De aquí se Observa que no sobrepasaremos la capacidad de nuestra planta.

**CAPITULO VIII**  
**COSTO DE EQUIPOS Y CONSUMIBLES**

**8.1 Costo de equipos**

Una vez establecido el tiempo podremos calcular el costo de equipos que emplearemos para el presente trabajo. Considerando 3 meses de uso, podremos obtener los valores de la tabla 15:

**Tabla 15**

ITEM	EQUIPOS	CANT.	MESES	VALOR	FACTOR	TOTAL
<b>EQUIPOS FABRICACION</b>						
1	Botellas vacías para gases	12	3	2.50	1.000	90.00
2	Cajón metálico para Herramientas	12	3	0.00	1.000	0.00
3	Camión Grúa HIAB 6 Ton	2	3	2,902.40	0.750	13,060.82
4	Equipo de Oxicorte	10	3	106.50	1.000	3,195.00
5	Esmeriles angulares 7"	44	3	73.00	1.000	9,636.00
6	Horno para Soldadura	12	3	0.00	0.000	0.00
7	Maletín de herramientas para Calderero	12	3	31.20	1.000	1,123.20
8	Máquina de soldar eléctrica 400A	24	3	66.15	1.000	4,762.80
9	Montacargas	2	3	1,046.62	0.750	4,709.78
10	Taladro de Banco	2	3	120.64	1.000	723.84
11	Taladro de Base Magnética	8	3	132.30	1.000	3,175.20
12	Taladros portátiles 1/2"	8	3	10.00	1.000	240.00
13	Tecles de cadena 3 TM	10	3	0.00	1.000	0.00
14	Tecles RACHET 1.5 TM	24	3	0.00	1.000	0.00
15	Tecles RACHET 3 TM	10	3	0.00	1.000	0.00
16	Tirfor 3 TM	10	3	0.00	1.000	0.00
17	Grúa Puente	2	3	1,800.00	0.750	8,100.00
18	Varios	1	3	2,000.00	1.000	6,000
	<b>TOTAL</b>					<b>54,816.64</b>

**CAPITULO IX**  
**COSTO DEL TRATAMIENTO SUPERFICIAL**

De acuerdo a las especificaciones técnicas y a los metrados obtenidos podremos establecer el área a cubrir con pintura primer y el área a cubrir con la pintura de acabado. Según esto obtendremos la tabla 17 para el caso del Imprimante

**Tabla No 17**

**Pintura Primer 13,758.23 m2**

Descripción	Espesor Mínimo Seco (mils)	Rend Teórico a 1 mil (m2/gal)	Rend. Teórico a mil (m2/gal)	Rend Practico aprox. (m2/gal)	Galones estimados	Costo por Galón	Costo Estimado (US \$)
MACROPOXY 646	5.00	107.50	21.50	12.90	1,067.00	20.50	21,873.50
Diluyente R 10646					214.00	8.67	1,855.38
<b>TOTAL IMPRIMANTE</b>							<b>23,728.88</b>

**Arenado y Pintado (Mano de Obra)**

Arenado	\$2.50
Pintura	\$0.80 por Capa
No capas Pintura	2
Total por m2	\$4.10
Total M.O.	\$56,408.74
Total Arenado y Pintado Imprimante	<b>\$80,137.62</b>
<b>Precio por m2 (Primer)</b>	<b>\$5.83</b>

Para el caso de la pintura de acabado, y siguiendo el mismo procedimiento obtendremos la tabla 18

Tabla No 18

**Pintura Acabado 6,597.69 m<sup>2</sup>**

Descripción	Espesor Mínimo Seco (mils)	Rend Teórico a 1 mil (m <sup>2</sup> /gal)	Rend. Teórico a mil (m <sup>2</sup> /gal)	Rend Practico aprox. (m <sup>2</sup> /gal)	Galones estimados	Costo por Galón	Costo Estimado (US \$)
SUMATANE HS BRILLANTE (A+B)	2.00	99.20	49.60	29.76	222.00	45.00	9,990.00
Diluyente 920					33.00	11.11	366.63
<b>TOTAL ACABADO</b>							<b>10,356.63</b>

**Pintado (Mano de Obra)**

Pintura	\$0.80	por Capa
No capas Pintura	1	
Total por m <sup>2</sup>	\$0.80	
Total M.O.	\$5,278.15	
<b>Total Pintado Acabados</b>	<b>\$15,634.78</b>	
<b>Precio por m<sup>2</sup> (Acabado)</b>	<b>\$2.37</b>	

## CAPITULO X

### INTEGRACION DE COSTOS

Una vez establecidos nuestros precios para Mano de Obra, materiales, consumibles, equipos y tratamiento superficial, podremos establecer nuestra planilla Integrada de Costos, de donde obtendremos los precios por partidas para la mano de obra directa.

La planilla se muestra en la tabla 19 según:





**CAPITULO XI**  
**COSTOS INDIRECTOS – GASTOS GENERALES**

Con la planilla de Costos establecida y el costo directo hallado, debemos agregar ahora los costos de gastos generales. Aquí deberemos incluir todos los costos de indirectos que influyen en nuestro precio. Dichos precios pueden verse en la tabla 20:

Tabla No 20

<b>Personal Técnico - Administrativo</b>	<b>Factor</b>	<b>Costo Unitario</b>	<b>Meses</b>	<b>Costo Total</b>
Gerente de Proyecto	0.75	1,805	3.00	4,060.15
Ing Residente	1.00	1,353	3.00	4,060.15
Ing Campo	1.00	1,353	3.00	4,060.15
Ing Seguridad	0.50	1,203	3.00	1,804.51
Ing Control de Calidad	1.00	1,203	3.00	3,609.02
Ing Planeamiento, Costos	1.00	1,203	3.00	3,609.02
Administrador	0.75	1,053	3.00	2,368.42
Logístico	0.75	1,203	1.50	1,353.38
			22.50	
<b>Sub Total</b>	<b>6.75</b>			<b>24,924.81</b>
	<b>Leyes Sociales</b>		<b>65.00%</b>	<b>16,201.13</b>
<b>Sub Total Personal Técnico - Administrativo</b>				<b>41,125.94</b>
<b>Personal Auxiliar</b>				
Jefe de Almacenes	1.00	902	2.50	2,255.64
Ayudante Almacenero	0.75	602	2.50	1,127.82
Auxiliar Administrativo (Planillero)	0.75	602	3.00	1,353.38
Guardianes	0.75	301	3.00	676.69
Limpieza	0.75	195	3.00	439.85
	4.00		14.00	
<b>Sub Total</b>				<b>5,853.38</b>
	<b>Leyes Sociales</b>		<b>65.00%</b>	<b>3,804.70</b>
<b>Sub Total Personal Auxiliar</b>				<b>9,658.08</b>

**Gastos de Administración**

Útiles		1.00	100	3.00	300.00
Viáticos	Staff	0.00	130	0.00	0.00
	Administrativo	0.00	130	0.00	0.00
	Administrativo Zona	0.00	45	0.00	0.00
Alojamiento	Staff	0.00	80	0.00	0.00
	Administrativo	0.00	80	0.00	0.00
Implementos de seguridad staff/adminis		9.25	22	0.3%	60.63
Gastos de Administración/visitas Obra, Varios		1.00	0	0.00	0.00
Ambulancia		0.00	3,000	0.00	0.00
Teléfono, fax, envíos, etc.		1.00	200	0.00	0.00
Oficina (muebles)		1.00	100	0.00	0.00
Almacén (muebles)		1.00	50	0.00	0.00
Comedor		0.00	1,000		0.00
Campamentos Alojamiento Staff/Adm.		0.00	300		0.00
Movilización y desmov personal		0.00	160		0.00
<b>Sub Total Gastos de Administración</b>					<b>360.63</b>

**Equipos de apoyo técnico administrativo**

Camioneta Obra con. Chofer		0.50	1,703	3.00	2,554.76
Combustible Camioneta		0.50	418	3.00	627.29
Tipógrafo	Zona	0.00	500	0.00	0.00
Walkie talky		0.00	0	0.00	0.00
Instalaciones Provisionales					
Agua/Energía		0.00	100	0.00	0.00
Computadoras		4.00	160.00	3.00	1,920.00
Impresoras		1.00	160.00	3.00	480.00
Oficina de Campo tipo					
Container 20ps		0.00	113	0.00	0.00
Almacén de Campo tipo					
Container 20ps		0.00	113	0.00	0.00
Grupo Electrónico 38kW		0.00	1,236	0.00	0.00
SSHH (caseta tipo DISAL)		0.00	214	0.00	0.00
Materiales para seguridad de obra		1.00	50	3.00	150.00
<b>Sub Total de Equipos</b>					<b>5,732.05</b>

**Gastos Fijos**

Polvorín y manejo de explosivos					
Gastos de Elaboración de Propuesta					
Memoria Descriptiva					
Minuta de Declaratoria de Fabrica		0.00%			0.00
Fianzas/Otros gastos financiamiento		0.50%			5,338.98
Gastos de Oficina Principal		10.00%			106,779.64
<b>Sub Total Gastos Fijos</b>					<b>112,118.62</b>

**Costo de Seguros**

Por Transporte de Equipos	0.00%	0	0.00
De Responsabilidad All Risk	0.00%	0	0.00
Transporte Equipos Suministro : CLIENTE	0.00%	0	0.00
<b>Sub Total Gastos de Seguros</b>			<b>0.00</b>

**Total Gastos Generales en U. S. \$** **168,995.33**

## CAPITULO XII

### PRESENTACION FINAL

Con todos los precios establecidos, estamos ya en condiciones de hacer nuestra presentación Final de precios.

Para un adecuado control, deberemos confeccionar 2 planillas de precios.

- Planilla para el control de presupuesto, en donde se muestran desagregados los costos de ingeniería, mano de obra directa, gastos generales y utilidad. Esta planilla se muestra en la tabla 21
- Planilla para presentación al cliente, en donde se muestran los precios por partida. Estos precios incluyen ya los costos de gastos generales y utilidades. Esta planilla se muestra en la tabla 22

Las tablas descritas se muestran a continuación:

Tabla 21

## PROPUESTA ECONÓMICA - FABRICACIONES METÁLICAS

SUMINISTRO Y FABRICACIÓN DE PARRALES  
ESTACIÓN MALVINAS - PLANILLA INTERNA

ITEM	DESCRIPCION	PESO TOTAL KG	UNIDAD	CANTIDAD	Unit US \$	Parcial US \$	Sub total US \$	P.U. US \$/Kg
<b>1</b>	<b>INGENIERÍA DE DETALLE, PLANOS DE FABRICACIÓN</b>							
1.1	Parral Principal 1	187.380.58	alb	1	6.945.04	6.945.04		0.04 \$/KG
1.2	Parral Principal 2	171.556.08	alb	1	6.393.84	6.393.84		0.04 \$/KG
1.3	Parral E-O Zona Turbocompresores	151.346.96	alb	1	4.685.14	4.685.14		0.03 \$/KG
							<b>18,024.02</b>	
<b>2</b>	<b>FABRICACIÓN</b>							
<b>2.1</b>	<b>Parral Principal 1</b>							
2.101	Portico 1 al 9	14.954.24	Unidad	9.00	2.489.61	22.406.49		1.50 \$/KG
2.102	Portico 10 al 17	13.266.95	Unidad	8.00	2.484.71	19.877.72		1.50 \$/KG
2.103	Portico 18 al 24	11.592.47	Unidad	7.00	2.481.11	17.367.76		1.50 \$/KG
2.104	Portico 25	3.103.20	Unidad	1.00	4.940.75	4.940.75		1.59 \$/KG
2.105	Portico 26	2.350.24	Unidad	1.00	3.396.38	3.396.38		1.45 \$/KG
2.106	Porticos 27 al 33	14.385.96	Unidad	7.00	3.000.11	21.000.77		1.46 \$/KG
2.107	Porticos 34 al 41	16.423.86	Unidad	8.00	2.997.02	23.976.17		1.46 \$/KG
2.108	Porticos 42 al 49	16.403.82	Unidad	8.00	2.991.53	23.932.20		1.46 \$/KG
2.109	Porticos 50 al 56	14.337.19	Unidad	7.00	2.987.39	20.911.71		1.46 \$/KG
2.110	Puntales + Arriostres Laterales	63.307.95	Glb	1.00	97.239.03	97.239.03		1.54 \$/KG
2.111	Travesaños	17.973.75	Glb	1.00	29.127.14	29.127.14		1.62 \$/KG
							<b>284,176.12</b>	
<b>2.2</b>	<b>Parral Principal 2</b>							
2.201	Portico 36 al 42	20.652.74	Unidad	7.00	4.687.97	32.815.76		1.59 \$/KG
2.202	Portico 43 v 45	7.532.59	Unidad	2.00	5.971.53	11.943.06		1.59 \$/KG
2.203	Portico 45 al 52	35.404.52	Unidad	12.00	4.689.83	56.277.98		1.59 \$/KG
2.204	Portico 57 al 66	25.295.72	Unidad	10.00	3.890.11	38.901.07		1.54 \$/KG
2.205	Portico 67 al 68	6.364.75	Unidad	2.00	5.013.10	10.026.19		1.58 \$/KG
2.206	Puntales	30.008.23	Glb	1.00	55.951.64	55.951.64		1.86 \$/KG
2.207	Arriostres Laterales	8.141.55	Glb	1.00	13.929.68	13.929.68		1.71 \$/KG
2.208	Travesaños	20.809.73	Glb	1.00	43.026.66	43.026.66		2.07 \$/KG
2.209	Union entre Porticos 43 v 45	9.197.94	Glb	1.00	18.262.42	18.262.42		1.99 \$/KG
2.210	Union entre Porticos 67 v 68	8.367.45	Glb	1.00	16.341.68	16.341.68		1.95 \$/KG
							<b>297,476.13</b>	
<b>2.3</b>	<b>Parral Principal E - O Zona Turbocompresores</b>							
2.301	Portico D	3.245.37	Unidad	1.00	4.972.29	4.972.29		1.53 \$/KG
2.302	Portico C	3.249.00	Unidad	1.00	5.013.57	5.013.57		1.54 \$/KG
2.303	Porticos AC-S	37.126.37	Unidad	11.00	5.106.30	56.169.31		1.51 \$/KG
2.304	Porticos J - F	15.374.04	Unidad	5.00	4.879.44	24.397.18		1.59 \$/KG
2.305	Porticos R - K	24.564.87	Unidad	8.00	4.869.65	38.957.20		1.59 \$/KG
2.306	Puntales	35.169.58	Glb	1.00	64.083.55	64.083.55		1.82 \$/KG
2.307	Arriostres Laterales	5.163.10	Glb	1.00	8.492.89	8.492.89		1.64 \$/KG
2.308	Travesaños	20.011.33	Glb	1.00	38.696.85	38.696.85		1.93 \$/KG
2.309	Union entre Porticos C' - D'	7.730.05	Glb	1.00	15.541.90	15.541.90		2.01 \$/KG
							<b>256,324.74</b>	
							<b>SUB TOTAL US \$</b>	<b>\$856,001.02</b>
		Peso Total (Kg)			(US \$)/kg			
		510.283.61			\$1.68			
					Gastos Generales US \$	19.74%	\$168.995.33	
					Utilidad US \$	5%	\$42.800.05	
					<b>TOTAL US \$</b>		<b>\$1,067,796.40</b>	
					US \$/Kg		2.09	
					Factor General		1.247424217	

Tabla 22

## PROPUESTA ECONÓMICA - FABRICACIONES METÁLICAS

SUMINISTRO Y FABRICACIÓN DE PARRALES  
ESTACIÓN MALVINAS

CLIENTE : SADE SKANSKA - TECNA - JJC

ÍTEM	DESCRIPCIÓN	PESO TOTAL KG	UNIDAD	CANTIDAD	Unit US \$	Parcial US \$	Sub total US \$
<b>1</b>	<b>INGENIERÍA DE DETALLE, PLANOS DE FABRICACIÓN</b>						
1.1	Parral Principal 1	187,380.58	qlb	1	8,663.50	8,663.50	
1.2	Parral Principal 2	171,556.08	qlb	1	7,975.90	7,975.90	
1.3	Parral E-O Zona Turbocompresore	151,346.96	qlb	1	5,844.40	5,844.40	
							<b>22,483.80</b>
<b>2</b>	<b>FABRICACIÓN</b>						
<b>2.1</b>	<b>Parral Principal 1</b>						
2.101	Portico 1 al 9	14,954.24	Unidad	9.00	3,105.70	27,951.30	
2.102	Portico 10 al 17	13,266.95	Unidad	8.00	3,099.50	24,796.00	
2.103	Portico 18 al 24	11,592.47	Unidad	7.00	3,095.00	21,665.00	
2.104	Portico 25	3,103.20	Unidad	1.00	6,163.30	6,163.30	
2.105	Portico 26	2,350.24	Unidad	1.00	4,236.80	4,236.80	
2.106	Porticos 27 al 33	14,385.96	Unidad	7.00	3,742.50	26,197.50	
2.107	Porticos 34 al 41	16,423.86	Unidad	8.00	3,738.60	29,908.80	
2.108	Porticos 42 al 49	16,403.82	Unidad	8.00	3,731.80	29,854.40	
2.109	Porticos 50 al 56	14,337.19	Unidad	7.00	3,726.60	26,086.20	
2.110	Puntales + Arriostres Laterales	63,307.95	Glb	1.00	121,298.40	121,298.40	
2.111	Travesaños	17,973.75	Glb	1.00	36,334.00	36,334.00	
							<b>354,491.70</b>
<b>2.2</b>	<b>Parral Principal 2</b>						
2.201	Portico 36 al 42	20,652.74	Unidad	7.00	5,847.90	40,935.30	
2.202	Portico 43 v 45	7,532.59	Unidad	2.00	7,449.10	14,898.20	
2.203	Portico 45 al 56	35,404.52	Unidad	12.00	5,850.30	70,203.60	
2.204	Portico 57 al 66	25,295.72	Unidad	10.00	4,852.70	48,527.00	
2.205	Portico 67 al 68	6,364.75	Unidad	2.00	6,253.50	12,507.00	
2.206	Puntales	30,008.23	Glb	1.00	69,795.50	69,795.50	
2.207	Arriostres Laterales	8,141.55	Glb	1.00	17,376.30	17,376.30	
2.208	Travesaños	20,809.73	Glb	1.00	53,672.50	53,672.50	
2.209	Union entre Porticos 43 v 45	9,197.94	Glb	1.00	22,781.00	22,781.00	
2.210	Union entre Porticos 67 v 68	8,367.45	Glb	1.00	20,385.10	20,385.10	
							<b>371,081.50</b>
<b>2.3</b>	<b>Parral Principal E - O Zona Turbocompresores</b>						
2.301	Portico D'	3,245.37	Unidad	1.00	6,202.60	6,202.60	
2.302	Portico C'	3,249.00	Unidad	1.00	6,254.10	6,254.10	
2.303	Porticos AC-S	37,126.37	Unidad	11.00	6,369.80	70,067.80	
2.304	Porticos J - F	15,374.04	Unidad	5.00	6,086.80	30,434.00	
2.305	Porticos R - K	24,564.87	Unidad	8.00	6,074.60	48,596.80	
2.306	Puntales	35,169.58	Glb	1.00	79,939.40	79,939.40	
2.307	Arriostres Laterales	5,163.10	Glb	1.00	10,594.30	10,594.30	
2.308	Travesaños	20,011.33	Glb	1.00	48,271.40	48,271.40	
2.309	Union entre Porticos C' - D'	7,730.05	Glb	1.00	19,387.40	19,387.40	
							<b>319,747.80</b>
							<b>TOTAL US \$</b>
							<b>\$1,067,804.80</b>

Nota: Nuestros Precios no Incluyen IGV 19%

## CAPITULO XIII

### ALCANCES

Una vez establecido el precio para el negocio, deberemos hacer llegar al cliente una hoja a manera de aclaración, en donde quede establecido todos los parámetros que se han utilizado para la elaboración del presupuesto además de todas las variables que podrían influir en nuestro costo si es que se llegaran a cambiar.

Esto se puede recopilar a través del siguiente documento:

## **COMPAÑIA S.A.**

AV. De Las Artes 628 San Borja PERU TELFS. (511) 1234567 FAX. 1234568  
Web Site: www.compañia.com.pe e-mail: tecnica@compañia.com.pe

**PC-248-2006- DI**

San Borja, 23 de Agosto del 2006

Señores

**CONSORCIO SADE SKANSKA – LATINTECNICA - JJC**

Presente.-

Att. **Sr. Alberto Schwarz**

Ref. **Cotización Prrales**

Estimados señores:

Por medio de la presente y dando atención a su amable solicitud, tenemos a bien someter a vuestra consideración nuestro presupuesto por los trabajos de la referencia, según las consideraciones generales adjuntas.

Sin otro particular, quedamos a vuestras órdenes para cualquier consulta y/o aclaración adicional que crean ustedes oportuno plantear.

Atentamente,

**COMPAÑIA S.A.**

**Ing° Jorge Cuya.  
Jefe División Industrial.**



## **CONSIDERACIONES GENERALES**

### **1. OBJETO**

La presente oferta es por el suministro de materiales, mano de obra calificada, supervisión, dirección, administración, materiales consumibles, herramientas y equipos para efectuar las Fabricaciones Metálicas de:

**“ Estructuras Metálicas para Parrales ”**

### **2. BASES DE LA OFERTA**

Nuestra oferta esta basada en la siguiente información suministrada por el Contratista:

- **ESPECIFICACIONES TÉCNICAS:**
  - a. PCAM – 0000– ET– X - 001 Quality System Requirements Inspection Levels
  - b. PCAM 0100 ET–C–0003 Piping&Equipment Insulation/Fireproofing, Selection & Installation
  - c. PCAM – 0100—ET–X–0002-E Selection and Application of Protective Coatings
  - d. PCAM – 200--RI– S – 001 Material Requisition Parral Principal 1, Parral Principal 2 y Parral E-O Zona de Turbocompresores
  
- **PLANOS :**
  - a. PCAM–0200–PL–S–001 Malvinas Plant Parral Principal 1, Disposición General, REV 0
  - b. PCAM–0200–PL–S–002 Malvinas Plant Parral Principal 1 Detalles Constructivos, REV 0
  - c. PCAM–0200–PL–S–003 Malvinas Plant Parral Principal 2, Disposición General, REV 0
  - d. PCAM–0200–PL–S–004 Malvinas Plant Parral Principal 2, Detalles Constructivos, REV 0
  - e. PCAM–0200–PL–S–005 Malvinas Plant Parral E-O Zona de Turbocompresores 2, Disposición General, REV 0
  - f. PCAM–0200–PL–S–006 Malvinas Plant Parral E-O Zona de Turbocompresores 2, Detalles Constructivos, REV 0

### **3. ALCANCE DE LOS TRABAJOS**

El presente proyecto contempla la fabricación de las estructuras para los parrales de la estación Malvinas del Proyecto Camisea.

La Ingeniería básica será entregada por el Contratista, la cual empleara COMPAÑIA para efectuar los dibujos de detalle y planos de fabricación

#### 4. CONSIDERACIONES GENERALES DE LOS TRABAJOS OFERTADOS

1. COMPAÑIA S.A. se compromete a ejecutar todas las actividades indicadas en la Hoja de Presupuesto.
2. Los precios indicados incluyen: suministro de materiales, mano de obra, consumibles, equipos, herramientas, supervisión, administración, gastos generales y utilidad para la correcta ejecución de los trabajos.
3. Los trabajos están basados en las especificaciones técnicas y planos de las bases del concurso; cualquier cambio en estas o en la Ingeniería Básica, dará lugar a una revisión del presupuesto.
4. Los perfiles laminado en caliente (Vigas, canales y ángulos) serán de calidad estructural ASTM A36, se consideran los de stock local y, los que no se encuentren localmente serán fabricados a partir de plancha A36.
5. Las planchas metálicas serán de acero al carbono calidad ASTM A36
6. Los Pernos a utilizar serán de calidad ASTM A 325
7. Los trabajos de fabricación terminados serán entregados en nuestro taller ubicado en la AV. De Las Artes 628 San Borja sobre plataforma de camión
8. La protección superficial de los elementos metálicos se realizará de la siguiente manera:
  - a. Tratamiento Superficial: Arenado Comercial SSPC-SP6.
  - b. Base: 01 Capa de Pintura Epóxica – Poliamida con un espesor de película seca de 5 mils. (a todas las superficies).
  - c. Final: 01 Capa de Pintura del tipo Poliuretano, con un espesor de película seca de 2 mils (solo a las superficies que lo requieran).
  - d. El espesor final de película seca será de 5 o 7 mils, dependiendo del caso.

9. No se Incluyen:

- Transporte a Obra
- Ignifugado
- Montaje
- Ningún tipo de equipos y material no indicado en los alcances.

10. Cualquier línea de servicio no indicada en relación de oferta económica, se considerara como trabajo adicional al proyecto inicial

5. **SUMINISTROS A CARGO DEL CLIENTE (SIN COSTO PARA COMPAÑIA)**

1. Entrega oportuna de información técnica e ingeniería básica requerida para el desarrollo de los planos de detalle y fabricación
2. Coordinación con nuestro Gerente de Proyecto.

6. **PRECIOS:**

- El desglose de los precios cotizados, se detalla en el anexo de oferta económica adjunto a este documento.
- Los precios cotizados para la ejecución de las obras, está expresados en dólares americanos.
- Nuestros precios no incluyen el Impuesto General a las Ventas.

7. **FORMA DE PAGO**

- 30% de adelanto contra presentación de carta fianza
- Valorizaciones Mensuales
- Cualquier otra modalidad de pago, podrá ser planteada para su evaluación y aceptación.

8. **PLAZO DE EJECUCIÓN**

El plazo de ejecución para los trabajos comprende 90 Días  
Los tiempos estimados están supeditados a lo siguiente:

- Entrega oportuna de la información Técnica a cargo del Contratista
- Pago del Adelanto

9. **GARANTIA**

Durante el proceso de fabricación en taller, se llevará un control efectuado por nuestros ingenieros permitiéndose inspecciones externas de acuerdo a lo requerido.

COMPAÑIA S.A. ofrece una garantía sobre la calidad de sus trabajos y su correcta ejecución. Según planos revisados y aprobados previamente por las partes.

COMPAÑIA S.A., garantiza todas las partes y materiales contra cualquier defecto de material y fabricación (mano de obra), por un periodo de un (01) año a partir de la entrega, para lo cual deberá ser notificado por un certificado de entrega por parte del cliente o contratista. Esta garantía excluye los daños ocasionados por un incorrecto almacenamiento, manipuleo, transporte, montaje y mantenimiento de las estructuras por parte del cliente y/o propietario.

El material consumible a ser utilizado será de la mejor calidad y cumplirá con normas exigidas.

#### **10. VALIDEZ DE LA OFERTA**

Esta oferta es valida por treinta (30) días computados a partir de la fecha de la presente oferta, pasado este lapso rogamos consultarnos.

Sin embargo, nuestros precios están sujetos a variación, siempre y cuando exista una modificación en el tipo de cambio, dispositivos legales, tributarios, laborales y/o municipales que alteren la composición de los mismos.

Nuestra oferta considera precios de materiales de stock local, en caso de variar estos al momento de otorgar la obra, nuestro presupuesto deberá ser revisado.

#### **11. DIVISIBILIDAD DE LA OFERTA**

Nuestra Oferta Principal es por los trabajos que se muestran en la hoja del presupuesto, estos precios pueden ser divididos en caso de ser necesario.

#### **12. CONDICION ESPECIAL**

Bajo ninguna circunstancia COMPAÑIA S.A., tendrá cargo alguno por lucro cesante, daños emergentes y/o cualquier otro concepto.

## CONCLUSIONES

- Desarrollar un sistema de computo adecuado para poder ejecutar un presupuesto. Dada la gran cantidad de variables a manejar y las interrelaciones entre estas, es muy difícil encontrar un precio adecuado y competitivo para un proyecto sin la ayuda de un computador.
- Tener un adecuado conocimiento de nuestra planta, para saber realmente si es que nuestro precio final será posible de alcanzar con las herramientas que tenemos.
- Llevar una constante comunicación con el departamento de producción y el gerente comercial, pues en la reunión de cierre final se tendrá que ajustar el presupuesto según los acuerdos tomados
- En la hoja de cálculo llevar un control de las variables frecuentes como el costo por Kg, el costo por hora hombre promedio, etc. Tanto para el costo directo como para el costo final.
- Manejar adecuadamente las variables que dependen de la compañía constructora (precio de equipos, rendimientos, manejo de consumibles, etc.)
- Llevar un registro de presupuestos presentados con los precios de fabricación por Kg.
- El departamento de operaciones deberá llevar un adecuado control de consumibles, para poder establecer la cantidad de consumibles por tonelada fabricada
- Tratar de desarrollar una producción en serie para poder mejorar los rendimientos de la planta

- Colocar siempre en la hoja de alcances las excepciones a los requerimientos del cliente
- Verificar que se cumplan las normas técnicas, ya que una no conformidad con alguna norma, podría ocasionar costos de calidad no presupuestados con las inconveniencias consiguientes.

## BIBLIOGRAFIA

Hoja de Calculo de Presupuestos HAUG S.A., programa excel

Hoja de Calculo de Presupuestos GyM., programa excel

# APENDICE



REV.	DESCRIPCION	FECHA	EJEC.	REV.	APR.
A	EMISIÓN PARA PEDIDO DE PRECIOS	12/07/02	PAE	COR	PP/JZ



CLIENT: PLUSPETROL PERU CORPORATION S.A.

OBRA: EPC1 CAMISEA



PROYECTO CAMISEA (PERU)

Título:

**PARRAL PRINCIPAL 1, PARRAL PRINCIPAL 2, y  
PARRAL E-O ZONA TURBOCOMPRESORES  
MATERIAL REQUISITION**

INGENIERIA DE PROYECTO

Toda la información contenida en la presente documentación es confidencial y de propiedad de Pluspetrol, siendo prohibida su reproducción o copia, total o parcial, sin autorización previa.

ESCALA

S/E

DOCUMENTO Nro:

**PCAM-200-RI-S-001**

Reemplaza a:

Revisión

**A**

Página 1 de 6

**pluspetrol**  
Perú Corp. S.A.**PCAM-200-RI-S-001****PARRAL PRINCIPAL 1, PARRAL PRINCIPAL 2, Y  
PARRAL E-O ZONA DE TURBOCOMPRESORES**

Página 2 de 6

**MATERIAL REQUISITION****REV: A**

## 1.- OBJECT

This Material Requisition defines technical requirements for goods and services necessary in Camisea Upstream Facilities Project, for Pluspetrol Perú Corp. S.A., to be built at Camisea Field, Perú Republic.

The following items shall be provided:

Item	Quantity	DESCRIPTION	TAG NUMBER
1	1	Parral principal 1	---
2	1	Parral principal 2	---
3	1	Parral E-O Zona de turbocompresores	---

Required structure will be furnished in full accordance with this Requisition, Technical Specifications, Standards and any other document herein indicated.

Technical information given in this RI is mandatory. Proposed variations must be approved in writing by Purchaser.

Vendor shall not start any fabrication, welding, etc., until drawings were approved by Purchaser.

No repairs are permitted without Purchaser approval.

## Prevailing Order

In the event of document's conflict, the following order shall prevail:

- This Material Requisition
- Codes, Standards and general regulations
- Notwithstanding, any conflict will be immediately reported to the Purchaser for its resolution.

## 2. SCOPE OF SUPPLY



Vendor's supply shall include the following :

- Design, materials, fabrication, tests, internal inspection, testing plan (Internal and acceptance), painting, fire proofing, packing for transportation as indicated in Invitation to Bid or Purchase Order (I.B. or P.O.)
- Written Warranty as required in I.B. or P.O.
- Documents and data herein required or in Data Sheet

### 3.- PROPOSALS

Proposals shall be in full accordance with requirements of this material requisition. Exceptions List shall be included in proposal, even if goods have no exceptions. In this case, following note shall be included: "EXCEPTIONS: We have no exceptions nor deviation to specified requirements". If this note is not included, Purchaser will understand that vendor have no exceptions regarding specified characteristics of goods.

Information indicated in "DOCUMENTS AND DATA REQUIRED" form of Data Sheets shall be included in Proposal for each good. Without this information, proposal will not be considered.

Weight for each item will be included in proposal.

Unit price for each item shall be indicated. Global price shall not be admitted.

### 4.- LIST of MANDATORY DOCUMENTS

MANDATORY DOCUMENTS	REV	REV	REV	REV	REV
1) PCAM-0200-PL-S-001 PARRAL PRINCIPAL 1 -DISPOSICION GENERAL-	A				
2) PCAM-0200-PL-S-002 PARRAL PRINCIPAL 1 -DETALLES CONSTRUCTIVOS.	A				
3) PCAM-0200-PL-S-003 PARRAL PRINCIPAL 2 -DISPOSICION GENERAL.	A				
4) PCAM-0200-PL-S-004 PARRAL PRINCIPAL 2 -DETALLES CONSTRUCTIVOS.	A				



5) PCAM-0200-PL-S-005 PARRAL E-O ZONA DE TURBOCOMPRESORES DISPOSICION GENERAL.	A				
6) PCAM-0200-PL-S-006 PARRAL E-O ZONA DE TURBOCOMPRESORES DETALLES CONSTRUCTIVOS.	A				
7) PCAM-0200-PL-S-007 PARRAL Ppal.1, PARRAL Ppal. 2 y PARRAL E-O ZONA DE TURBOCOMPRESORES MODULOS PARA EL TRANSPORTE	A				
8) PCAM-0100-ET-S-0002-B STRUCTURAL STEEL DESIGN	B				
9) PCAM-0100-ET-X-0002-E SELECTION AND APPLICATION OF PROTECTIVE COATINGS	E				
10) PCAM-0100-ET-C-0003-B PIPING & EQUIPMENT INSULATION / FIREPROOFING, SELECTION INSTALLATION	E				
11) PCAM-0100-ET-S-0004-A CONSTRUCTION PRACTICE FOR STEEL FABRICATION AND ERECTION	A				
12) PCAM-000-ET-X-001 QUALITY SYSTEM REQUIREMENTS INSPECTION LEVELS	A				




## 5.- VENDOR'S DOCUMENTS

Vendor shall submit technical documents for approval, according to form "Documents and Data Required", attached to Data Sheet. Documents type and date shall be observed.

Each document shall have its Title, Document N°, Revision N°, Issue date, Page N° and Responsible name and signature. Each issue of same document shall be reviewed with subsequent numerical review.

## 6.- INSPECTION AND TEST

Manufacturer shall prepare and/or implement a Quality Assurance System based on the ISO 9000 Standards and elaborate an Inspection Plan for different stages of fabrication. Acceptance and rejection criteria and the type of inspections and tests to carry out during the execution of the works, shall be included in this information.

 <b>SKANSKA</b>		 <b>TECNA S.A.</b>	
CLIENTE: PLUSPETROL PERU CORPORATION		OBRA: EPC1 CAMISEA	
 <b>pluspetrol</b> Perú Corp. S.A.	<b>PCAM-200-RI-S-001</b>		Página 5 de 6
	<b>PARRAL PRINCIPAL 1, PARRAL PRINCIPAL 2, Y PARRAL E-O ZONA DE TURBOCOMPRESORES</b>		
	<b>MATERIAL REQUISITION</b>	<b>REV: A</b>	

Inspection level details are defined in Technical Instruction PCAM-000-ET-X-001, attached. For goods herein included **INSPECTION LEVEL "3"** is applicable.

The Manufacturer shall provide personnel, materials and qualified equipment for the execution of the inspection tasks, test and reports that are emergent of the application of the requirements, involved in Specifications, Standards and/or Codes, including visual control and dimensional verification.

Purchaser's authorized inspectors or representatives shall be permitted to enter and inspect goods during fabrication, at vendor or subvendors shop. Vendor to provide these representatives with proper means to carry out the inspection. Inspectors can reject materials or working procedures if they are not according to specifications or to required technological level.

## 7.- PREPARATION FOR SHIPMENT

- 7.1 Each part of structure shall be properly identified and packed.
- 7.2 The external surface of all structures shall be free from slag, scale, weld spatter, grit, dirt, water and other foreign matter.
- 7.3 Structures shall be painted and fire protected, when is indicated in specification.
- 7.4 Mecanized surfaces shall be protected
- 7.5 Structures shall be assembled at shop before shipping to the jobsite.

## 8.- DELIVERY PLACE AND DATE

Place and date indicated in I.B. or P.O. shall be observed.

SADE

SKANSKA



TECNA S.A.



CLIENTE: PLUSPETROL PERU CORPORATION

OBRA: EPC1 CAMISEA


**pluspetrol**  
Perú Corp. S.A.

PCAM-200-RI-S-001

**PARRAL PRINCIPAL 1, PARRAL PRINCIPAL 2, Y  
PARRAL E-O ZONA DE TURBOCOMPRESORES**

Página 6 de 6

**MATERIAL REQUISITION****REV: A**

## DOCUMENTS AND DATA REQUIRED

THIS LIST DEFINE DOCUMENTS TO BE SUBMITTED TO PURCHASER FOR APPROVAL

COLUMN "A" INDICATES DOCUMENTS TO BE INCLUDED IN PROPOSAL

COLUMN "B" INDICATES DOCUMENTS TO BE SUBMITTED FOR PURCHASER APPROVAL, DURING PROJECT DEVELOPMENT,

AFTER INTENTION LETTER OR PURCHASE ORDER RECEIPT.

COLUMN "C" INDICATES CERTIFICATED OR AS BUILT DOCUMNETS.

IF THIS DOCUMENTS ARE NOT SUBMITTED, SUPPLY WILL BE CONSIDERED UNCOMPLETE.

N°	DOCUMENT	A	B	C	
		Copies Qty. w / bid	Copies Qty. for approv.	Term from PO or Intention Leter	Term from Delivery (Maximum)
1	SHOPS DRAWING	2	3	3 weeks	3+MF 1 week
2	ERECTION DRAWING	2	3	4 weeks	3+MF 1 week
3	MILL TEST FOR SHAPES, PLATES AND BOLTS	2	3	3 weeks	3+MF 1 week
4	WELDING PROCEDURE SPECIFICATION (WPQ)	2	3	3 weeks	3+MF 1 week
5	PROCEDURE QUALIFICATION RECORDS		3	3 weeks	3+MF 1 week
6	WELDER PROCEDURE QUALIFICATION	2	3	3 weeks	3+MF 1 week
	NOTES: 1.- MF: Magnetic file				

REV.	DESCRIPCION	FECHA	EJEC.	REV.	APR.
A	FOR APPROVAL	30/05/02	PP	PP	JZ

CONSORCIO SADE SKANSKA – LATINTECNA - JJC

CLIENT: PLUSPETROL PERU CORPORATION S.A.  
 OBRA: CAMISEA UPSTREAM FACILITIES PROJECT

		<b>PROYECTO CAMISEA (PERU)</b>	
		Título: <b>QUALITY SYSTEM REQUIREMENTS INSPECTION LEVELS</b>	
<b>INGENIERIA DE PROYECTO</b>		DOCUMENTO Nro:	PCAM-000-ET-X-001
Toda la información contenida en la presente documentación es confidencial y de propiedad de Pluspetrol, quedando prohibida su reproducción o copia, total o parcial, sin autorización previa.	ESCALA		Revisión <b>A</b>
	S/E	Reemplaza a:	Página 1 de 2

## INSPECTION LEVELS

LEVEL	INSPECTION SCOPE
1	Inspection during material reception in Purchaser Shop (Mark, Model, Characteristic, Material Certificates (When it is applicable) and Quantity
2	Visual and Dimensional Inspection, Material Certificates, Mark and Model. This inspection can be made in Vendors Shop or where the Purchaser Order establishes
3	Visual and Dimensional Inspection, Functional Test, Material Certificates including Vendor Subcontractors. Welding Procedure Qualification, Welders Qualification in accordance with the Code and /or applicable Specification. Verification of Test made by Vendor.. Vendor Subcontractors shall be approved by Purchaser If Purchase considered necessary Vendor shall submit for approval the Safety, Health and Environmental plan
4	Vendor shall issued for Purchase approval the Inspection and Test Plan Reports of Vendor Inspections. Visual and Dimensional Inspection, Functional Test, Representative Test of the Item, Test of Characteristic of the Item, Material Certificates including Materials supplied by Vendor Subcontractors Welding Procedure Qualification, Welders Qualification in accordance with the Code and /or applicable Specification, including Subcontractors. Inspection of Test to be made by Vendor.. Vendor Subcontractors shall be approved by Purchaser If Purchase considered necessary Vendor shall submit for approval the Safety, Health and Environmental plan

## NOTES .-

- 1.- The inspection can be made by Purchaser or his Authorized Representative, including the Purchaser Client.
- 2.- The time between Vendor Inspection request and the day of inspection shall be agreed between Purchase and Vendor after the Purchase Order
- 3.-For Inspection level 4 the Hold points and Witness Point shall be establish by the Purchase in the Vendor Inspection and Test Plan



**STRUCTURAL STEEL DESIGN****PARAGON**  
ENGINEERING SERVICES

PES Project Number A1065

Pluspetrol

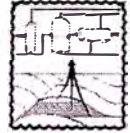
Revision:	A	B	0	1
Description:	Issued for Bid	Issued for Bid		
Prepared By:	OM	OM		
Checked By:	WM	WMC		
Approved By:	MBM	TJG		
Date of Issue:	8/16/01	03/15/02		

**CAMISEA UPSTREAM  
FACILITIES****SPECIFICATION NUMBER: PCAM-0100-ET-S-0002-B****PES NO.: A1065-05-050000-0100-S-0086-B**



## STRUCTURAL STEEL DESIGN

Doc. No.: PCAM-0100-ET-S-0002-Rev B

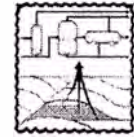


**PARAGON**  
ENGINEERING SERVICES

Date: March 14, 2002

### TABLE OF CONTENTS

1.0	INTRODUCTION .....	3
2.0	DEFINITIONS .....	3
3.0	CODES, STANDARDS AND OTHER DOCUMENTS .....	3
4.0	PREVAILING ORDERS.....	4
5.0	SCOPE .....	5
6.0	STRUCTURAL DESIGN.....	5
7.0	STRUCTURAL DETAILS .....	7
8.0	DESIGN AND SHOP DRAWINGS .....	9
9.0	MATERIALS.....	10
10.0	FABRICATION.....	12



## 1.0 INTRODUCTION

The PISCO Facility consists of a fractionation unit, topping unit, refrigeration system, vapor recovery units, refrigerated storage, ambient storage, tanker and truck loading facilities plus all utilities and ancillary systems. Products from the facility are refrigerated propane and butane, propane/butane mixed product, naphtha, jet fuel, and diesel. These standard specifications define the minimum requirements for the engineering design of structural steel for use on OWNER'S onshore production facilities.

The PISCO site is located approximately 250 km south of Lima near the town of PISCO.

## 2.0 DEFINITIONS

2.1 Capitalized text when used in this document shall have the following specific definitions:

CONTRACT shall mean the EPC Construction CONTRACT invoking this specification, together with its Annexes, Appendices, and Schedules.

WORK is the complete goods and services to be provided as described in the CONTRACT.

OWNER is Pluspetrol Peru Corporation S.A.

CONTRACTOR is the company, incorporated in Peru, that entered into a CONTRACT agreement with the OWNER to perform the EPC WORK.

OWNER'S REPRESENTATIVE is the individual appointed by the OWNER to act as such for the purposes provided in Article 13 of The CONTRACT or any other person so appointed from time to time by the OWNER and notified in writing as such to the CONTRACTOR.

ENGINEER is Paragon Engineering Services, Inc.

SUBCONTRACTOR is any person or company to whom the CONTRACTOR has subcontracted parts of the WORK (with the consent of OWNER'S REPRESENTATIVE, or pursuant to Article 33 of the CONTRACT) and the SUBCONTRACTOR's legal successors in title, but not any assignee of the SUBCONTRACTOR.

## 3.0 CODES, STANDARDS AND OTHER DOCUMENTS

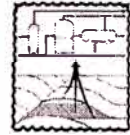
The latest revisions at the time of award of CONTRACT of the following Referenced Documents and Specifications and those listed in the CONTRACT or Purchase Order shall be



Perú Corp. S.A.

## STRUCTURAL STEEL DESIGN

Doc. No.: PCAM-0100-ET-S-0002-Rev B



PARAGON  
ENGINEERING SERVICES

Date: March 14, 2002

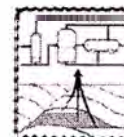
considered a part of this Specification unless a specific revision date is listed below. The material requirements and fabrication of all components shall meet or exceed the applicable sections of the latest issues of the following Codes and Standards, unless specified otherwise in this document:

- 3.1 AISC Manual of Steel Construction, 9th Edition, ASD.
- 3.2 CFR Title 29 Section 1910 Subpart D (OSHA).
- 3.3 ASCE 7-95 - Minimum Design Loads for Buildings and Other Structures.
- 3.4 AWS D1.1 - Structural Welding Code.
- 3.5 ASTM A-385 - Standard Practice for providing High Quality Zinc Coatings (hot-dip).
- 3.6 ASTM A-992 - Standard Specification for Shapes Used in Building Framing for Structural Steel.
- 3.7 ASTM A-307 - Specification for Carbon Steel Bolts and Studs.
- 3.8 ASTM A-325 - High Strength Bolts for Structural Steel Joints, Including Suitable Nuts and Plain Hardened Washers.
- 3.9 UBC 97 - 1997 Uniform Building Code.
- 3.10 For prefabricated buildings, Metal Building Manufacturers Association "Code of Standard Practice and Recommended Design Practice Manual".
- 3.11 Specification PCAM-0100-ET-S-0008; Civil and Structural Design Criteria.
- 3.12 OSHA Handrail & Toe plate Ref., OSHA Ladder Ref., OSHA Stairway Ref.

#### 4.0 PREVAILING ORDERS

Prevailing order documents controlling the WORK performed shall be as follows:

- 4.1 Local laws and regulations.
- 4.2 Construction permits as issued in accordance with findings of EIA review.
- 4.3 Project specific engineering specifications as issued by OWNER and OWNER's REPRESENTATIVE. This specification is one such document.
- 4.4 Industry Codes and Standards (API, ASME, etc.).



4.5 CONTRACTOR'S bid response documents.

## 5.0 SCOPE

5.1 These standard specifications define the minimum requirements for the engineering design of structural steel for use on OWNER's onshore production facilities.

5.2 The CONTRACTOR shall be responsible for the complete design and fabrication of the structural steel supplied in the WORK.

## 6.0 STRUCTURAL DESIGN

### 6.1 Design Premise

Design of steel structures shall be in accordance with the provisions of the AISC Specification for Structural Steel Buildings - Allowable Stress Design.

The CONTRACTOR shall determine all design loads including process, test, wind, vibration, fireproofing, maintenance impact and allowances for future expansion. The design premise shall be approved by OWNER'S REPRESENTATIVE prior to starting design.

### 6.2 Vertical Design Loads

#### 6.2.1 Dead Load

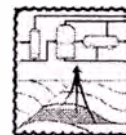
The dead load is the weight of steelwork and all material permanently fastened to and supported by the steelwork, including process equipment, piping, etc.

#### 6.2.2 Live Load

The live load shall be determined in accordance with ASCE 7, specification PCAM-0100-ET-S-0008; Civil and Structural Design Criteria, and supplemented as needed to provide a sound structure, suitable for the intended use. Live loads on platforms may be reduced as permitted in ASCE 7.

#### 6.2.3 Operating Load

The operating load is comprised of the dead load plus nominal fluid contents of vessels, equipment and piping, plus live load.



#### **6.2.4 Test Load**

Structures supporting piping and equipment shall be designed for a test load consisting of the weight of the piping and equipment full of water unless otherwise specified and/or approved in writing by OWNER'S REPRESENTATIVE. The Test Load determination shall be based on the requirements defined in the OWNER'S REPRESENTATIVE approved Equipment Hydro-Static Test Documents.

#### **6.2.5 Impact Load**

Vertical or Horizontal live loads that cause impact shall be increased as specified in the AISC "Manual of Steel Construction" and ASCE 7, and supplemented as needed for unique items such as tube bundle pulling beams, monorails, crane rails, etc.

#### **6.2.6 Maintenance and Other Loads**

Loads resulting from transportation, erection or maintenance operations shall be considered where applicable in structural design. In designing skeleton-frame type structures, maintenance loads shall not be combined with wind or earthquake loads.

#### **6.2.7 Thermal Loads**

Vertical and Horizontal thermal loads shall be applied as required to account for pipe stress loads and equipment expansion or contraction. Thermal loads shall be treated as live loads.

### **6.3 Horizontal Design Loads**

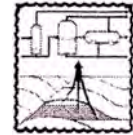
Horizontal load from wind and earthquake shall be applied in accordance with ASCE 7 and/or UBC 97, based on environmental data provided by OWNER in the Site Specific Seismic Hazard Analysis Criteria and Civil and Structural Design Criteria.

### **6.4 Combined Design Loads**

Structures shall be designed for all individual loads and for the various combinations of loads that may act together. The following four combinations are to be considered and the most severe is to control:

**6.4.1 Dead Load + Live Load + Impact Load**

**6.4.2 Dead Load + Wind or Earthquake Load**



6.4.3 Dead Load + Live Load + Wind or Earthquake Load

6.4.4 Dead Load + Test Load

Allowable stresses in combinations with wind or earthquake may be increased as provided in AISC Manual of Steel Construction. Structures design shall consider lift and transport per Section 7.5.

6.5 Lateral Stability

6.5.1 Lateral stability of structures may be obtained either by bracing or by moment connected design. Vertical bracing shall be designed for axial loads only.

6.5.2 Clearance requirements shall be checked. Where required, bracing for lateral stability of structures shall clear top of platforming in aiseways or other paths of ingress/egress by a minimum of seven (7) feet (2.14m).

6.6 Connections

6.6.1 Connections for secondary members of the structures shall be designed for the maximum calculated stresses only.

6.6.2 All shop connections shall be welded unless otherwise specified. Field connections may be bolted or welded. Where bolted, field connections shall be bolted per AISC Specifications. Where bolts are used, they shall conform to ASTM A325 and shall be 19mm (3/4-inch) minimum diameter.

6.6.3 Beveled washers shall be installed under the heads of bolts or nuts when bearing on a tapered flange. Beveled washers also shall be used where necessary to provide flat bearing for diagonal tie-rod bracing.

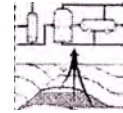
6.7 Clearances

Unless otherwise specified, the clearances recommended in Equipment Arrangements or PCAM-0100-ET-S-0008 Civil and Structural Design Criteria shall be maintained.

**7.0 STRUCTURAL DETAILS**

7.1 Platforms and Walkways

7.1.1 Platforms shall have a minimum clear width of 3 feet (0.941m) with a minimum clear headroom of 7 feet (2.13m).



- 7.1.2 Platforms more than 30 feet (9.14m) long shall have two means of access/egress, one at each end of the platform.
- 7.1.3 Access walkways not used as maintenance platforms shall be a minimum of 30 inches (0.762m) wide and have a minimum clear headroom of 7 feet (2.13m).
- 7.1.4 Platforms serving vessel manways located in the top head shall be located below the face of the manway flange at a distance sufficient to permit the removal of the flange bolts from the bottom of the flange. Top head platforms on vessels shall have a minimum of 3 feet (0.914m) clearance between edges of flanges and the outer edge of platform to provide working area around flanges.

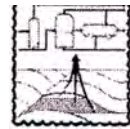
Platforms serving manways shall be sized to permit 180° opening of hinged manway cover without interference from structure or handrail.

- 7.1.5 Platform flooring shall be serrated, open-type and banded grating (1 1/4"x 3/16") (32mm x 5mm) or in special cases, 1/4-inch (6.4mm) minimum raised pattern floor plate. Floor plates shall be bolted to supporting members. Where open-type grating is used, it is to be of the pressure-locked or welded design. All grating shall be fastened to structural steel with saddle-type fasteners or welded studs. Flooring shall be restrained to prevent lateral movement.
- 7.1.6 The back of the inner ring angles on circular platforms shall clear vessel wall or insulation by approximately 2 inches (50mm).
- 7.1.7 Unsupported grating shall not be used as a mounting surface for equipment or pipe supports.
- 7.1.8 Hinged self-closing gates are to be provided at all openings in guardrails, except where there is an entrance to a ramp or stairway. Gates shall be mounted so as to be conveniently operated, and shall withstand a load of 200 pounds (890 N) applied in any direction except upwards.
- 7.1.9 All platforms or open sided floor area 4 feet (1.22m) or more above the adjacent floor or platform shall have handrail and toe plate attached. Handrail and toe plates shall be in accordance with OSHA requirements.

## 7.2 Ladders and Stairways

- 7.2.1 Primary access to platforms attached to vessels and to auxiliary service platforms shall be by means of ladders. Primary access to main operating and service levels, tank tops, and the roofs of buildings supporting major equipment





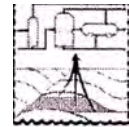
shall be by means of stairways with secondary access by ladder. Ladder access to tops of small tanks to be with OWNER'S REPRESENTATIVE written approval.

- 7.2.2 Components of ladders and stairs shall be fabricated from hot-rolled structural shapes, flat and round bars. All-welded construction shall be utilized, except that bolted connections may be used to attach ladders and stairs to equipment and skids if shipping constraints require them to "ship loose".
- 7.2.3 Ladders shall conform to OSHA requirements. Ladders shall have solid, round rungs, a minimum diameter of  $\frac{3}{4}$  inch (19mm), evenly spaced at a maximum of 14 inches (356mm) a minimum of 10 inches (254mm) and shall not be less than 18 inches (457mm) wide.
- 7.2.4 Rail ladders shall be fastened at top and bottom, and at intermediate points as determined by design load requirements not to exceed ten (10) feet (3m).
- 7.2.5 Ladders shall be located to provide "side step" access from adjoining platforms where possible.
- 7.2.6 A toe clearance space 7 inches (178mm) deep measured from the centerline of the rung to the closest obstruction or wall over the full width of the ladder shall be provided behind all ladders.
- 7.2.7 Cages conforming to OSHA requirements shall be provided on ladders as required by local governing codes and regulations. At a minimum, all ladders taller than 20 feet (6m) shall be caged.
- 7.2.8 Stairways shall conform to OSHA requirements and shall be not less than 30 inches (762mm) wide.
- 7.2.9 Stair railings shall be provided on both sides unless adequate protection is afforded by an adjacent structure. Stair railings shall be provided on both sides for all stairs adjacent to tanks or vessels.
- 7.2.10 The stair tread shall be not less than 8 inches (203mm) wide. The sum of tread run and rise shall equal 17-1/2 inches (445mm).

## **8.0 DESIGN AND SHOP DRAWINGS**

### **8.1 General**

- 8.1.1 The design drawings shall show a complete design with sizes, sections and the relative locations of the various members. Floor levels, column centers and



offsets shall be dimensioned. Plans shall be produced to an adequate scale that conveys the information fully and legibly. Plans shall indicate type or types of construction (i.e., rigid frame, semi-rigid frames, etc.) to be employed and shall be supplemented by such data as loads, shears, moments and axial forces to be resisted by all members and their connections as required for the preparation of shop drawings. Detail design drawings shall be supported by checked, signed, and sealed detail design calculations. Calculations shall be submitted to OWNER'S REPRESENTATIVE for review prior to start of fabrication.

- 8.1.2 Shop drawings shall show complete details necessary for the fabrication of assemblies including location, type, size and extent of welds, materials to be used and surface finish requirements.
- 8.1.3 Shop drawings shall detail bolted joints. Welds shall be indicated by standard AWS symbols.

## **9.0 MATERIALS**

### **9.1 Structural Steel**

Structural steel shall conform to the ASTM steels approved in the AISC specifications. ASTM-A992 shall normally be specified.

### **9.2 Other Materials**

Steel pipe, structural tubing, and other material shall conform to the AISC specification.

### **9.3 Anchor Bolts**

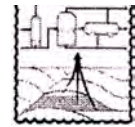
9.3.1 Anchor bolts shall conform to ASTM-A325 or ASTM-A36.

9.3.2 Unless otherwise specified, anchor bolts, nuts and washers shall be galvanized.

### **9.4 Structural Bolts**

9.4.1 Bolts for main structural connections shall be  $\frac{3}{4}$ " (19mm) or larger and shall be high strength ASTM-A-325. Note: When no type is specified for ASTM-A325 bolts, either Type 1 or Type 2 may be furnished. Both types can be hot dipped galvanized.

9.4.2 When the structural steel is galvanized, bolts, nuts and washers shall also be galvanized.



## 9.5 Welding

Structural welding shall be performed using low hydrogen electrodes.

## 9.6 Painting Skids

Skids shall be painted in accordance with the Protective Coating Specification PCAM-0100-ET-X-0002.

Bottom surface of skid structural members shall be coated with Primer Mastertop 1680 primer or OWNER approved equal in accordance with Manufacturer's Instructions.

## 9.7 Painting Pile Heads and Structural Steel Pile Frames

### 9.7.1 Surface Preparation

All substrates to be coated are to be pre-cleaned utilizing a biodegradable industrial detergent to remove oil, grease, dirt and surface contaminates prior to abrasive blasting.

All substrates previously pre-cleaned shall be abrasive blasted to the degree of SSPC SP-6 Commercial Blast Clean while achieving an anchor profile of 1.5-2.0 mils.

### 9.7.2 Coating System, Epoxy Primer, Urethane Finish

#### 9.7.2.1 Epoxy Prime, Urethane Finish

##### Primer

Apply a full primer coat by spray application of PPG/Keeler & Long KL3200 (or approved equal) Epoxy at 5.0-6.0 mils dft. Color White.

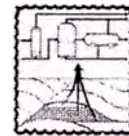
##### Finish

Apply a full finish coat by spray application of PPG/Keeler & Long KLY-1 Series Acrylic Urethane (or approved equal) at 2.0-3.0 mils dft. Color to be determined.



## STRUCTURAL STEEL DESIGN

Doc. No.: PCAM-0100-ET-S-0002-Rev B



**PARAGON**  
ENGINEERING SERVICES

Date: March 14, 2002

### 10.0 FABRICATION

#### 10.1 General

Fabrication shall be in accordance with the OWNER's Specification PCAM-0100-ET-S-0004 Steel Fabrication and Erection.

Generally, steel fabrication shall be in accordance with the recommendations of AISC Manual of Steel Construction and AWS D1.1 Structural Welding Code.



**CONSTRUCTION PRACTICE  
FOR  
STEEL FABRICATION  
AND ERECTION**



PES Project Number A1065

Pluspetrol

Revision:	A	0	1	2
Description:	Issued for Bid			
Prepared By:	OM			
Checked By:	FSK			
Approved By:	DH			
Date of Issue:	10/19/01			

**CAMISEA UPSTREAM  
FACILITIES**

**SPECIFICATION NUMBER: PCAM-0100-ET-S-0004-A**

**PES No.: A1065-05-050000-0100-S-0124-A**



**CONSTRUCTION PRACTICE  
FOR  
STEEL FABRICATION  
AND ERECTION**

Doc. No.: PCAM-0100-ET-S-0004 Rev. A

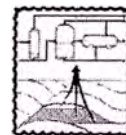


**PARAGON**  
ENGINEERING SERVICES

Date: October 19, 2001

**TABLE OF CONTENTS**

1.0	SCOPE AND DEFINITIONS .....	3
2.0	CODES, STANDARDS, AND SUPPLEMENTAL SPECIFICATIONS .....	3
3.0	MATERIALS.....	4
4.0	WORKMANSHIP .....	5
5.0	WELDING .....	5
6.0	BOLTED JOINTS.....	6
7.0	PROTECTIVE COATINGS.....	6
8.0	ERECTION .....	7



## 1.0 SCOPE AND DEFINITIONS

- 1.1 This specification covers the minimum requirements of OWNER for the fabrication and erection of steel structures for use in onshore oil and gas operations.
- 1.2 Within this specification the following definitions shall apply:

OWNER: Pluspetrol Peru Corporation S.A.

FABRICATOR: The party that is responsible for the supply of the equipment and materials, the structural steel fabricates, and performs the other services as defined herein.

CONTRACTOR: The firm/entity who is responsible to the OWNER for the structural steel fabrication as defined herein, and who is directly responsible to receive and erect the fabricated structural steel.

- 1.3 The OWNER shall approve any deviation from this specification prior to performing the work.
- 1.4 The CONTRACTOR is responsible to adhere to this specification. The CONTRACTOR shall notify the OWNER prior to taking any exception to this specification.

## 2.0 CODES, STANDARDS, AND SUPPLEMENTAL SPECIFICATIONS

- 2.1 As a minimum, the design and materials shall be in accordance with the current editions of the Codes and Standards cited below. Except where stated specifically, the current effective dates of the codes and standards shall be construed as the editions in effect at the date of Issuance for Bids.

### **American Institute of Steel Construction (AISC)**

Manual of Steel Construction, ASD, Ninth edition – 1989

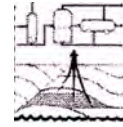
Code of Standard Practice for Steel Buildings and Bridges – 2000

Specification for the Design, Fabrication and Erection of Structural Steel for Buildings – 1989

Specification for Structural Joints Using ASTM A325 or A440 Bolts – 2000

### **American Welding Society (AWS)**

ANSI/AWS D1.1-98 Structural Welding Code-Steel



AWS A2.4 Standard Symbols for Welding, Brazing and Nondestructive Testing - 1998

**American Society for Testing and Materials (ASTM)**

A6 / A6M-00 General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling

A325-00 Standard Specifications for Structural Bolts, Steel, Heat Treated, 120/105 KSI Minimum Strength

A123/A123M-01 Standard specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A143-74 (1999) Safeguarding Against Embrittlement of Hot Galvanizing Structural Steel Products and Procedure for Detecting Embrittlement

A992-00 Standard Specification for Steel for Structural Shapes used in Building Framing

**American Petroleum Institute (API)**

API Spec 2B Specification for Fabricated Structural Steel Pipe, 5<sup>th</sup> Ed., 1996

**Project Specifications**

PCAM-0100-ET-X-0002; Selection and Application of Protective Coatings.

**3.0 MATERIALS**

- 3.1 Structural members shall be straight and true in cross section within the tolerance set forth by the AISC. Sharp kinks or bends are cause for rejection of material.
- 3.2 Classification of all steels furnished shall be supported by mill certificates. Copies of these mill certificates shall be furnished to the OWNER before incorporating any of the material into a structure.
- 3.3 Substitution of structural members made from higher grades of steel or with greater cross sectional properties than shown on the drawings is prohibited without the prior consent of the OWNER.



#### **4.0 WORKMANSHIP**

- 4.1 Any camber present due to mill rolling or shop fabrication shall be turned upward.
- 4.2 Individual members shall be fully prepared with all copes, blocks, holes and weld bevels pre-cut prior to assembly.
- 4.3 Web block cuts shall be carefully controlled to avoid over-cut notches.
- 4.4 Burrs, metal slivers and rough edges shall be ground smooth.
- 4.5 Boltholes shall be punched, sub-punched and reamed or drilled. Flame cutting of holes is not permitted. Unless otherwise noted on the drawings, all holes shall be 1.5mm (1/16 inch) larger than the diameter of the bolt to be used.
- 4.6 Splicing of structural members where not detailed on the drawings is prohibited without the prior written approval of the OWNER as to location and type of splice to be made. Cutting of structural steel members on site during erection shall not be permitted without prior written approval of the OWNER.
- 4.7 Centerline dimensions shall be held to within 6mm (1/4 inch) for critical dimensions involving field tie-ins. This tolerance applies to overall dimensions and shall not apply separately to subdivisions of overall dimensions.
- 4.8 No work shall be performed when the weather or other adverse conditions do not permit competent workmanship and/or adequate inspection.

#### **5.0 WELDING**

- 5.1 All structural welding shall be in accordance with AWS D1.1.
- 5.2 Unless noted otherwise on the drawings, all shop connections shall be welded and all field connections shall be bolted.
- 5.3 Electrodes for shop and field welds shall conform to Class E70XX.
- 5.4 Flange to flange connection shall be by full penetration welds. All other welds, unless noted otherwise, shall be minimum size fillet welds in accordance with the AISC Manual of Steel Construction.
- 5.5 Welder Qualification and Identification.
  - 5.5.1 All welders employed by the FABRICATOR for shop or by the CONTRACTOR for field welding on this work shall be required to show written evidence that



they have satisfactorily passed a performance qualification test using a qualified welding procedure within the last ninety days. OWNER shall approve welding procedures prior to welding. The FABRICATOR shall bear all costs for qualifying welding procedures and welders in accordance with AWS D1.1.

## 5.6 Inspection of Welds

- 5.6.1 OWNER may elect to use any applicable method, such as radiography, ultrasonics, magnetic particle, trepanning, etc. to check weld quality (particularly on main load carrying members, padeyes and splices).
- 5.6.2 Defective welds, after repair, are subject to radiographic or ultrasonic re-examination at the FABRICATOR's expense.
- 5.6.3 Any rejected welds, which upon destructive examination were found to be acceptable, shall be repaired at OWNER's expense.

## 6.0 BOLTED JOINTS

- 6.1 Bolted connections for primary structural members shall conform to ASTM A325-SC (slip critical), unless noted otherwise on drawings.
- 6.2 Secondary bolted connections shall be detailed as ASTM A325-X (threads excluded from shear plane), unless noted otherwise on drawings.
- 6.3 Bolts shall have a hardened washer placed under the element to be tightened.
- 6.4 Bolts shall be tightened in accordance with "Turn-of-Nut" tightening method.
- 6.5 All joint surfaces shall have protective coatings applied before assembly.
- 6.6 Anchor bolts for base plates are to be firmly tightened and locked after grout has cured.

## 7.0 PROTECTIVE COATINGS

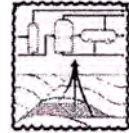
- 7.1 Unless noted as galvanized, all structural steel shall be coated in accordance with OWNER's specification PCAM-0100-ET-X-0002, Selection and Application of Protective Coatings.
- 7.2 All uncoated field members, field splice, weld areas, etc. shall be painted by the CONTRACTOR in accordance with specification PCAM-0100-ET-X-0002, Selection and Application of Protective Coatings.



Perú Corp. S.A.

**CONSTRUCTION PRACTICE  
FOR  
STEEL FABRICATION  
AND ERECTION**

Doc. No.: PCAM-0100-ET-S-0004 Rev. A



**PARAGON**  
ENGINEERING SERVICES

Date: October 19, 2001

## **8.0 ERECTION**

- 8.1 Erection shall be in accordance with AISC specifications, and shall include the setting of all columns, beams, trusses, grating, handrails, etc. and all the erection of all other steel to true line, grade, and plumb.
- 8.2 Structural steel shall be plumbed with suitable guy wires and held plumb during field tightening of bolts, or field welding, if required. Guy wires shall be placed so as not to interfere with the necessary work. Guy wires are to remain in place until the structure is stable. No permanent bolting or field welding shall be done until structures are properly aligned.
- 8.3 Steel shall not be placed or erected on concrete foundations or floor slabs until the concrete has attained 50 percent of its 28-day strength.



**SELECTION AND APPLICATION  
OF PROTECTIVE COATINGS**



PES Project Number A1065

Pluspetrol

Revision:	B	C	D	E
Description:	Issued for EPC1	Issued for EP-F Bid	Issued for Bid	Issued for Bid
Prepared By:	BTB	FDLF	BTB	DM
Checked By:	AP	DWW	DWW	DWW
Approved By:	DH	MBM	MBM	MBM
Date of Issue:	9/26/01	12/19/01	01/24/02	03/14/02

**CAMISEA UPSTREAM  
FACILITIES**

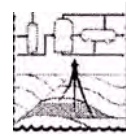
**SPECIFICATION NUMBER: PCAM-0100-ET-X-0002-E**

**PES No.: A1065-05-050000-0100-X-0054-E**



**SELECTION AND APPLICATION OF  
PROTECTIVE COATINGS**

**Doc. No.: PCAM-0100-ET-X-0002 Rev. E**



**PARAGON**  
ENGINEERING SERVICES

Date: March 13, 2002

**TABLE OF CONTENTS**

1.0	INTRODUCTION .....	3
2.0	DEFINITIONS .....	3
3.0	REFERENCED CODES, STANDARDS, AND OTHER DOCUMENTS .....	3
4.0	PREVAILING ORDERS.....	4
5.0	SCOPE .....	4
6.0	DESIGN REQUIREMENTS .....	5
7.0	ATTACHMENTS .....	12

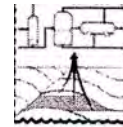
Table A - Coating Systems

Table B - Vendor List



## SELECTION AND APPLICATION OF PROTECTIVE COATINGS

Doc. No.: PCAM-0100-ET-X-0002 Rev. E



**PARAGON**  
ENGINEERING SERVICES

Date: March 13, 2002

### 1.0 INTRODUCTION

This Specification defines the minimum requirements for surface preparation, application and materials for coatings required to protect structures and equipment in an onshore oil and gas facility in tropical South America.

### 2.0 DEFINITIONS

2.1 Capitalized text when used in this document shall have the following specific definitions:

**CONTRACT** shall mean the EPC Contract invoking this specification, together with its Annexes, Appendices, and Schedules.

**WORK** is the complete goods and services to be provided as described in the **CONTRACT**.

**OWNER** is Pluspetrol Peru Corporation S.A.

**CONTRACTOR** is the company, incorporated in Peru, that entered into a **CONTRACT** agreement with the **OWNER** to perform the EPC **WORK**.

**OWNERS REPRESENTATIVE** is the individual appointed by the **OWNER** to act as such for the purposes provided in Article 13 of The **CONTRACT** or any other person so appointed from time to time by the **OWNER** and notified in writing as such to the **CONTRACTOR**.

**ENGINEER** is Paragon Engineering Services, Inc.

**SUBCONTRACTOR** is any person or company to whom the **CONTRACTOR** has subcontracted parts of the **WORK** (with the consent of **OWNERS REPRESENTATIVE**, or pursuant to Article 33 of the **CONTRACT**) and the Subcontractor's legal successors in title, but not any assignee of the Subcontractor.

### 3.0 REFERENCED CODES, STANDARDS, AND OTHER DOCUMENTS

The latest revisions of the following referenced documents and specifications and those listed in the **CONTRACT** or Purchase Order shall be considered a part of this specification. The material requirements and fabrication of all components shall meet or exceed the applicable sections of the latest issues of the following Codes and Standards, unless specified otherwise in this document:

3.1 American National Standards Institute (ANSI) A53.1 – Marking Physical Hazard Safety Color Code.

3.2 American Society for Testing Materials (ASTM) A123 – Hot Dip Galvanizing.

3.3 The Society for Protective Coatings (SSPC):

- SSPC – SP 1 Solvent Cleaning
- SSPC – SP 2 Hand Tool Cleaning
- SSPC – SP 3 Power Tool Cleaning
- SSPC – SP 5 White Metal Blast Cleaning
- SSPC – SP 6 Commercial Blast Cleaning
- SSPC – SP 10 Near - White Blast Cleaning

#### **4.0 PREVAILING ORDERS**

Prevailing order documents controlling the WORK performed shall be as follows:

- 4.1 Local laws and regulations.
- 4.2 Construction permits as issued in accordance with findings of EIA review.
- 4.3 Project specific engineering specifications as issued by OWNER and OWNER'S REPRESENTATIVE. This specification is one such document.
- 4.4 Industry Codes and Standards (API, ASME, etc.).
- 4.5 CONTRACTOR'S bid response documents.

#### **5.0 SCOPE**

- 5.1 This specification defines the minimum requirements for the surface preparation, application, and materials for coatings required to protect piping, tanks, vessels, structural steel, and equipment at onshore installations in accordance with the standards and codes listed in Section 3.0 and other conditions of this specification.
- 5.2 This specification is intended to supplement the construction drawings and to serve as an installation guide for activities not detailed.
- 5.3 Should any discrepancies exist between any drawings, codes, specifications, or conflicting interpretation of it by others, it shall be the responsibility of the CONTRACTOR to notify the OWNER'S REPRESENTATIVE in writing before any



WORK is initiated. Failure to do so may result in all WORK being redone at the CONTRACTOR'S expense. The more stringent shall apply unless otherwise permitted by the OWNER'S REPRESENTATIVE. The OWNER'S REPRESENTATIVE decision will be final in resolving these conflicts.

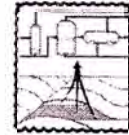
- 5.4 All items listed or implied in this specification shall be considered part of the CONTRACTOR'S Scope of WORK or Supply.
- 5.5 All WORK shall be subject to inspection by the OWNER'S REPRESENTATIVE at any time. The CONTRACTOR shall immediately make any items available for inspection at the request of the OWNER'S REPRESENTATIVE. The inspection or lack of inspection of the WORK by the OWNER does not relieve the CONTRACTOR from the responsibility of performing the WORK in accordance with this specification
- 5.6 CONTRACTOR shall make any repairs at his cost.
- 5.7 The OWNER reserves the right to stop the WORK at any time when it is determined by the OWNER that the WORK is not in accordance with this specification.
- 5.8 The CONTRACTOR shall have a latest edition of all-applicable standards and codes listed in this specification available on site from the beginning of construction.
- 5.9 The CONTRACTOR shall maintain accurate and organized records during the course of construction and documentation as required by the CONTRACT and this specification. The records shall be made available for OWNER inspection at any time.

## **6.0 DESIGN REQUIREMENTS**

- 6.1 Where any equipment or other items are coated before incorporation into a structure, the coating system shall be applied up to the topcoat. The final coat shall be applied after installation and coating damage repair as provided herein. Pressure equipment, piping, etc., to be subjected to stress relief, welding, or pressure testing shall not be cleaned, insulated or coated until such activities are satisfactorily completed.
- 6.2 Unless otherwise specified, the following shall not be coated:
  - 6.2.1 Grease nipples and fittings,
  - 6.2.2 Machined surfaces,
  - 6.2.3 Gasket contact surfaces,
  - 6.2.4 Threaded connections,



- 6.2.5 Friction-grip surfaces,
  - 6.2.6 Site weld margins before welding,
  - 6.2.7 Equipment, name or special instruction plates attached to or included as part of any unit,
  - 6.2.8 Valve stems, movable linkages, compressor or pump shafts, or any similar surfaces that are normally lubricated or have close working tolerances,
  - 6.2.9 Flange sealing surfaces.
- 6.3 CONTRACTOR shall be responsible for storing materials in covered shelters at temperatures recommended by the manufacturer.
- 6.4 CONTRACTOR shall ensure that the coating materials provided are utilized on a "First-In First-Out" basis and that the shelf life is not exceeded.
- 6.5 When coating materials from more than one manufacturer are used, strict control shall be maintained over their storage, issue and use to ensure that no unapproved interchange, mixing or over coating of or by different manufacturer's materials take place.
- 6.6 All coating materials shall be furnished in original, unopened containers bearing the manufacturer's label and instructions. All containers of paint shall remain unopened until required for use. Coating materials which have livered, gelled, or otherwise deteriorated shall not be used.
- 6.7 For two-part materials, the pot life under application conditions shall be clearly stated on the container label and this pot life shall not be exceeded. When the pot-life limit is reached, the spray equipment shall be emptied, remaining material discarded, the equipment cleaned and new material prepared.
- 6.8 Equipment
- 6.8.1 All brushes, rollers, spray and blast equipment shall be in good condition and appropriate for the WORK undertaken.
  - 6.8.2 Contractor shall furnish air required for blasting and conventional spraying. Air shall be clean, dry and in sufficient quantity and at adequate pressure to perform the work in accordance with manufacturing data sheets.
  - 6.8.3 In recirculating paint systems where gas under pressure is used over the liquid, the gas shall be inert, e.g., nitrogen.



- 6.8.4 Abrasives for cleaning shall be free from undesirable contaminants. Expendable abrasives shall not contain more than 2% by weight of either Fe<sub>2</sub>O<sub>3</sub> or CuO. CONTRACTOR shall, when requested by OWNER'S REPRESENTATIVE, produce analysis of the abrasive in use. The abrasive shall be of suitable size, and when recirculated, shall be maintained within a suitable size range, to produce the specified blast profile.
- 6.8.5 If a centrifugal wheel blast cleaning device is used for surface preparation, the start-up charge shall be a combination of steel grit and steel shot sized to obtain the specified surface profile. All required make-up shall be limited to steel grit.
- 6.8.6 Sand used for blast cleaning shall be dry, neutral pH, hard siliceous material of angular configuration free of dust, clay or other foreign particles. Sieve analysis shall be as follows:

U.S. SIEVE SERIES	RETAINED ON SIEVE
Through 8, Retained on 20	20% to 40%
Through 20, Retained on 40	47% to 80%
Through 40	12% Maximum

**6.9 Internal Coatings - All Tanks**

- 6.9.1 Coatings for internal surfaces shall be in accordance with recommendations of the manufacturer. Approved manufacturers are listed in Table B. Coating type shall be epoxy.
- 6.9.2 All water tanks shall be fully coated internally including the roof in accordance with Table A.
- 6.9.3 Oil storage tanks shall be coated on the base and for a minimum height of 3 meters above their base in accordance with Table A.
- 6.9.4 Coatings shall be visually inspected and tested with a holiday detector (Tinker & Razor or OWNER'S REPRESENTATIVE approved equal). All thin or damaged areas shall be repaired or recoated. Repairs of coating shall be carried out in strict accordance with the coating manufacturer's written procedures.

**6.10 Surface Preparation**

- 6.10.1 The following surfaces shall not be abrasive blasted:

## SELECTION AND APPLICATION OF PROTECTIVE COATINGS

Doc. No.: PCAM-0100-ET-X-0002 Rev. E

Date: March 13, 2002

- Grease nipples and fittings,
  - Machined surfaces,
  - Gasket contact surfaces,
  - Threaded connections,
  - Friction-grip surfaces,
  - Site weld margins before welding,
  - Equipment, name or special instruction plates attached to or included as part of any unit,
  - Valve stems, movable linkages, compressor or pump shafts, or any similar surfaces that are normally lubricated or have close working tolerances,
  - Flange sealing surfaces.
- 6.10.2 The degree and type of surface preparation shall be in accordance with specified section of Table A or Coating Vendor's Recommendation, whichever is more stringent.
- 6.10.3 All bolt holes shall be drilled and sharp edges rounded prior to surface preparation. This includes ANSI flange boltholes. (No torch cut hole is permissible).
- 6.10.4 All rough welds, burrs, weld splatter, indentations, and other sharp surface projections shall be ground smooth (or to 1/8" minimum radius) prior to further surface preparation. Any grinding done after sandblasting shall be blast cleaned to obtain proper anchor pattern. Any heat-treating shall be completed prior to blasting or coating operations.
- 6.10.5 Blast cleaning abrasives shall be consistent with the requirements of sections 6.8.4 through 6.8.6 of this specification. The particle size of abrasive mix shall be consistent with the requirements for anchor profile of the coating being applied.
- 6.10.6 Adequate oil/moisture separators shall be installed in the sand blasting and painting equipment to keep the surfaces to be coated free of oil/moisture contamination. A daily blotter test shall be performed to monitor the suitability of the compressed air supply.



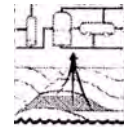
- 6.10.7 Any oil, grease, soil, dust, or foreign matter deposited on the surface after the surface preparation is completed shall be removed prior to painting. If rusting occurs after completion of surface preparation, the surfaces shall again be cleaned in accordance with the specified method.
- 6.10.8 Surfaces shall be primed within four hours after being blast cleaned.
- 6.10.9 After final blast cleaning, no inhibitor shall be used.
- 6.10.10 Cleaning and painting shall be planned so that detrimental amounts of dust or other contaminants do not fall on wet paint.
- 6.11 Application
- 6.11.1 All applications shall be performed in accordance with the Coating Manufacturer's recommendations and the applicable sections of Steel Structures Painting Council Specification (SSPC-PA 1), "Shop, Field, and Maintenance Painting".
- 6.11.2 All field applied coating materials shall be furnished by the Manufacturer in unopened, clearly identified containers. No mixing of different coatings may be done without the express written permission of the OWNER'S REPRESENTATIVE.
- 6.11.3 Spray equipment shall be in accordance with the Coating Manufacturer's recommendations in regard to tip size, hose diameters, hose lengths, pot agitation, and pot pressure.
- 6.11.4 Coatings shall not be applied to steel which has a surface temperature less than 5°F above the atmospheric dewpoint. The surface temperature shall not be high enough to cause blistering, porosity, or other damaging effects to the coating.
- 6.11.5 Coatings shall not be applied in rain, wind in excess of 15 mph, snow, fog, mist, or in areas where injurious airborne elements exist. Coatings shall not be applied when relative humidity is above 80 percent or when temperature is below 50°F.
- 6.11.6 When coatings must be applied in damp or cold weather, the steel must be painted under cover; the surrounding air and steel shall be heated to a satisfactory temperature. In all such cases, the temperature and humidity conditions of paragraphs 6.11.4 and 6.11.5 must be met. Such steel shall remain under cover and protected until dry or until weather conditions permit its exposure.



Perú Corp. S.A.

## SELECTION AND APPLICATION OF PROTECTIVE COATINGS

Doc. No.: PCAM-0100-ET-X-0002 Rev. E



**PARAGON**  
ENGINEERING SERVICES

Date: March 13, 2002

- 6.11.7 Each coat of material shall be applied as continuous film of uniform thickness free of pores. Any thin spots or areas missed in the application shall be recoated and permitted to dry before the next coat is applied.
  - 6.11.8 Each coat shall be in a proper state of cure or dryness before the application of the succeeding coat. Material shall be considered dry for re-coating when an additional coat can be applied without the development of any detrimental film irregularities, such as lifting or loss of adhesion of the undercoat.
  - 6.11.9 Alternate coats shall be tinted to produce enough contrast to indicate complete coverage of the surface to which coatings are being applied. When the coating is the color of the steel or when the tinting of the final coat is objectionable, the first coat to apply shall be tinted. The tinting material shall be recommended by the Manufacturer and shall not be detrimental to its service life.
  - 6.11.10 Wet coatings shall be protected against contamination from dust or other foreign matter.
  - 6.11.11 Coating shall not be force-dried under conditions that will cause checking, wrinkling, blistering, formation of pores, or harm to the condition of the paint.
  - 6.11.12 Coating damaged by shipment, handling, welding, and cutting or by any other means shall be repaired without undue delay before erecting or installing the materials and equipment affected. The areas of damaged coating shall be prepared in accordance with the coating manufacturer's printed recommendations and the appropriate coating(s) reapplied. The finished thickness of a repaired area shall in no case be less than that of the original coating.
  - 6.11.13 Manufacturer's standard coatings on equipment such as compressors, motors, pumps, panels, etc. will be satisfactory as the primer coat providing that the inter-coat compatibility with the appropriate painting system is ensured. It is the joint responsibility of the coating manufacturer and the CONTRACTOR to develop a coating system that meets the specified criteria.
- 6.12 Galvanizing
- 6.12.1 Where specified, all steel grating, ladders, handrails, stairways, etc., and miscellaneous hardware shall be hot dip galvanized per ASTM A-123 after all cutting, shaping, and welding.



- 6.12.2 The weight of zinc coating shall average not less than 2.3 ounces per square ounces per square foot.
- 6.12.3 Galvanized surfaces shall not be painted.
- 6.13 Final Colors
  - 6.13.1 Vessels, piping, structural steel, and equipment shall have a final color by Manufacturers standards. OWNER'S REPRESENTATIVE shall approve final color scheme.
  - 6.13.2 Fire and safety equipment shall have a final color of Safety Red in accordance with ANSI Z53.1.
  - 6.13.3 Life saving equipment shall have a final color of Safety Orange in accordance with ANSI Z53.1.
  - 6.13.4 Temporary bracing to be painted brown. Final acceptance of the WORK shall be painted yellow.

**7.0 ATTACHMENTS**

**TABLE A  
COATING SYSTEMS**

CLASSIFICATION OF SURFACE	SURFACE PREPARATION	TOTAL PRIME COAT	MID COAT	TOP COAT	MAX DFT MIL	TEMP LIMIT °F
1 Un-insulated Piping, Pipe Support & Unpainted Steel Structures	<u>Blast Clean</u> "Commercial" SSPC-SP6 1-3 mils Profile	<u>Epoxy</u> <u>5-6</u>	<u>None</u>	<u>Polyurethane</u> 1 1/2-2	4 1/2 - 7 1/2	200
2. Vessels, piping, etc., ambient to 200°F	<u>Blast Clean</u> "Commercial" SSPC-SP6 1-3 mils Profile	<u>Epoxy</u> <u>5-6</u>	<u>None</u>	<u>Polyurethane</u> 1 1/2-2	5 - 8	200
2A. Vessels, skids, piping	<u>Blast Clean</u> "Near White" SSPC-SP10 1-3 mils Profile	<u>Epoxy</u> <u>5-6</u>	<u>None</u>	<u>Polyurethane</u> 1 1/2-2	4 1/2 - 7 1/2	200
3. Vessels, piping, etc. 200°F - 300°F	<u>Blast Clean</u> "Near White" SSPC - SP10 1 - 3 mils Profile	<u>Zinc Primer</u> 2 1/2 - 4 mils	<u>Epoxy</u> <u>5-6</u>	<u>Polyurethane</u> 1 1/2-2	9-12	300
3A. Vessels, stacks, piping, etc. 200°F - 1200°F	<u>Blast Clean</u> "Near White" SSPC - SP10 1 - 3 mils Profile	<u>Zinc Primer</u> 2 1/2 - 4 mils	<u>None</u>	<u>Mod. Silicone</u> 1 - 2 mils	3 1/2 - 6	1200
4. Insulated piping, vessels, etc., operating from ambient to 200°F (See Note)	<u>Blast Clean</u> "Commercial" SSPC-SP6 1 - 3 mils Profile	<u>Alkyd Primer</u> 1 1/2 - 2 1/2 mils	<u>None</u>	<u>Alkyd</u> 1 1/2 - 2 1/2 mils	3 - 5	200
5. Insulated piping vessels, etc. operating above 200 °F (See Note)	<u>None</u>	<u>None</u>	<u>None</u>	<u>None</u>	--	--
6. Insulated piping vessels, etc. operating below 200° F	<u>Blast Clean</u> "Near White" SSPC-SP10 1 - 3 mils Profile	<u>Zinc Primer</u> 2 1/2 - 4 mils	<u>None</u>	<u>Epoxy</u> 5 - 6 mils	7 1/2 - 10	--



**SELECTION AND APPLICATION OF  
PROTECTIVE COATINGS**



**PARAGON**  
ENGINEERING SERVICES

Doc. No.: PCAM-0100-ET-X-0002 Rev. E

Date: March 13, 2002

CLASSIFICATION OF SURFACE	SURFACE PREPARATION	TOTAL PRIME COAT	MID COAT	TOP COAT	MAX DFT MIL	TEMP LIMIT °F
7. Engines, pumps, and machinery already painted by OEM	<u>Power Tool Clean</u> SSPC-SP3	<u>Universal Primer</u> (See Para. 3.13)	<u>Epoxy</u> 5 - 6 mils	<u>Polyurethane</u> 1 1/2 - 2 mils	9-12	300
8. Structural Steel grating, stairs, handrails, ladders and cages	These items shall be galvanized per ASTM A 123	<u>None</u>	<u>None</u>	<u>None</u>	--	--
9. Galvanized	<u>Solvent Clean</u> SSPC-SP1	<u>None</u>	<u>None</u>	Cold Galvanizing	2 - 4	180
10. Repair	<u>Hand or Power Tool Clean</u> SSPC-SP2 or SP3	<u>As Req'd by Classification</u>	<u>As Req'd by classification</u>	<u>As Req'd by classification</u>	--	--
11. Potable Water Tanks – Internal	<u>White Metal</u> SSPC-SP5	<u>Epoxy Primer</u> 3-6 mils	<u>None</u>	Epoxy 5-8 mils	8-14 mils	225°F
12. Crude oil * Firewater. Tanks – Internal	<u>Blast Clean</u> SSPC-SP10	<u>Epoxy</u> 3-6 mils	<u>None</u>	<u>Epoxy</u> 5-8 mils	8-14 mils	140°F

Note: Piping and vessels located in sheltered areas and not subjected to rain mist or spray do not require protective coatings under insulated surfaces.

\* Coated on base and up to 3 meter level only.



**TABLE B**  
**VENDOR LIST**

TYPE	VENDOR	I.D. NUMBER
Alkyd Primer	Ameron Carboline Devoe International Sigma	To be Determined
Alkyd Mid Coat	Ameron Carboline Devoe International Sigma	To be Determined
Alkyd Top Coat	Ameron Devoe Carboline International Sigma	To be Determined
Zinc Primer	Carboline Devoe Ameron International Sigma	To be Determined
Epoxy	Carboline Devoe Ameron International Sigma	To be Determined
Polyurethane	Carboline Devoe Ameron International Sigma	To be Determined
Modified Silicone	Carboline Devoe Ameron International Sigma	To be Determined



**SELECTION AND APPLICATION OF  
PROTECTIVE COATINGS**



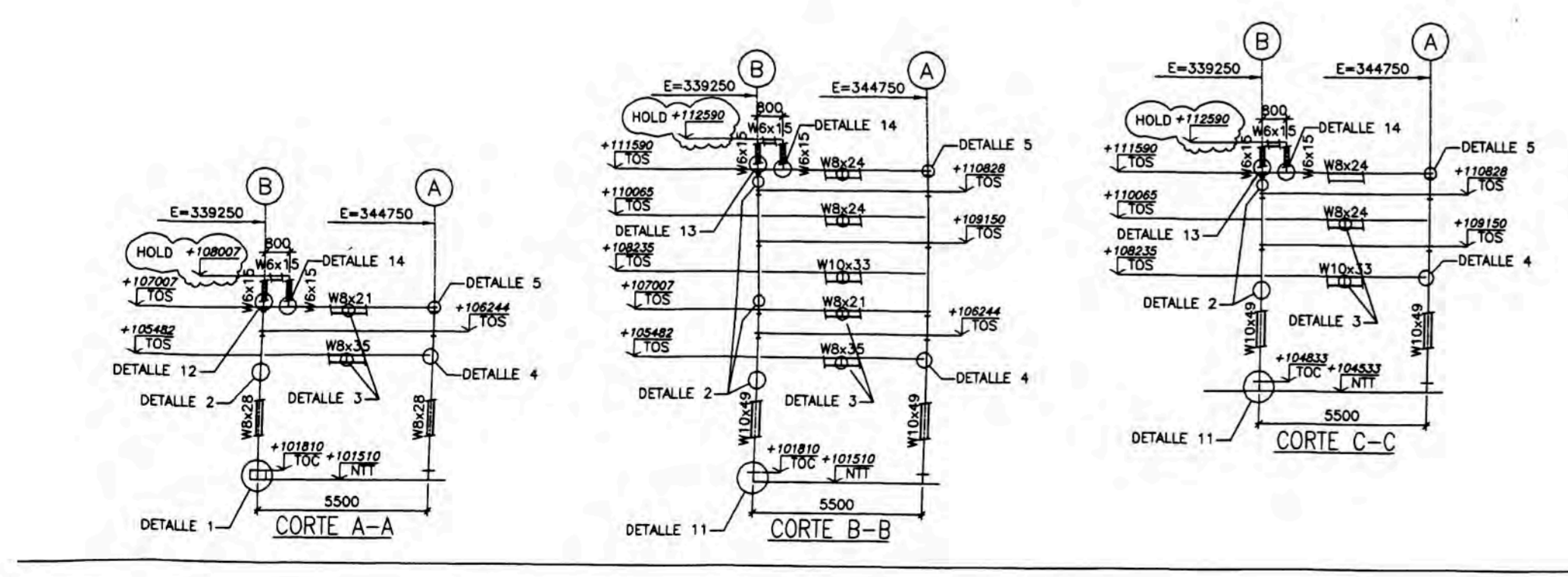
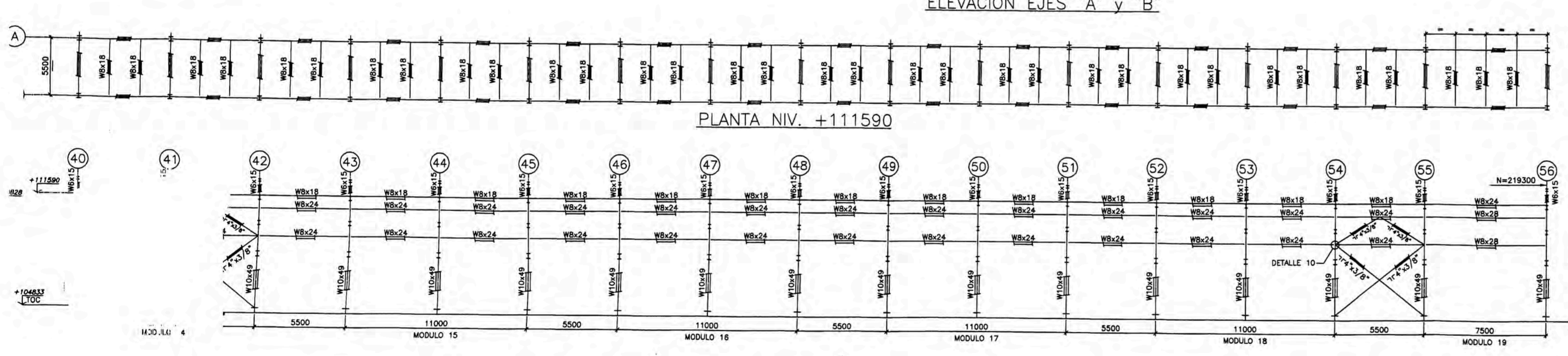
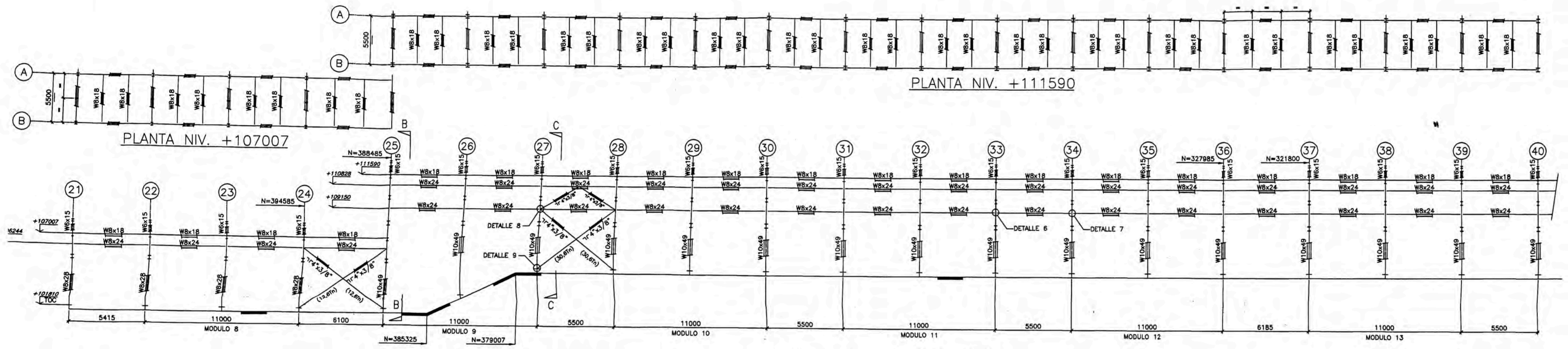
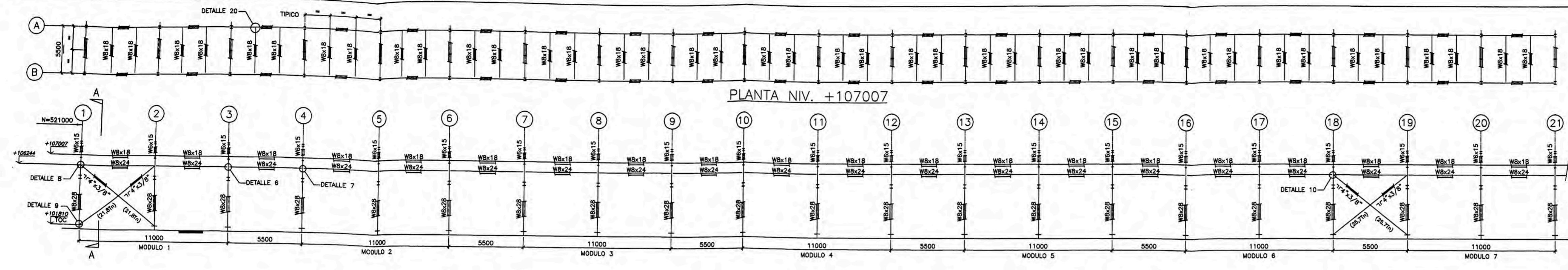
**PARAGON**  
ENGINEERING SERVICES

**Doc. No.: PCAM-0100-ET-X-0002 Rev. E**

**Date: March 13, 2002**

Cold Galvanizing	ZRC Galvacon Subox International Sigma	To be Determined
------------------	--	------------------

**PLANOS**



NOTAS GENERALES:

1. TODOS LOS PERFILES Y CHAPAS ESTRUCTURALES SERAN DE CALIDAD ASTM A 36.-
2. LOS BULONES PARA LAS CONEXIONES ESTRUCTURALES SERAN GALVANIZADOS Y DE CALIDAD ASTM A 325, SALVO INDICACION EN CONTRARIO.-
3. LOS ELECTRODOS SERAN DE CALIDAD E 70XX DE ACUERDO CON AWS D1.1.-
4. EL DIAMETRO MINIMO DE LOS BULONES ESTRUCTURALES SERA 3/4".-
5. LAS ESTRUCTURAS SE IGNIFUGARAN DE ACUERDO A LA ESPECIFICACION TECNICA "PIPING & EQUIPMENT INSULATION / FIREPROOFING, SELECTION & INSTALLATION", PCAM-0100-ET-C-0003-B.-
6. A TODAS LAS SUPERFICIES IGNIFUGADAS SE LES APLICARA EL "PRIMER COAT" INDICADO EN LA ESPECIFICACION "SELECTION AND APPLICATION OF PROTECTIVE COATINGS" PCAM-0100-ET-X-0002-E, EN TABLA A, CORRESPONDIENTE A LA "CLASSIFICATION OF SURFACE 1".-
7. A LAS SUPERFICIES QUE NO TENGAN PROTECCION IGNIFUGA SE APLICARA EL ESQUEMA COMPLETO DE PINTURA INDICADO EN EL ITEM 6.-
8. LOS CORDONES DE SOLDADURA NO INDICADOS TENDRAN UN CATETO IGUAL AL 0.7 DEL ESPESOR MINIMO A UNIR.-
9. LOS ESFUERZOS PARA EL CALCULO DE CONEXIONES NO INDICADOS EN LAS BARRAS DE ARRIOSTRAMIENTOS Y RETICULADOS SE TOMARAN IGUAL A LA CAPACIDAD PORTANTE DE LA BARRA A TRACCION.-

REFERENCIAS:

PCAM-0200-PL-S-002: PARRAL PRINCIPAL 1- DETALLES.-  
 TOS : TOP OF STEEL.-  
 TOC : TOP OF CONCRETE.-  
 NTT : NIVEL TERRENO TERMINADO.-

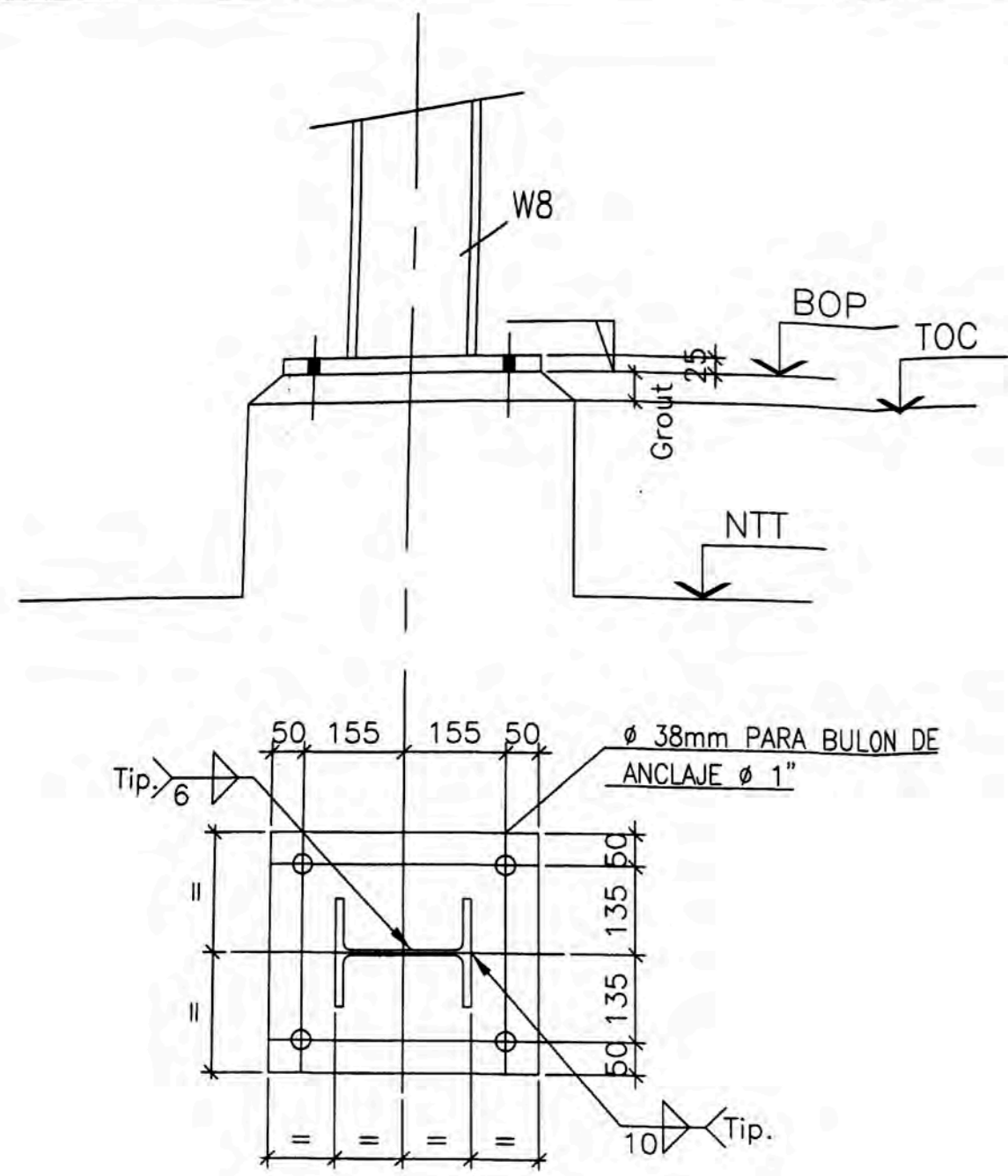
ESPECIFICACIONES TECNICAS

STRUCTURAL STEEL DESIGN: PCAM-0100-ET-S-0002-A.-  
 SELECTION AND APPLICATION OF PROTECTIVE COATINGS CON ANEXO COMPLEMENTARIO: PCAM-0100-ET-X-0002-E.-  
 PIPING & EQUIPMENT INSULATION / FIREPROOFING, SELECTION INSTALLATION: PCAM-0100-ET-C-0003-B.-  
 CONSTRUCTION PRACTICE FOR STEEL FABRICATION AND ERECTION: PCAM-0100-ET-S-0004-A.-

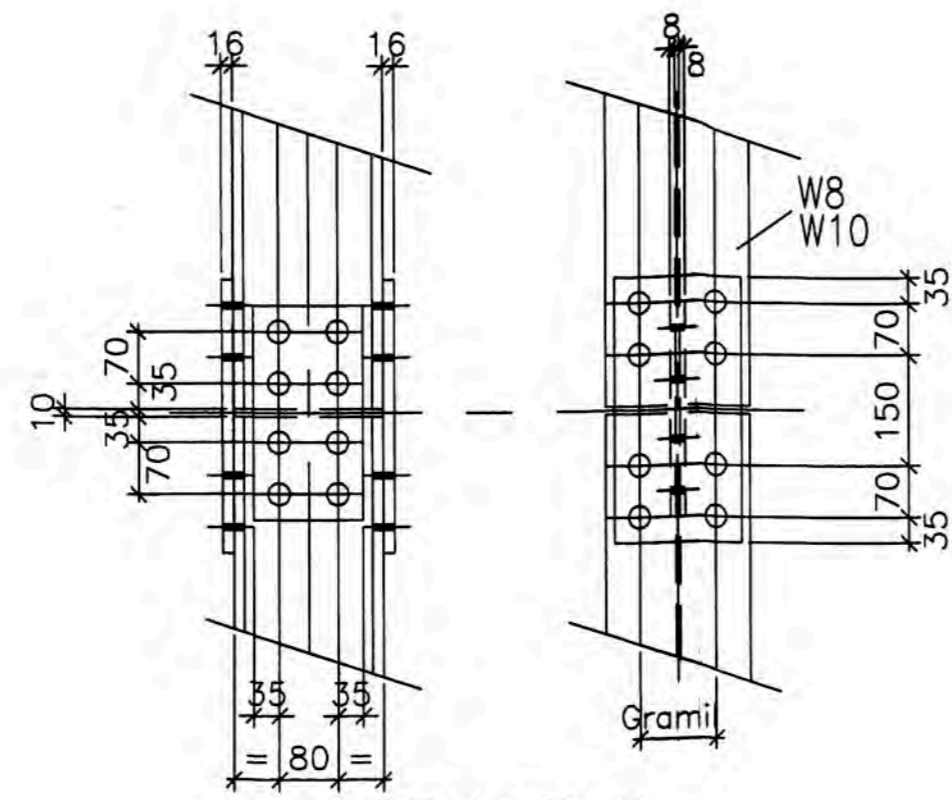
REQUISICIONES DE INGENIERIA

FABRICACION DE PARRALES: PCAM-0200-RI-S-001-A.-

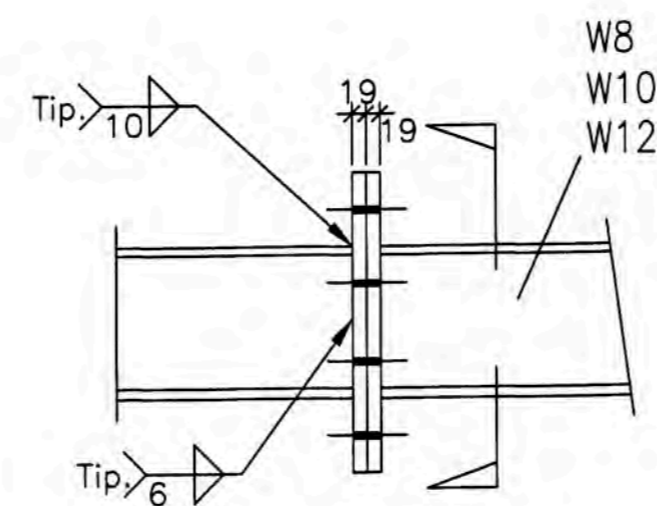
A EMISION PARA COMENTARIOS		12/07/02	PAE	COR	JC
REV.	DESCRIPCION	FECHA	EJEC.	REV.	APR.
 <b>CONSORCIO SADE SKANSKA-LATINTECNA-JJC</b>					
CLIENTE: PLUSPETROL PERU CORPORATION S.A.			PROYECTO: EPC1 CAMISEA		
OBRA: EPC1 CAMISEA			TITULO: MALVINAS PLANT PARRAL PRINCIPAL 1 DISPOSICION GENERAL		
INGENIERIA DE PROYECTO		ESCALA: 1:150	DOCUMENTO N°: PCAM-0200-PL-S-001	REVISION: A	
<small>Toda la informacion contenida en la presente documentacion es confidencial y de propiedad de Pluspetrol, siendo prohibida su reproduccion o copia, total o parcial, sin autorizacion previa.</small>		Reemplaza a:	Hoja: 01 de 1		



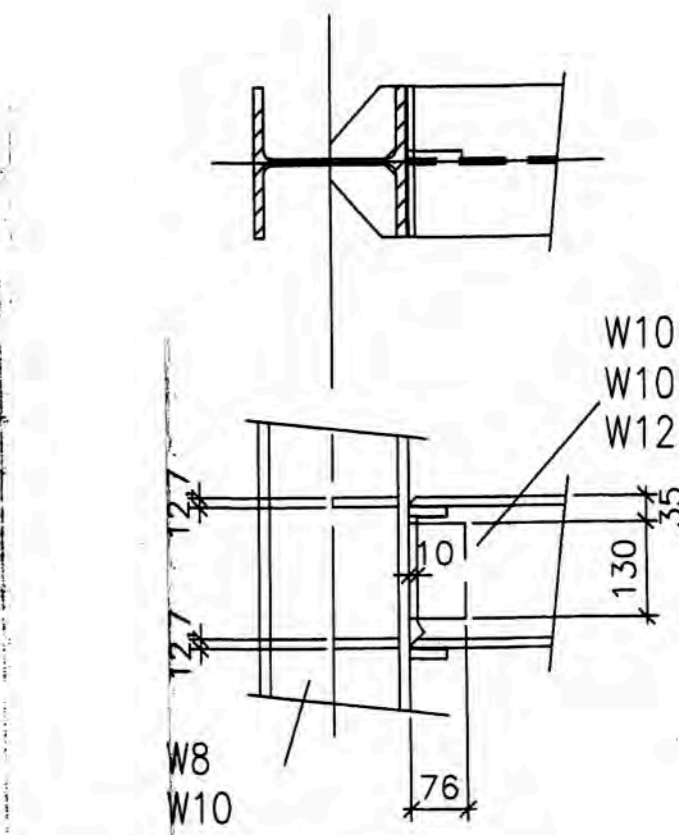
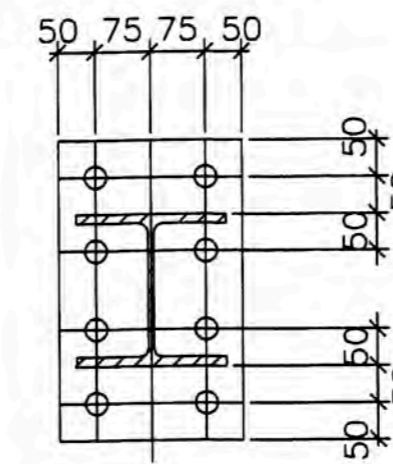
DETALLE 1



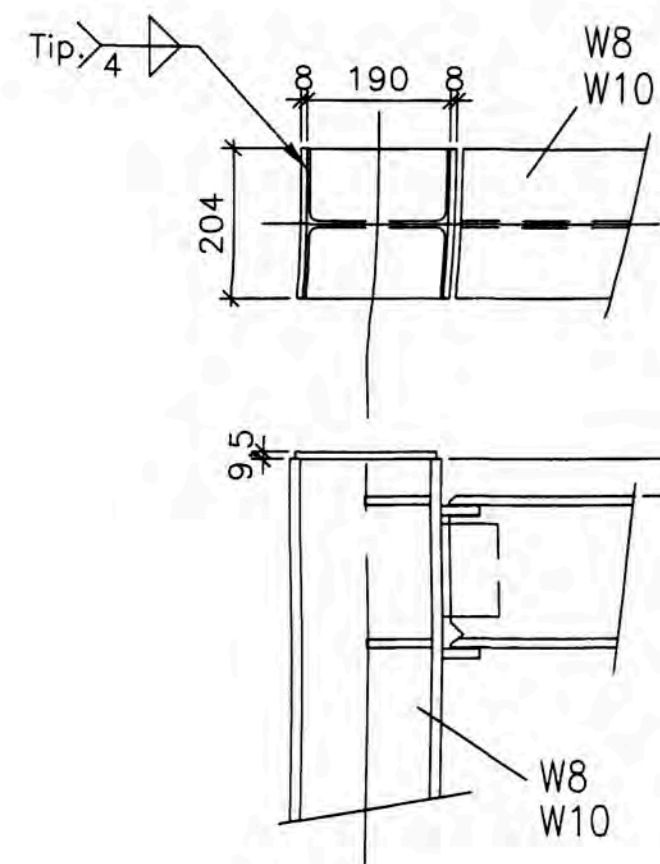
DETALLE 2



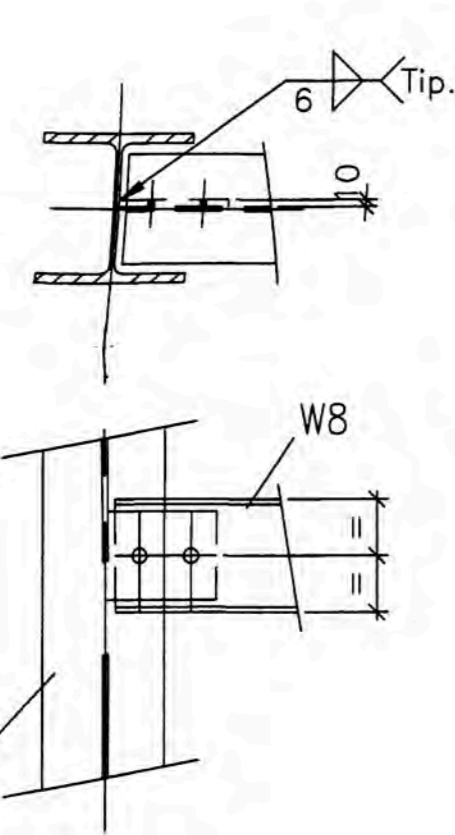
DETALLE 3



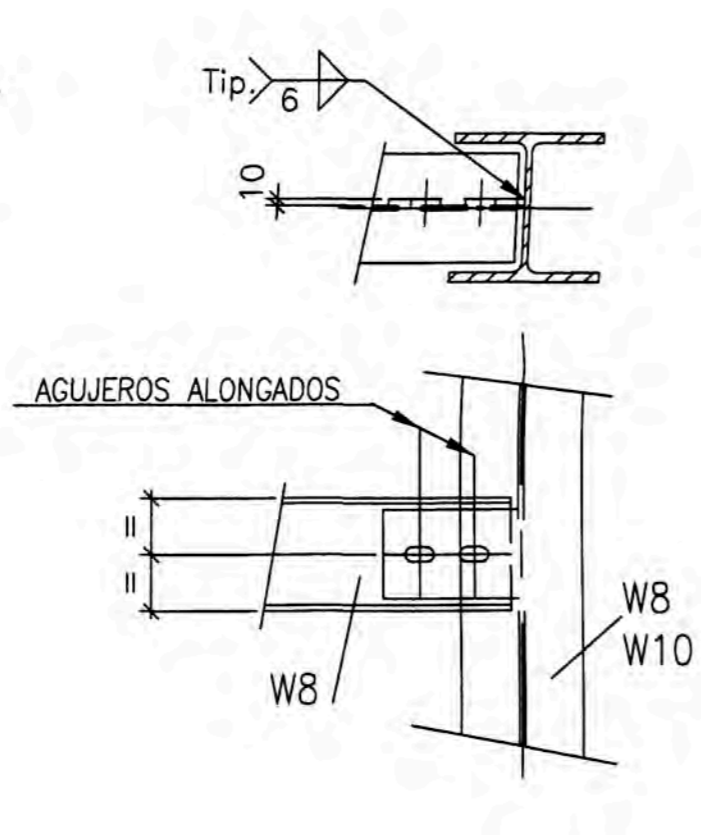
DETALLE 4



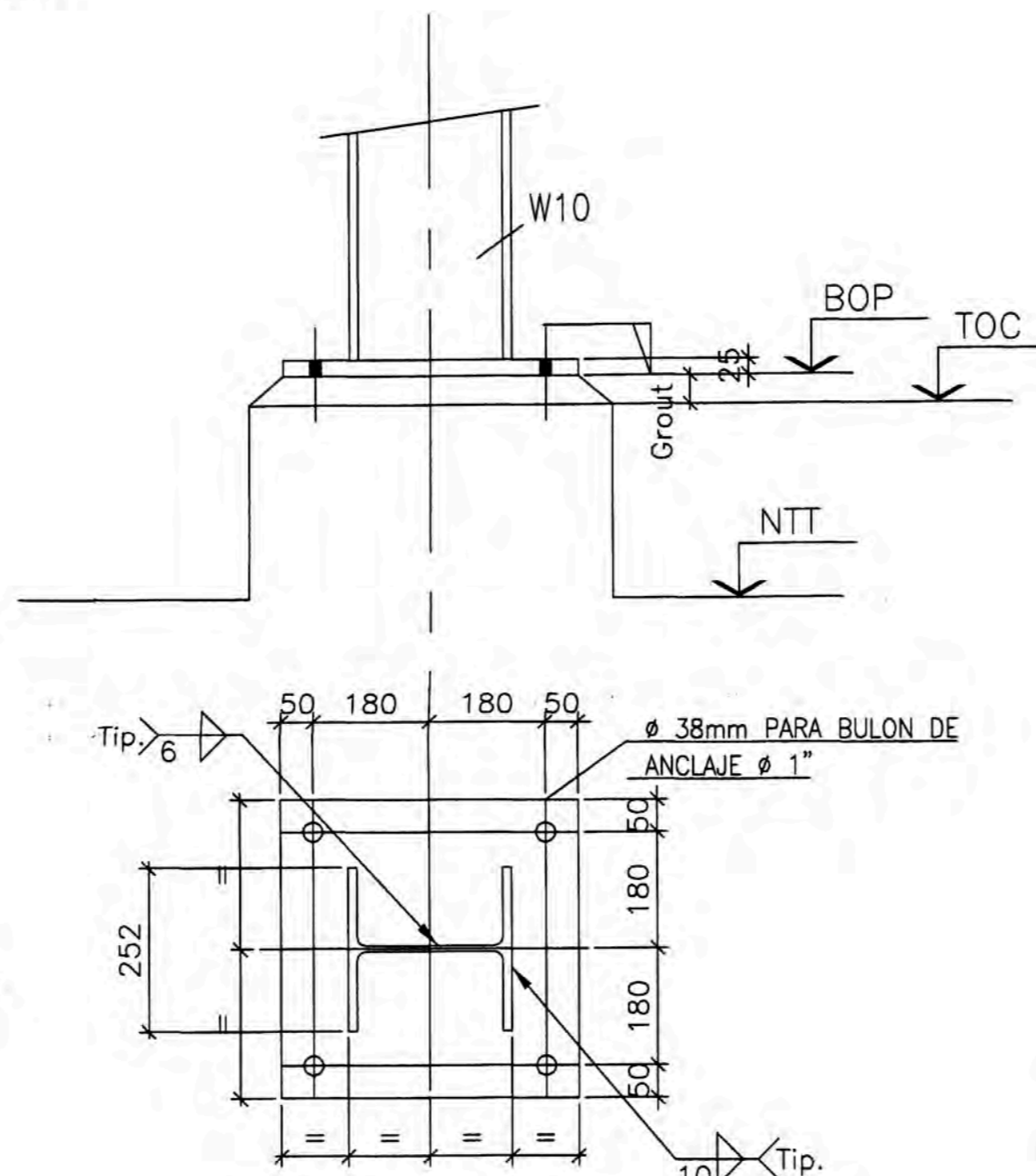
DETALLE 5



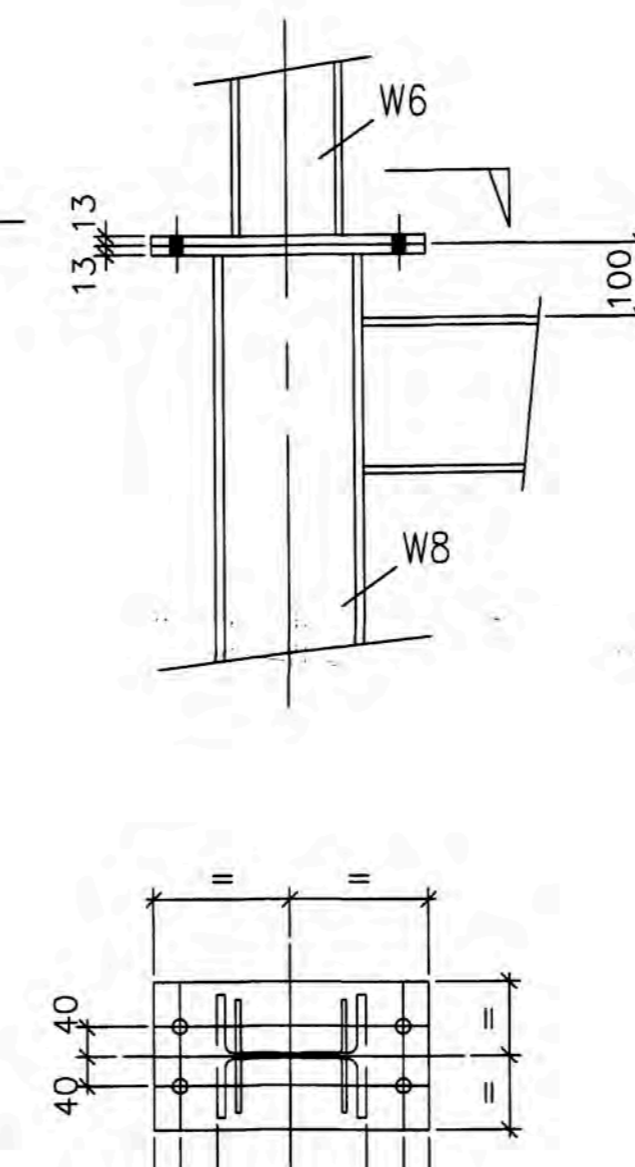
DETALLE 6



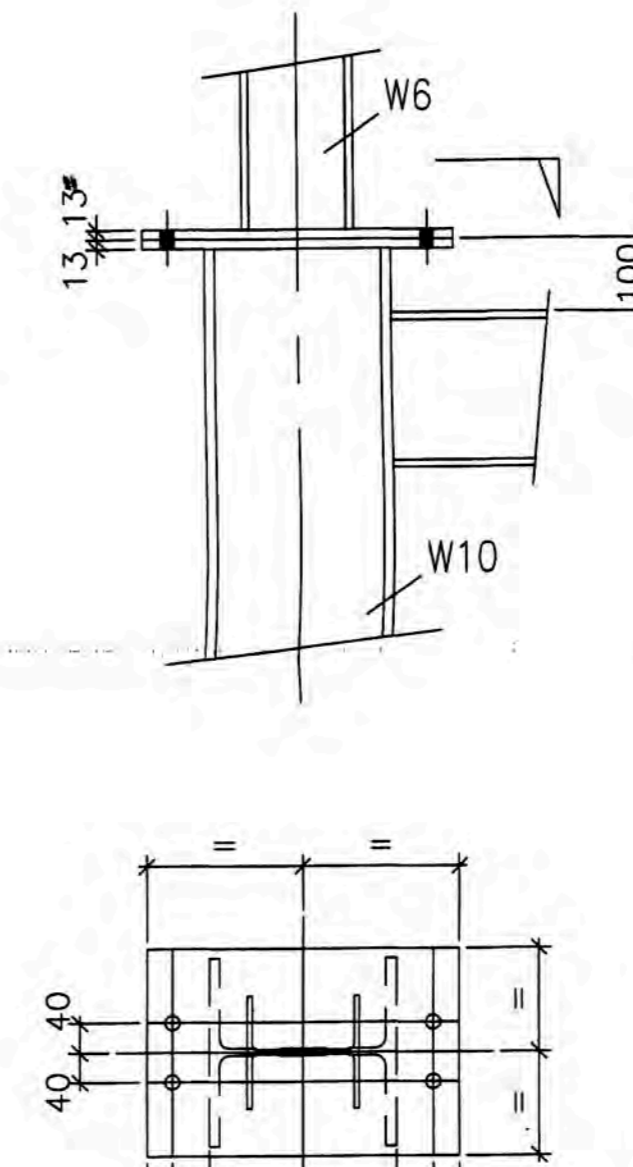
DETALLE 7



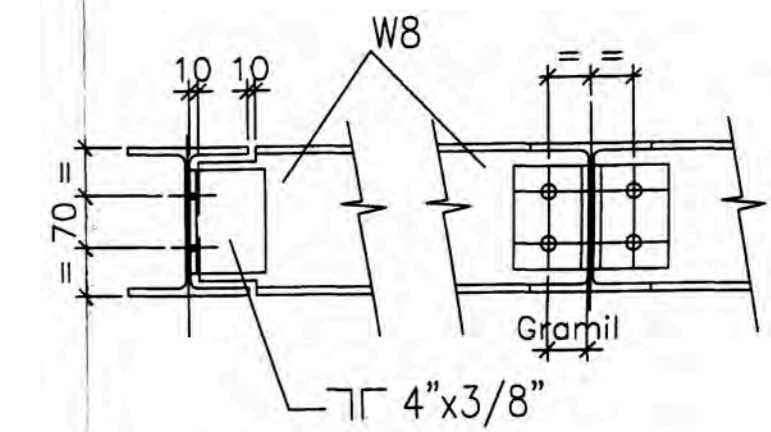
DETALLE 11



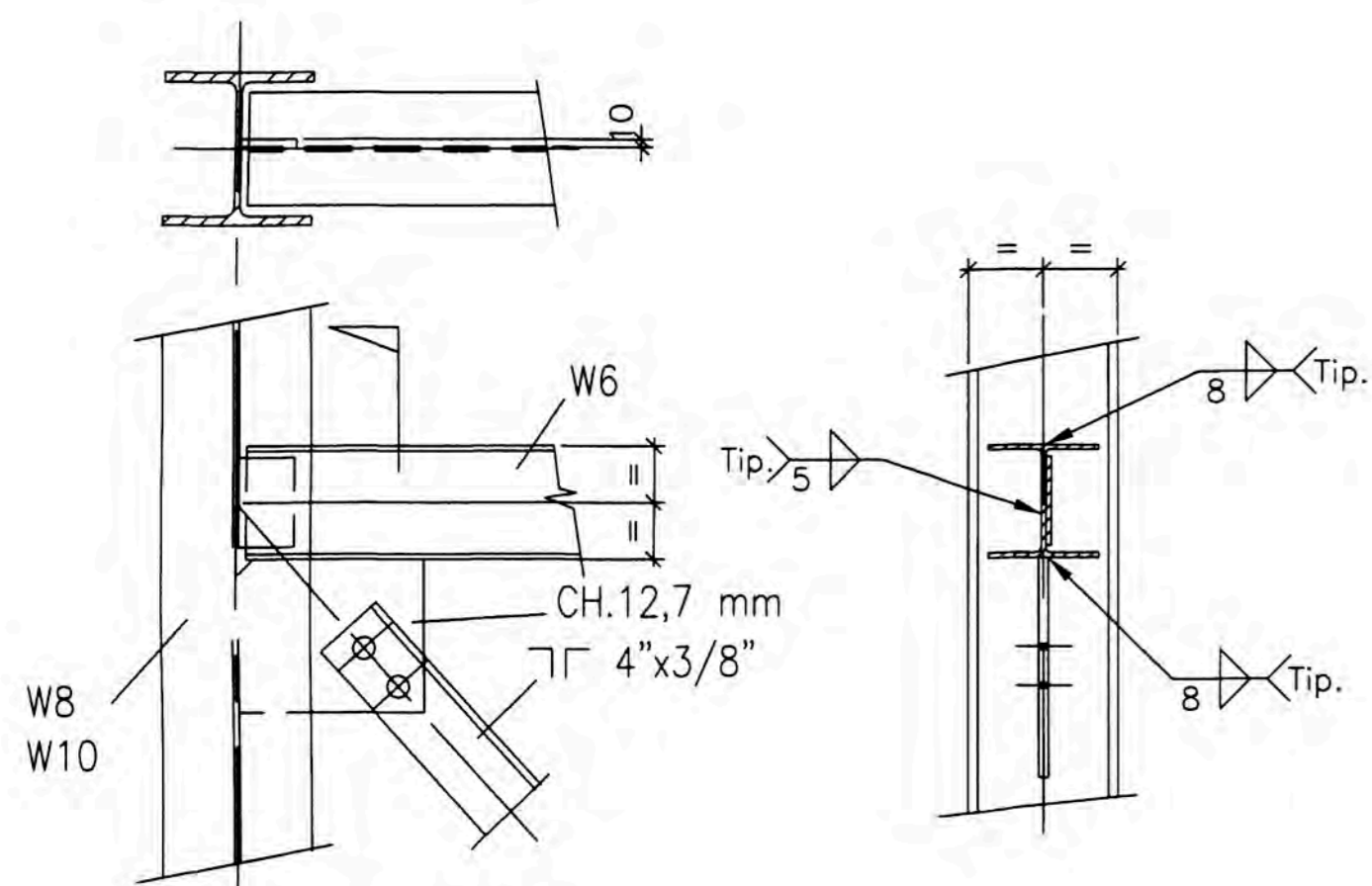
DETALLE 12



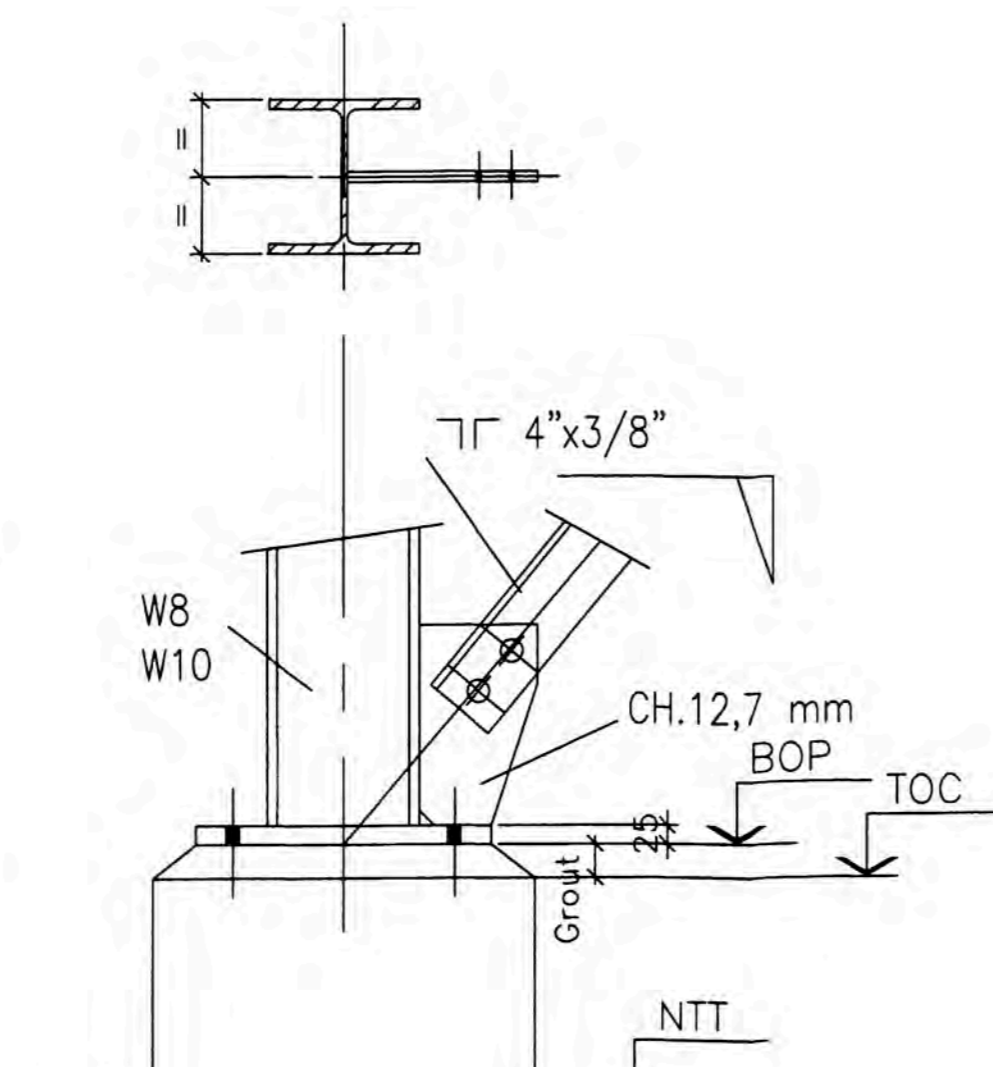
DETALLE 13



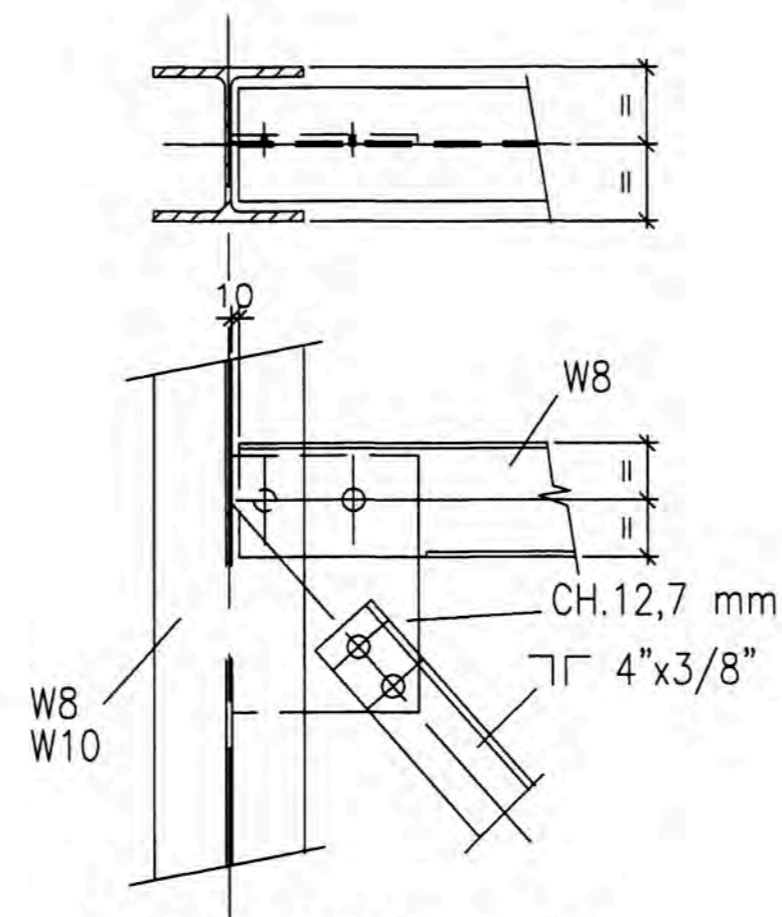
DETALLE 20



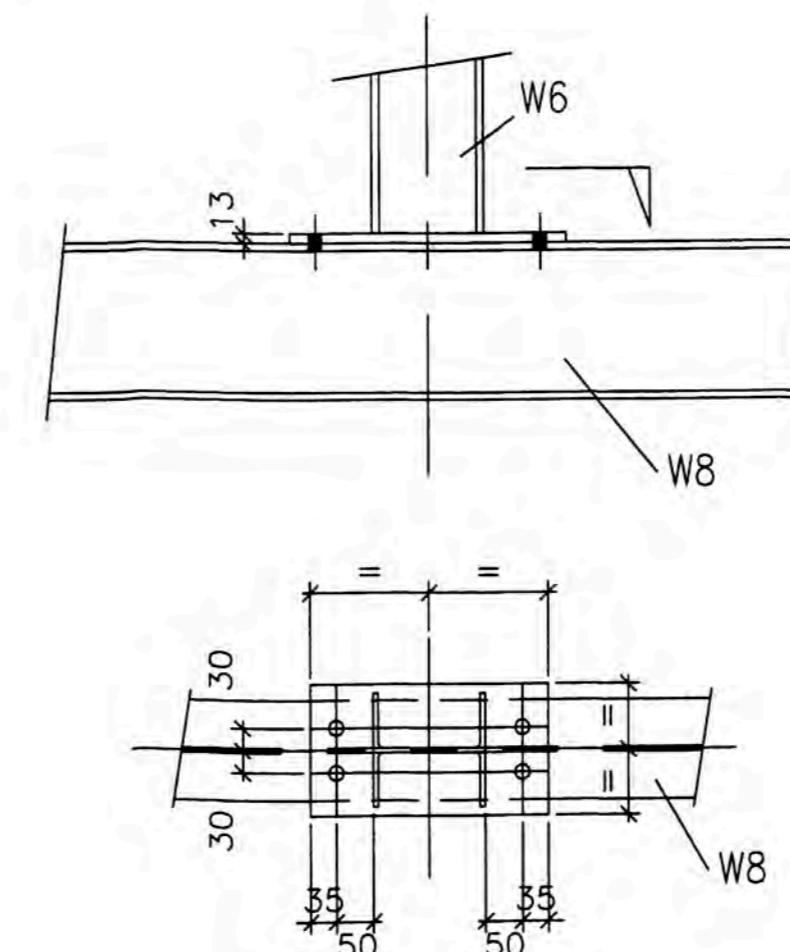
DETALLE 8



DETALLE 9



DETALLE 10



DETALLE 14

NOTAS GENERALES:

- LA CANTIDAD DE BULONES INDICADA EN LOS DETALLES DE UNIONES, TIENE CARACTER INDICATIVO. LA CANTIDAD DEFINITIVA LA DETERMINARA EL FABRICANTE DE ACUERDO A LOS ESFUERZOS EN LOS ELEMENTOS DE LA UNION
- EL DIAMETRO MINIMO DE LOS BULONES SERA 3/4", SALVO INDICACION EN CONTRARIO.-

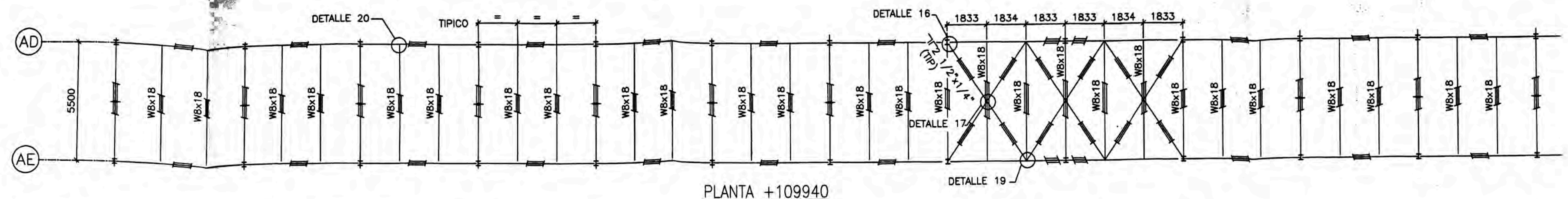
REFERENCIAS:

PCAM-0200-PL-S-001: PARRAL PRINCIPAL 1- DETALLES.-  
 BOP : BOTTOM OF PLATE.-  
 TOC : TOP OF CONCRETE.-  
 NTT : NIVEL TERRENO TERMINADO.-

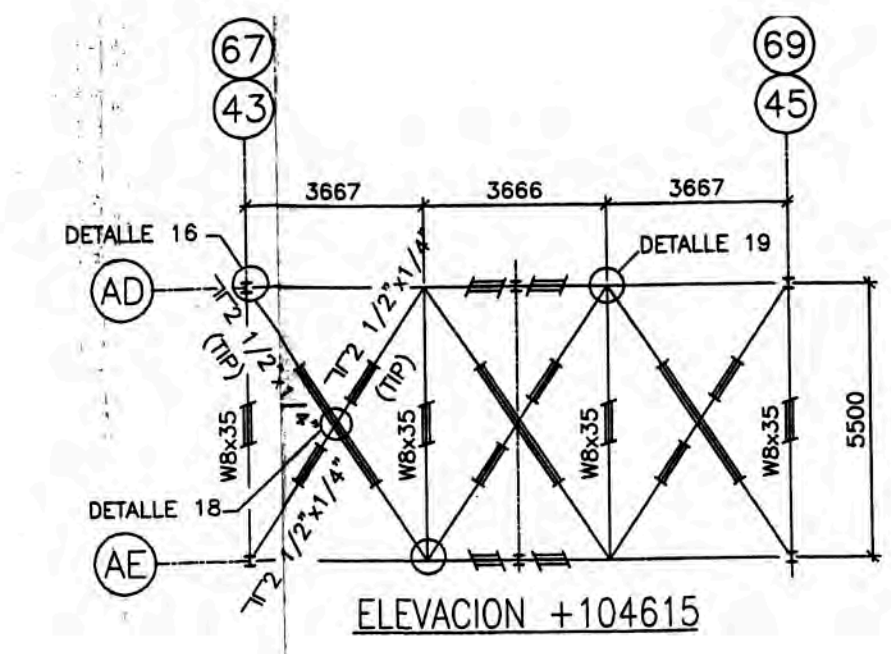
REV.	EMISION PARA COMENTARIOS	DESCRIPCION	FECHA	EJEC.	REV.	APR.
A			12/07/02	PAE	COR	JC

CONSORCIO SADE SKANSKA-LATINTECNA-JJC  
 CLIENTE: PLUSPETROL PERU CORPORATION S.A.  
 OBRA: EPC1 CAMISEA

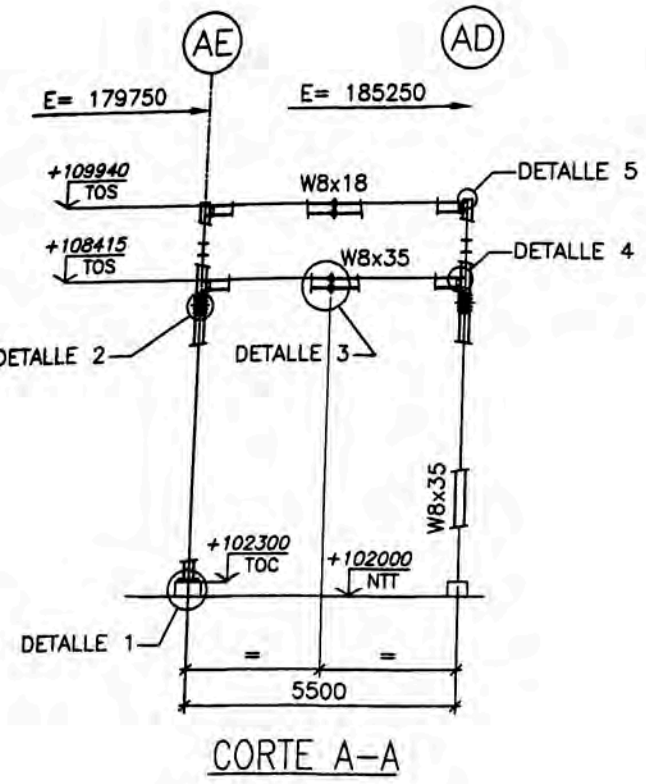
INGENIERIA DE PROYECTO	TITULO	REVISION:
	MALVINAS PLANT PARRAL PRINCIPAL 1 DETALLES CONSTRUCTIVOS	A
ESCALA	DOCUMENTO N°:	Reemplaza a:
1:10	PCAM-0200-PL-S-002	
		Hoja: 01 de 1



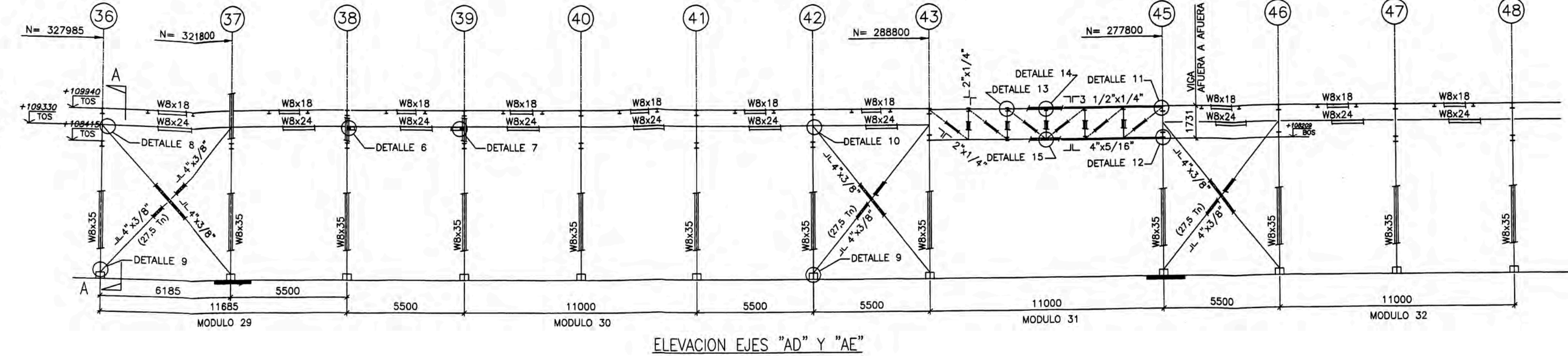
PLANTA +109940



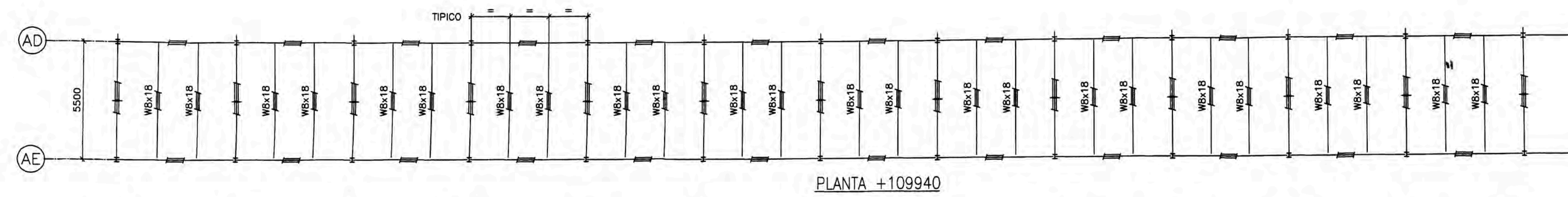
ELEVACION +104615



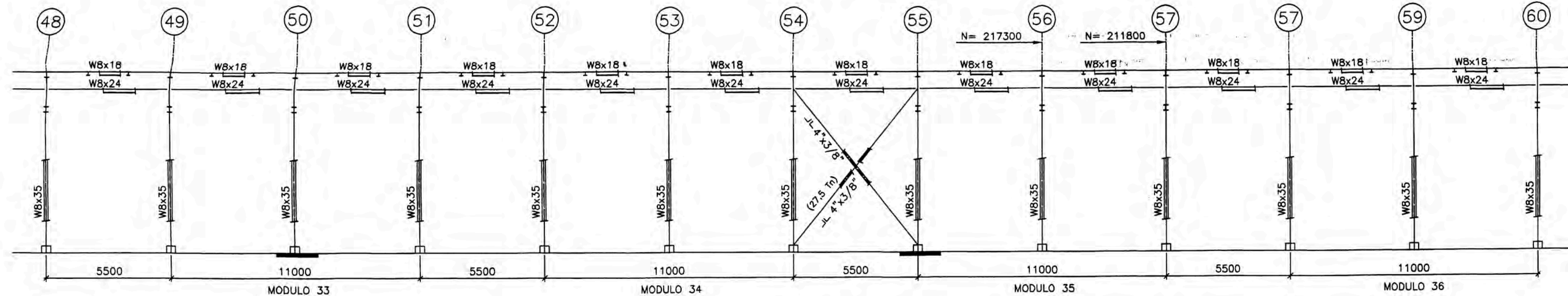
CORTE A-A



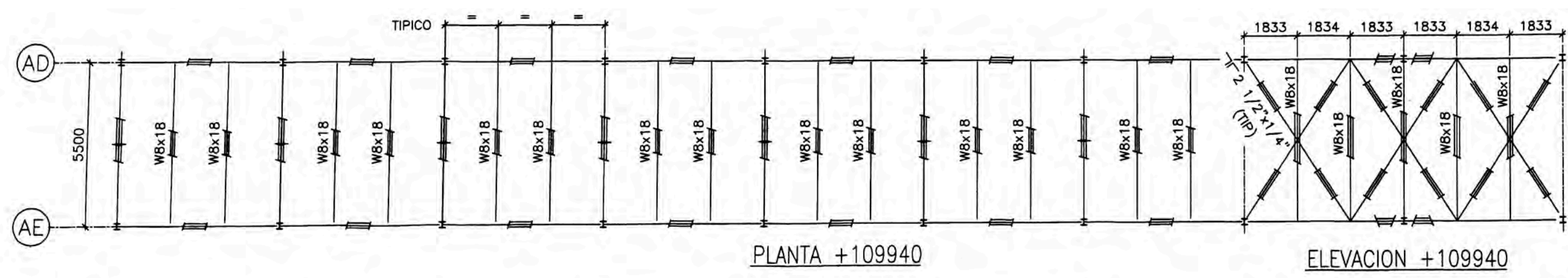
ELEVACION EJES "AD" Y "AE"



PLANTA +109940

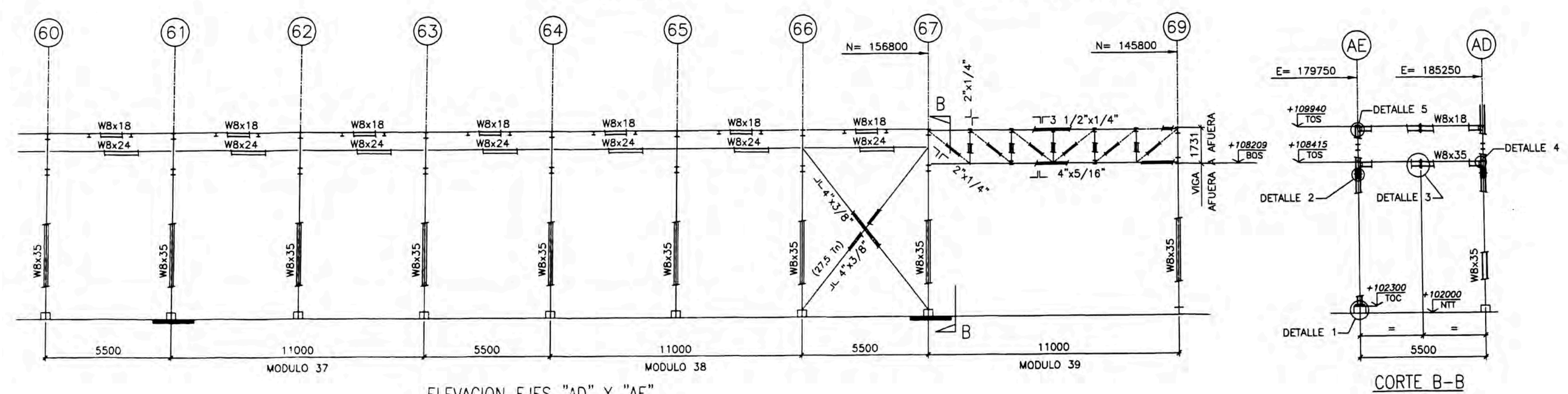


ELEVACION EJES "AD" Y "AE"



PLANTA +109940

ELEVACION +109940



ELEVACION EJES "AD" Y "AE"

CORTE B-B

NOTAS GENERALES:

1. TODOS LOS PERFILES Y CHAPAS ESTRUCTURALES SERAN DE CALIDAD ASTM A 36.-
2. LOS BULONES PARA LAS CONEXIONES ESTRUCTURALES SERAN GALVANIZADOS Y DE CALIDAD ASTM A 325, SALVO INDICACION EN CONTRARIO.-
3. LOS ELECTRODOS SERAN DE CALIDAD E 70XX DE ACUERDO CON AWS D1.1.-
4. EL DIAMETRO MINIMO DE LOS BULONES ESTRUCTURALES SERA 3/4".-
5. LAS ESTRUCTURAS SE IGNIFUGARAN DE ACUERDO A LA ESPECIFICACION TECNICA "PIPING & EQUIPMENT INSULATION / FIREPROOFING, SELECTION & INSTALLATION", PCAM-0100-ET-C-0003-B.-
6. A TODAS LAS SUPERFICIES IGNIFUGADAS SE LES APLICARA EL "PRIMER COAT" INDICADO EN LA ESPECIFICACION "SELECTION AND APPLICATION OF PROTECTIVE COATINGS" PCAM-0100-ET-X-0002-E, EN TABLE A, CORRESPONDIENTE A LA "CLASSIFICATION OF SURFACE 1".-
7. A LAS SUPERFICIES QUE NO TENGAN PROTECCION IGNIFUGA SE APLICARA EL ESQUEMA COMPLETO DE PINTURA INDICADO EN EL ITEM 6.-
8. LOS CORDONES DE SOLDADURA NO INDICADOS TENDRAN UN CATETO IGUAL AL 0.7 DEL ESPESOR MINIMO A UNIR.-
9. LOS ESFUERZOS PARA EL CALCULO DE CONECCIONES NO INDICADOS EN LAS BARRAS DE ARRIOSTRAMIENTOS Y RETICULADOS SE TOMARAN IGUAL A LA CAPACIDAD PORTANTE DE LA BARRA A TRACCION.-

REFERENCIAS:

PCAM-0200-PL-S-004: PARRAL PRINCIPAL 2- DETALLES.-  
 TOS : TOP OF STEEL.-  
 TOC : TOP OF CONCRETE.-  
 NTT : NIVEL TERRENO TERMINADO.-  
 BOS : BOTTOM OF STEEL.-

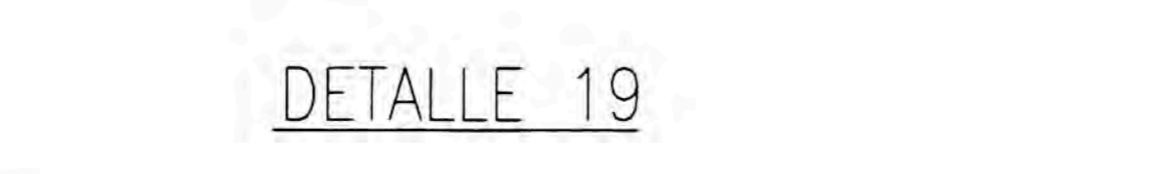
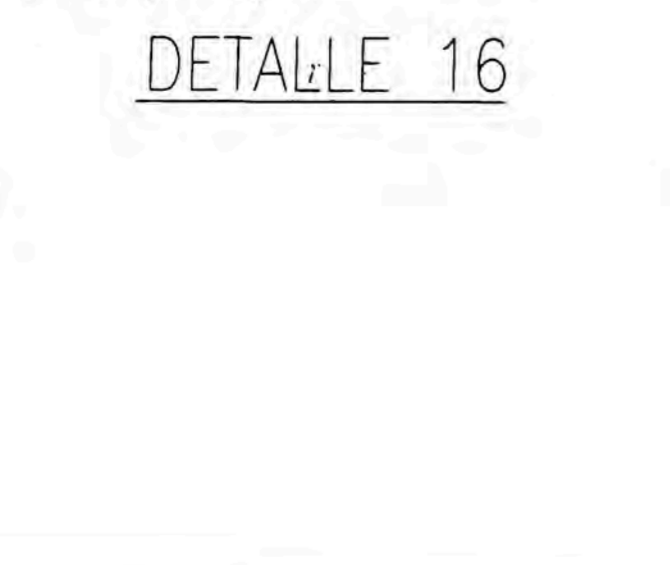
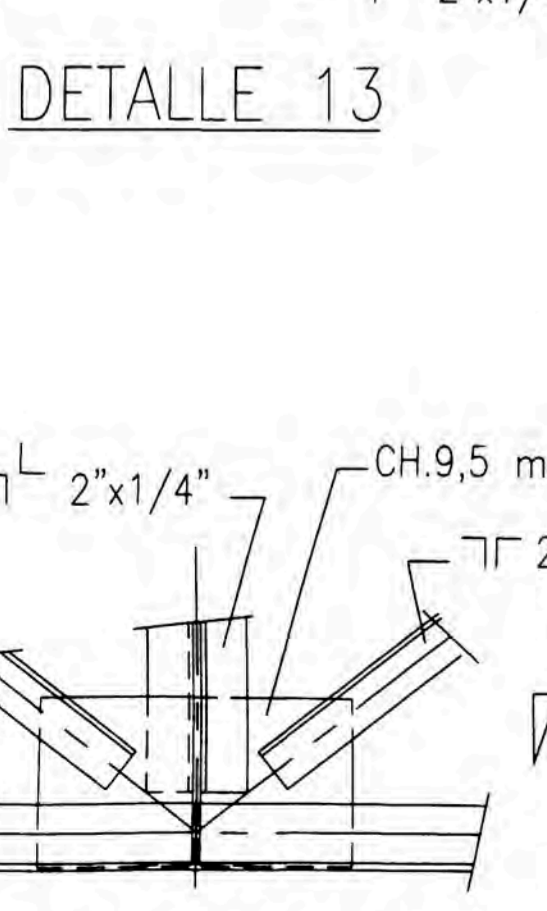
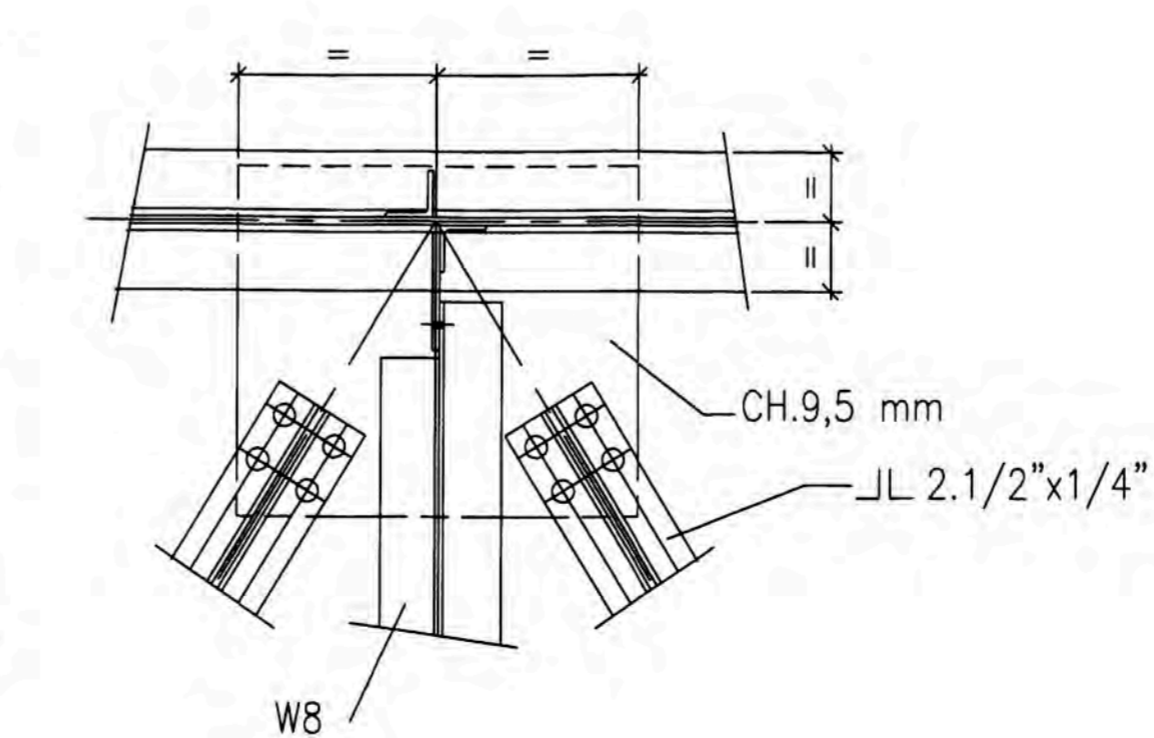
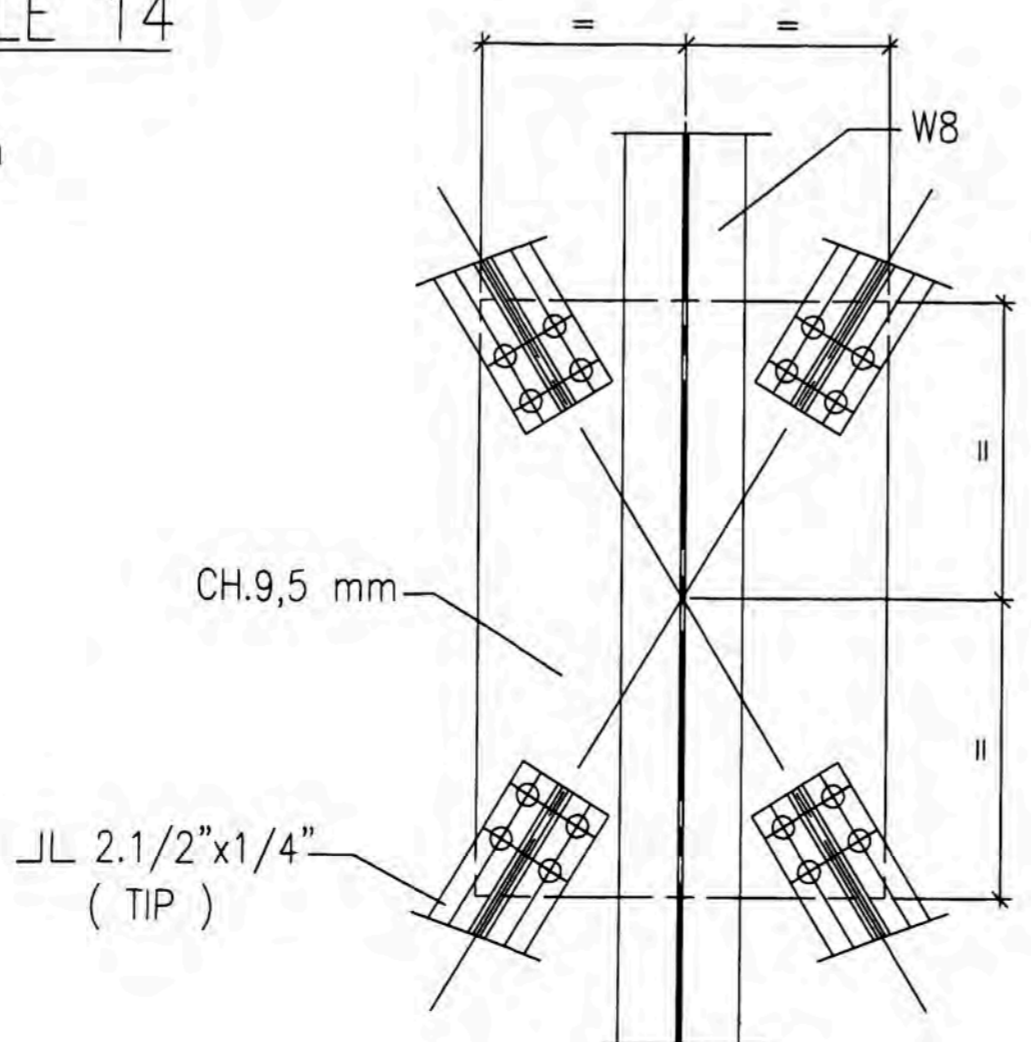
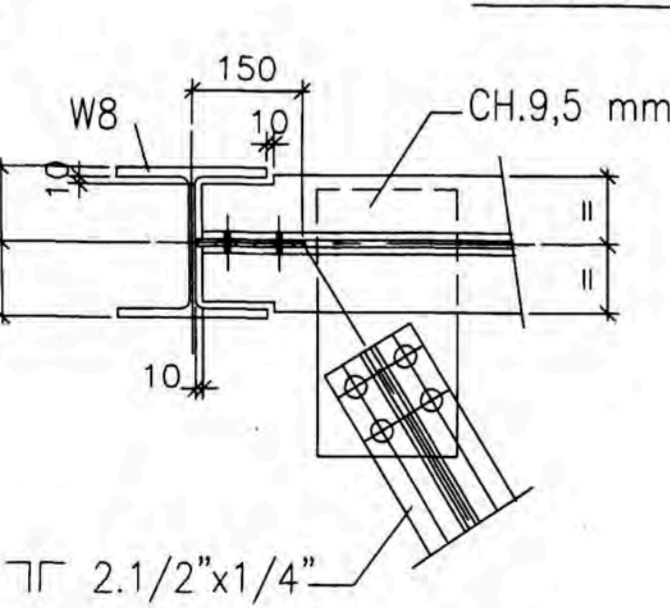
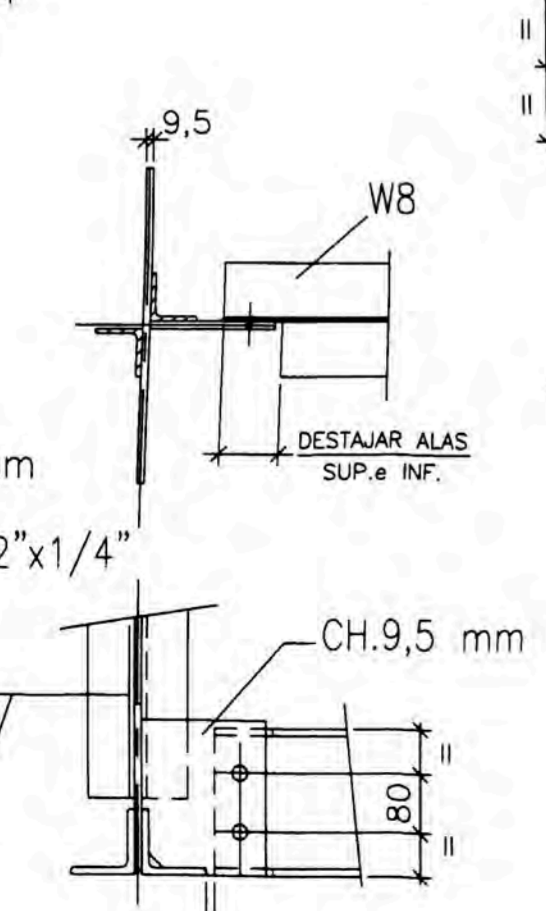
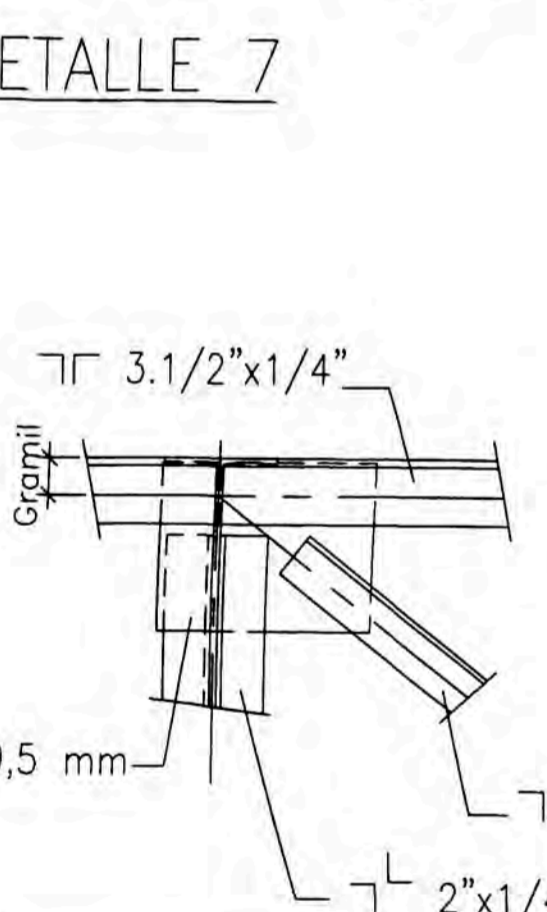
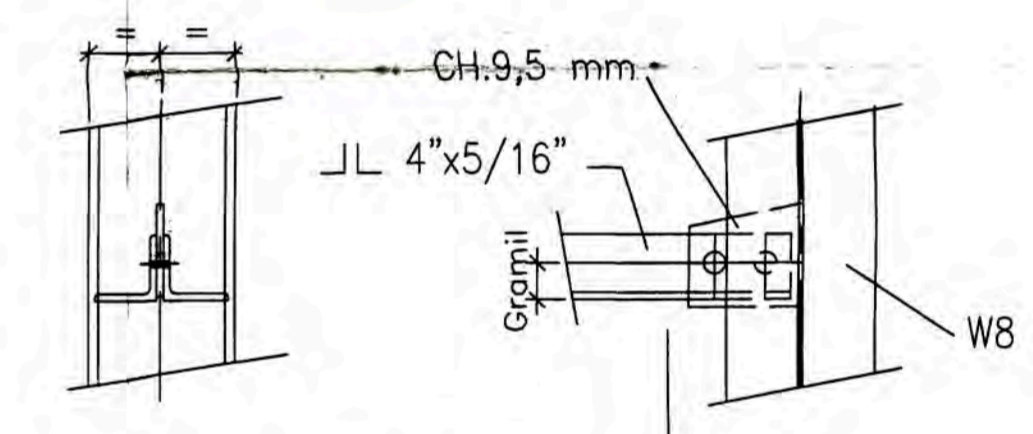
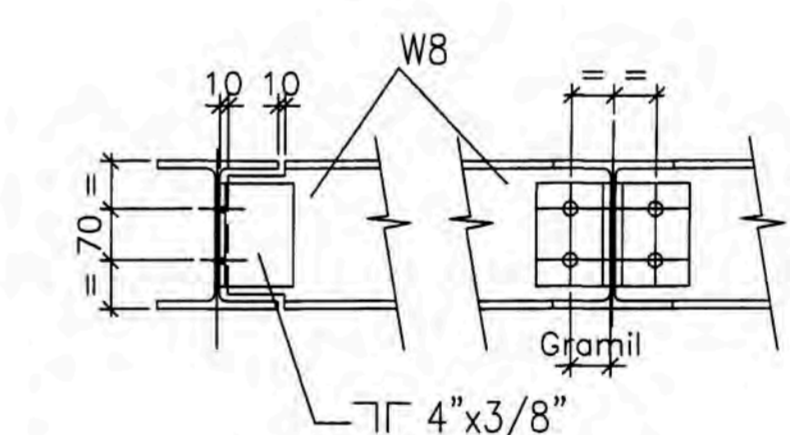
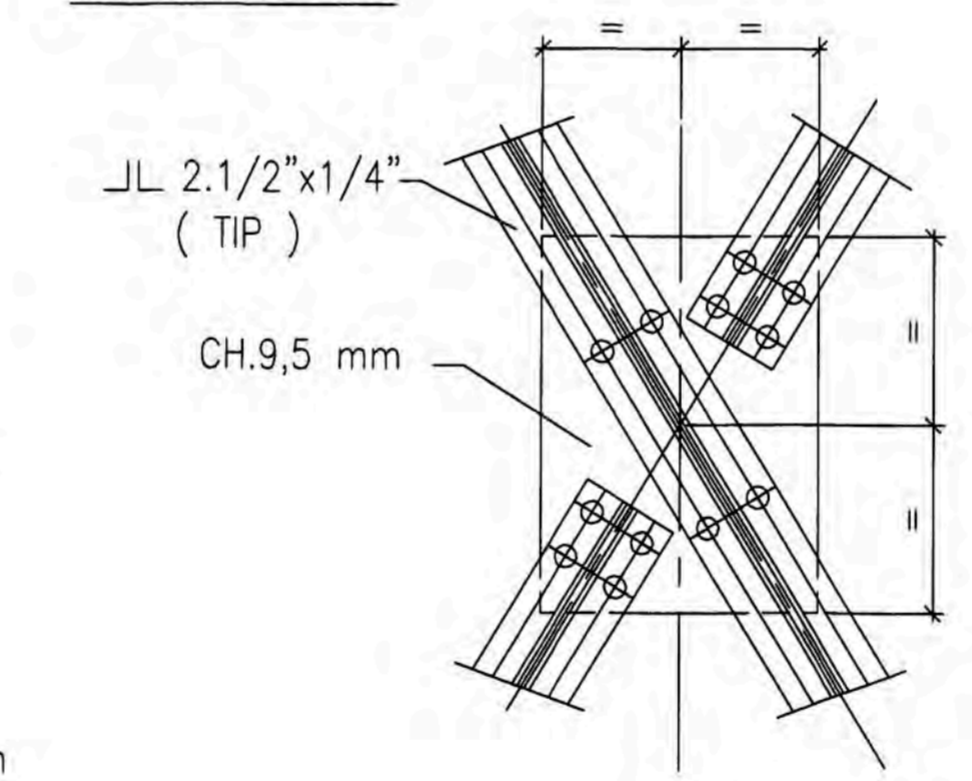
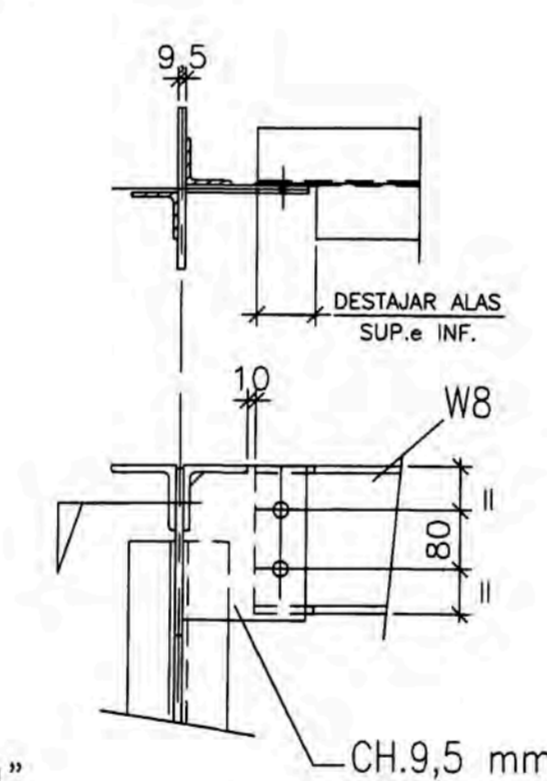
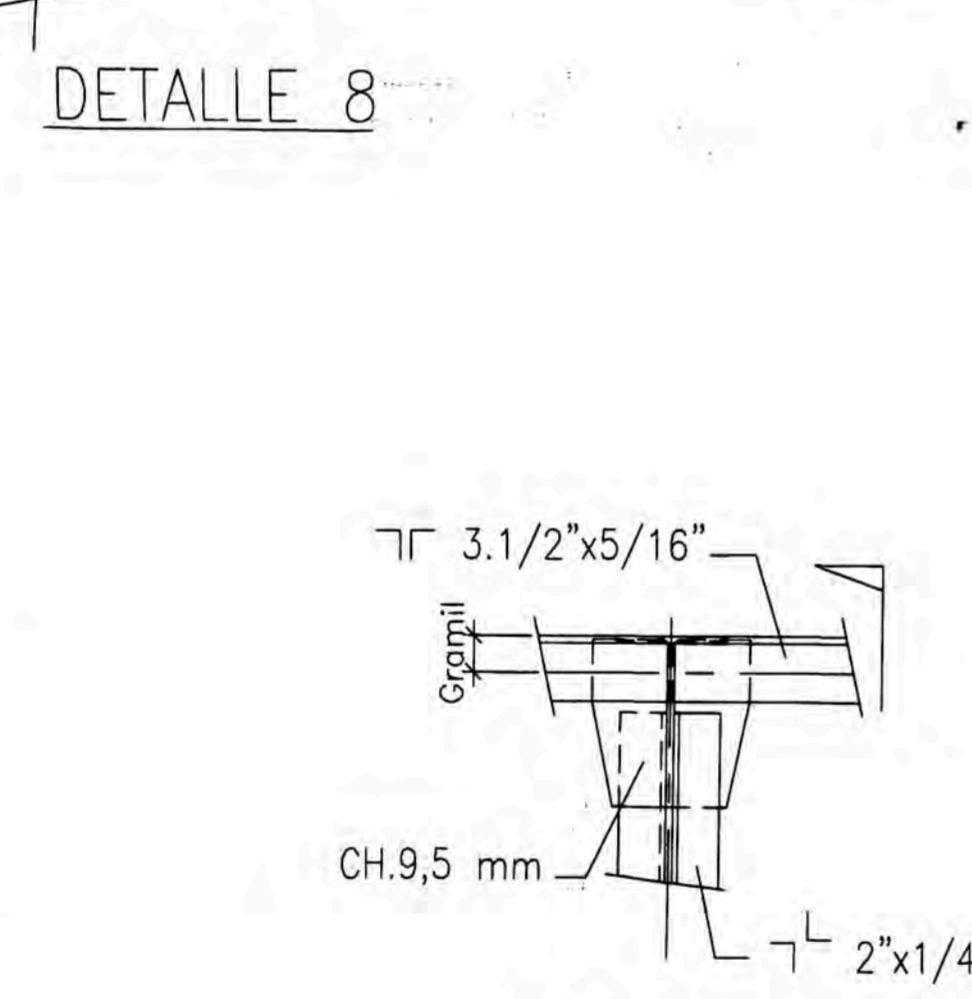
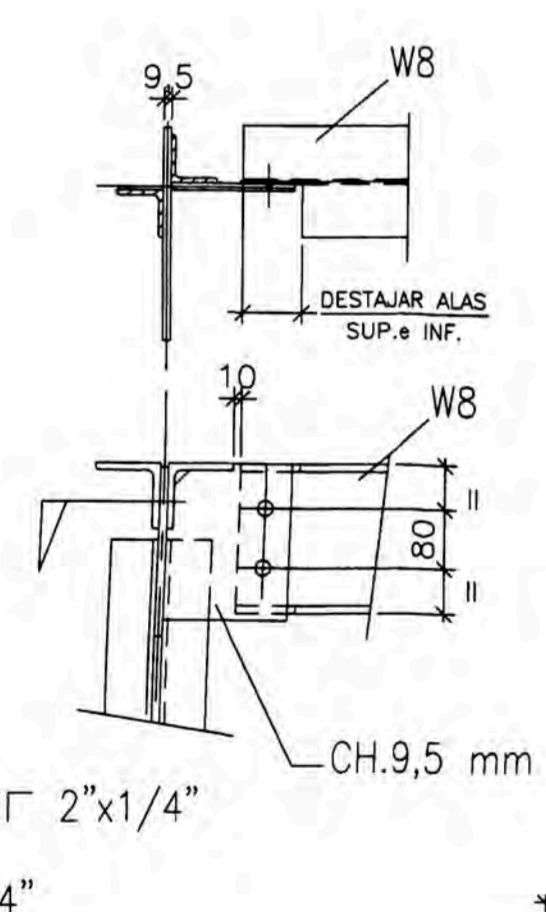
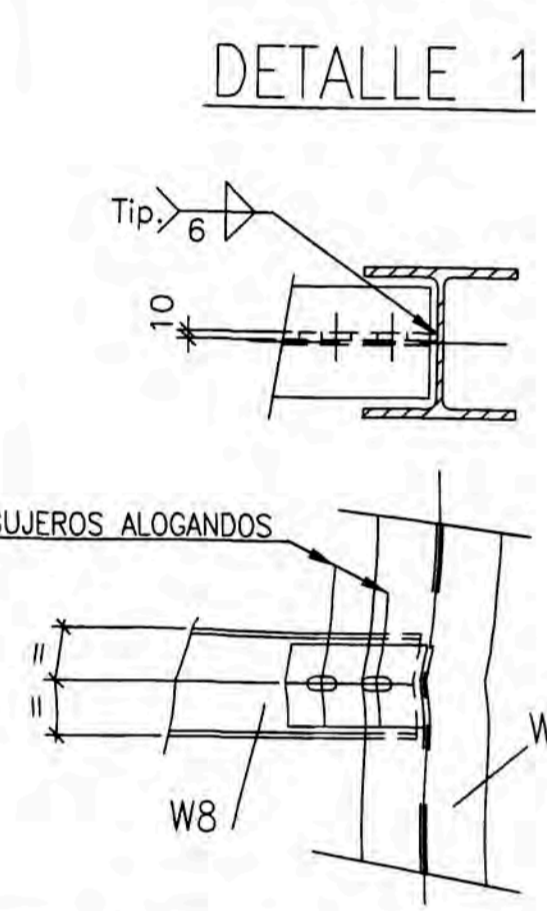
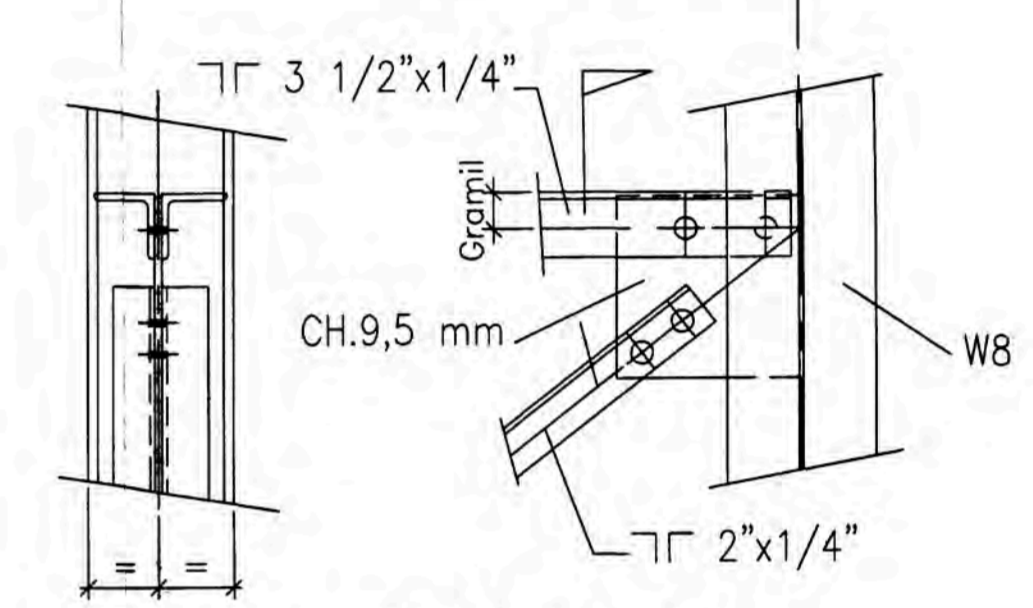
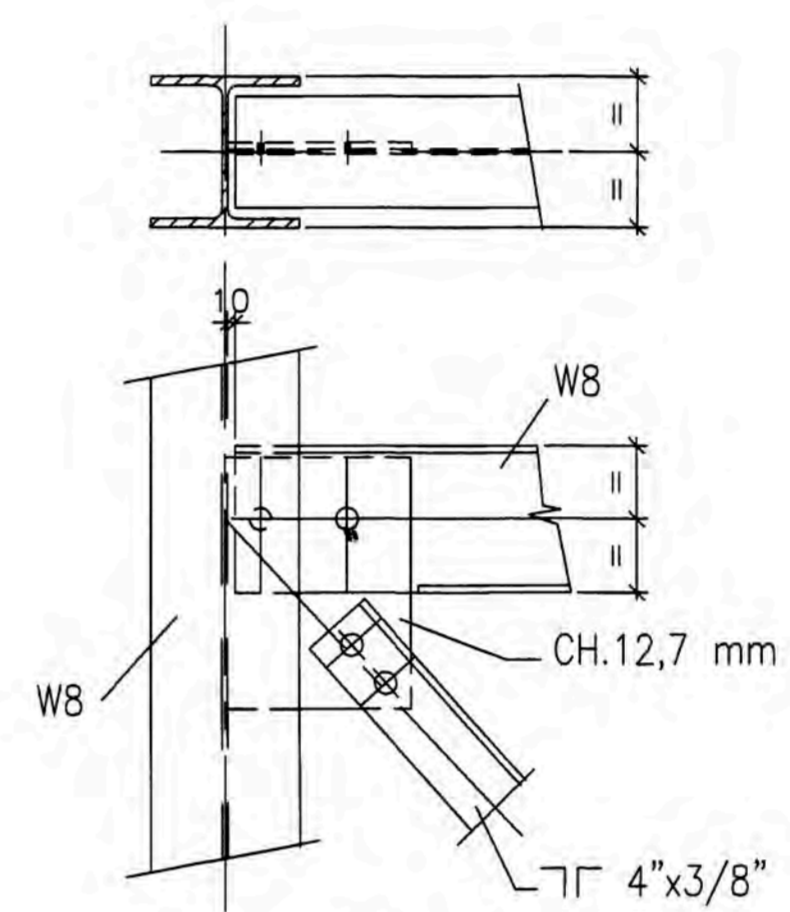
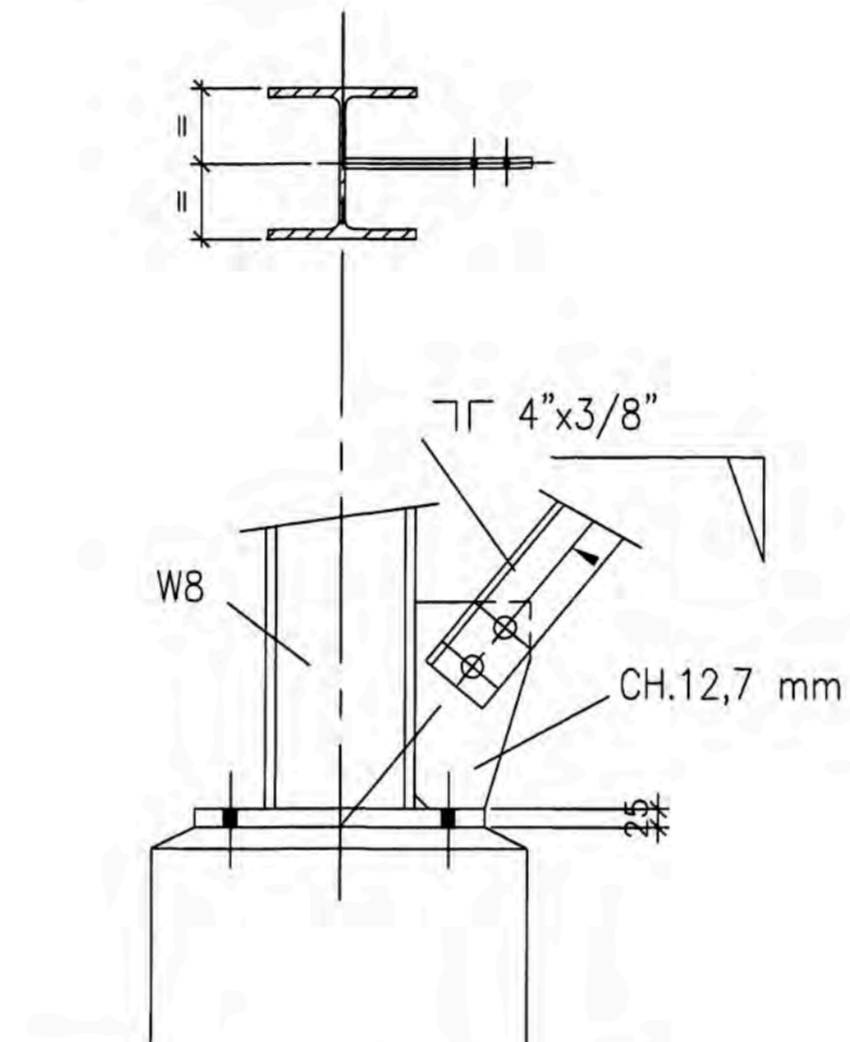
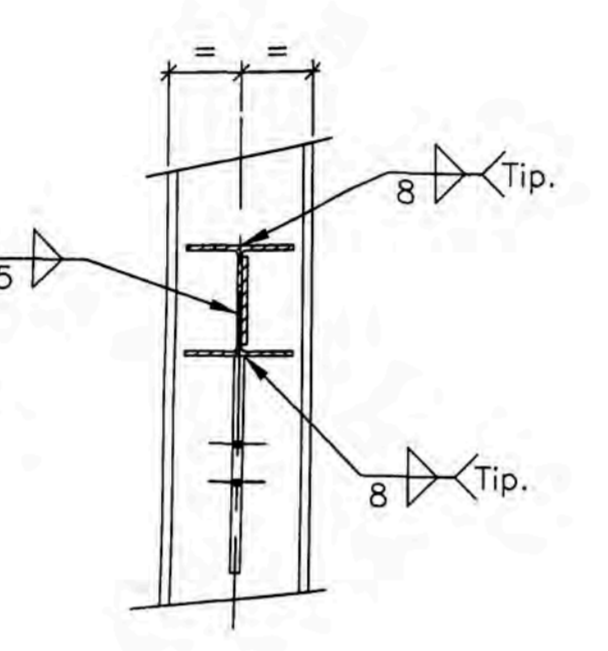
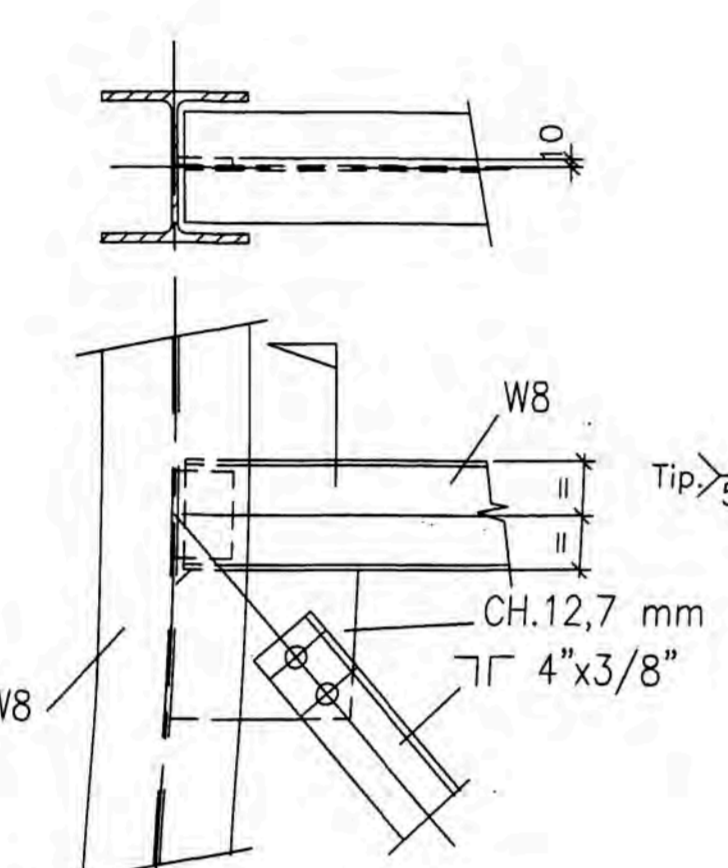
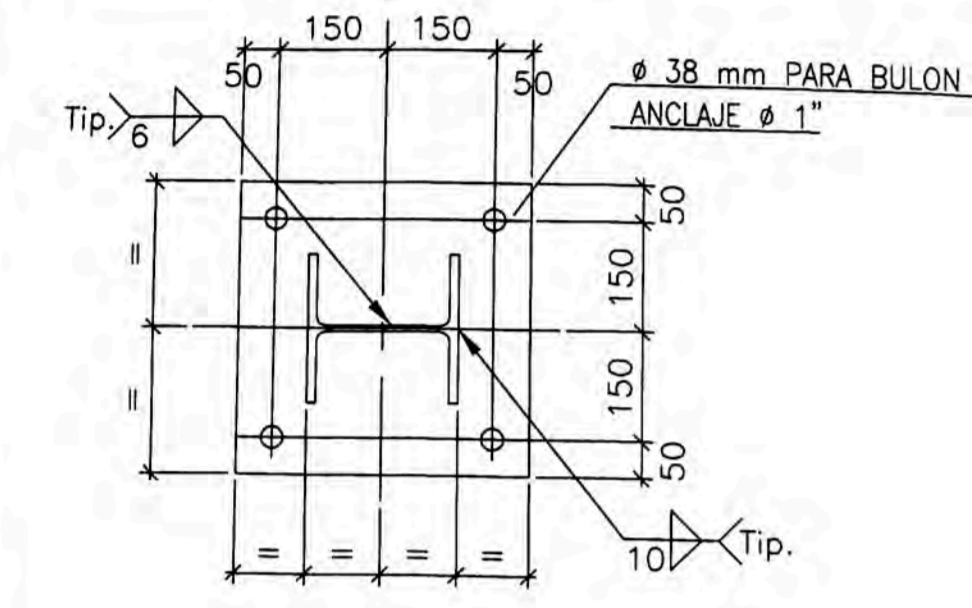
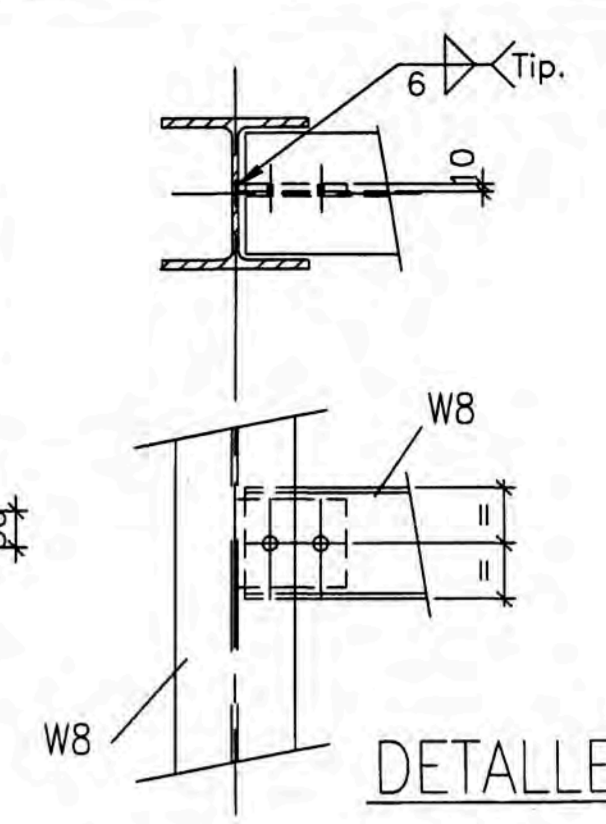
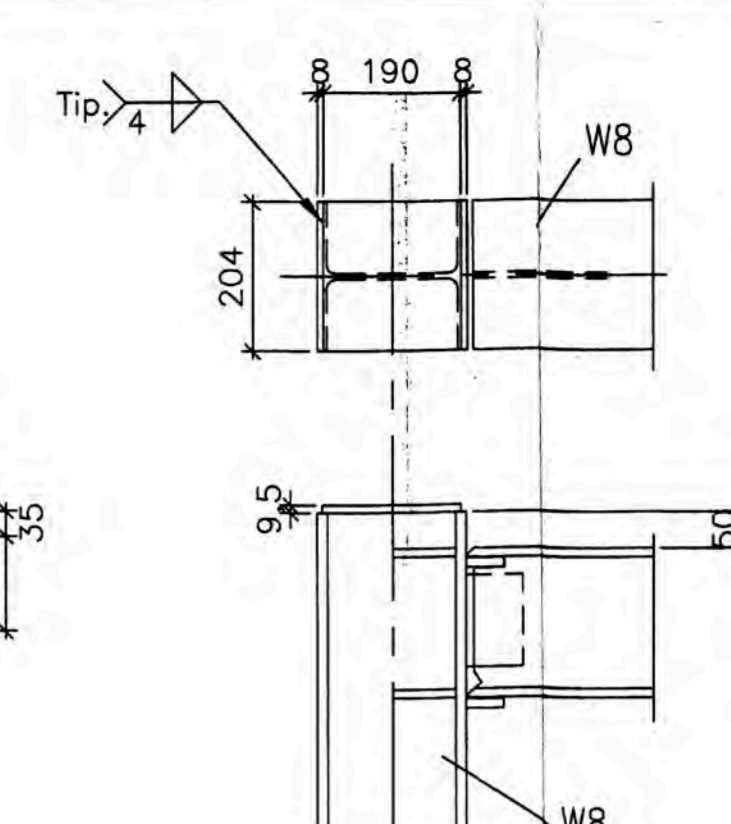
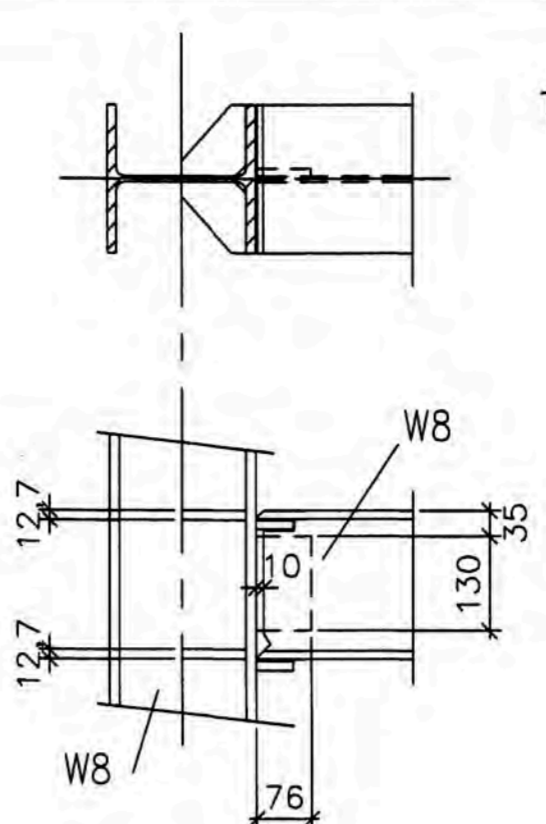
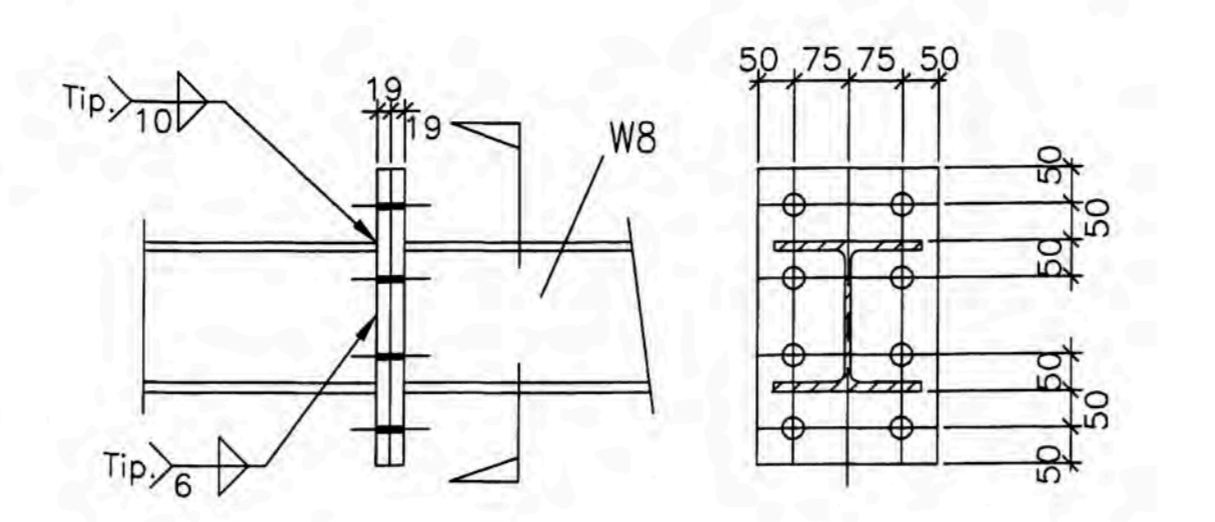
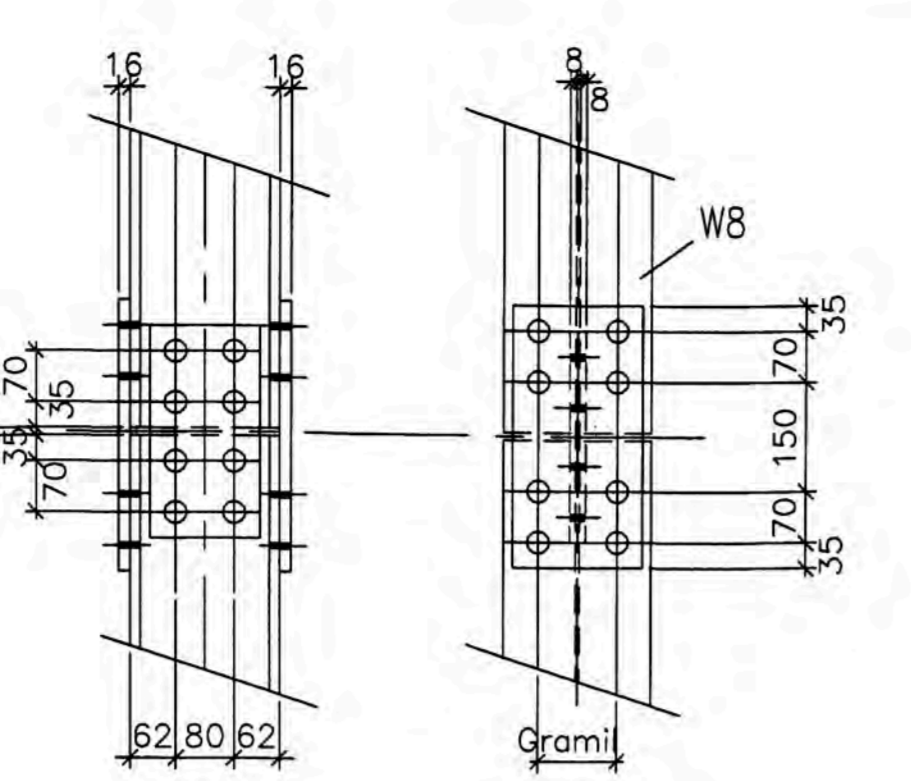
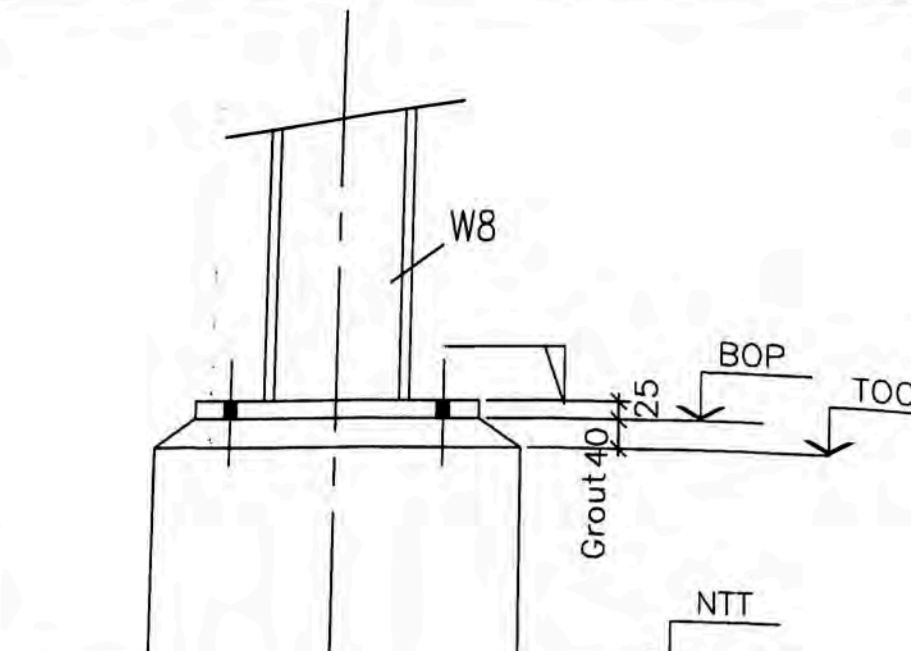
ESPECIFICACIONES TECNICAS

STRUCTURAL STEEL DESIGN: PCAM-0100-ET-S-0002-A.-  
 SELECTION AND APPLICATION OF PROTECTIVE COATINGS CON ANEXO COMPLEMENTARIO: PCAM-0100-ET-X-0002-E.-  
 PIPING & EQUIPMENT INSULATION / FIREPROOFING, SELECTION INSTALLATION: PCAM-0100-ET-C-0003-B.-  
 CONSTRUCTION PRACTICE FOR STEEL FABRICATION AND ERECTION: PCAM-0100-ET-S-0004-A.-

REQUISICIONES DE INGENIERIA

FABRICACION DE PARRALES: PCAM-0200-RI-S-001-A.-

A EMISION PARA COMENTARIOS		12/07/02	RF	COR	JC
REV.	DESCRIPCION	FECHA	EJEC.	REV.	APR.
		<b>CONSORCIO SADE SKANSKA-LATINTECNA-JJC</b>			
CLIENTE: PLUSPETROL PERU CORPORATION S.A.		PROYECTO EPC1 CAMISEA			
OBRA: EPC1 CAMISEA		TITULO: MALVINAS PLANT PARRAL PRINCIPAL 2 DISPOSICION GENERAL			
INGENIERIA DE PROYECTO		DOCUMENTO N°: PCAM-0200-PL-S-003		REVISION: A	
<small>Toda la informacion contenida en la presente documentacion es confidencial y de propiedad de Pluspetrol, siendo prohibido su reproduccion o copia, total o parcial, sin autorizacion previa.</small>		ESCALA: 1:150	Reemplazo a:		Hoja 01 de 1



DETALLE 1

DETALLE 2

DETALLE 3

DETALLE 4

DETALLE 5

DETALLE 6

DETALLE 7

DETALLE 8

DETALLE 9

DETALLE 10

DETALLE 11

DETALLE 13

DETALLE 14

DETALLE 18

DETALLE 20

DETALLE 12

DETALLE 15

DETALLE 16

DETALLE 17

DETALLE 19

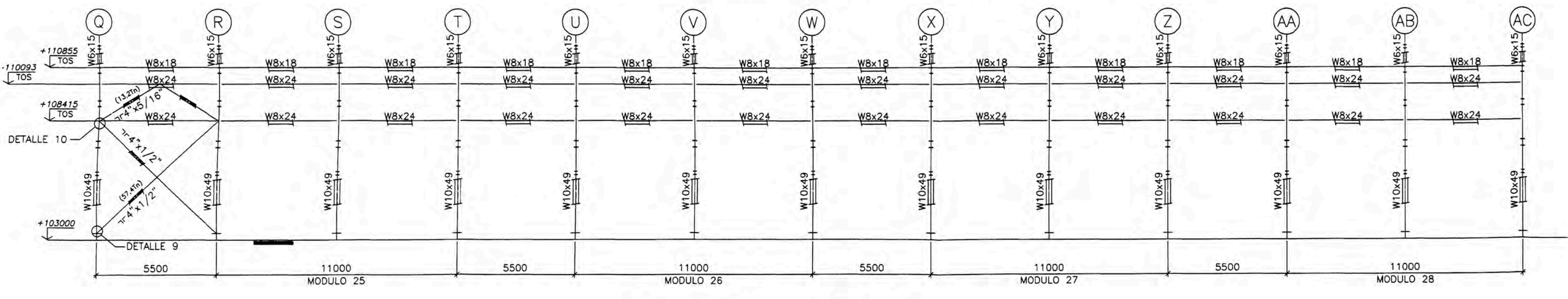
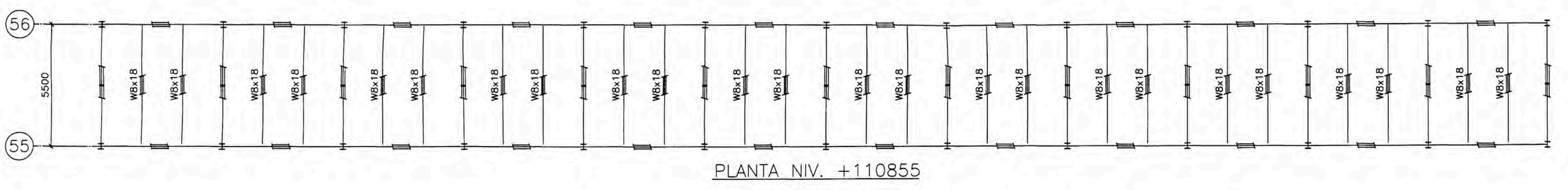
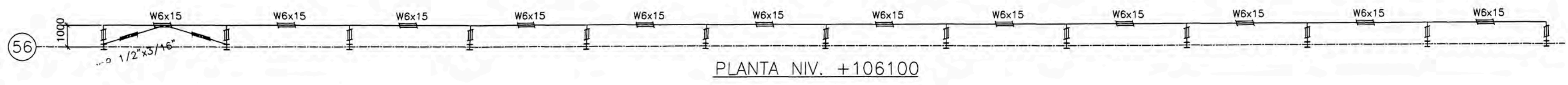
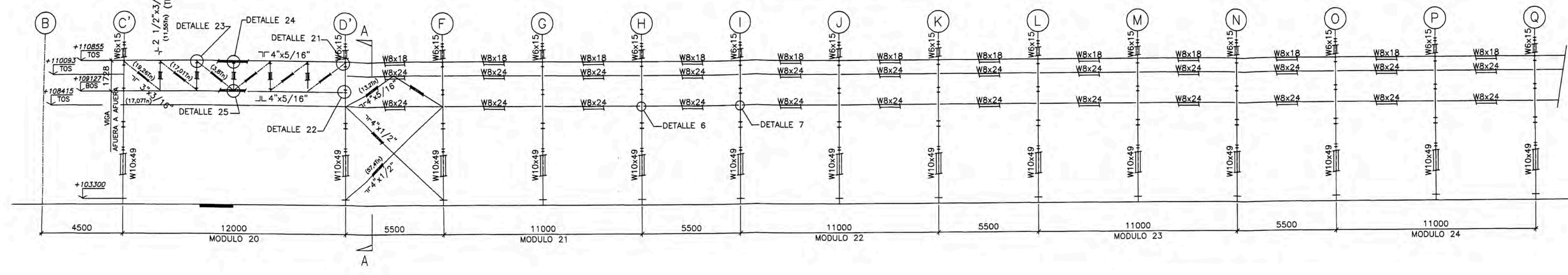
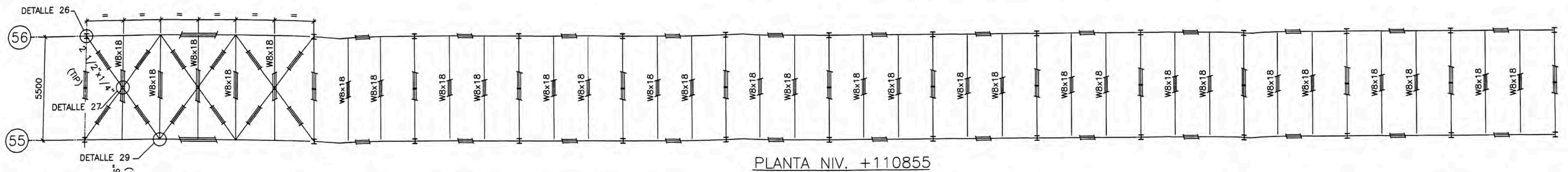
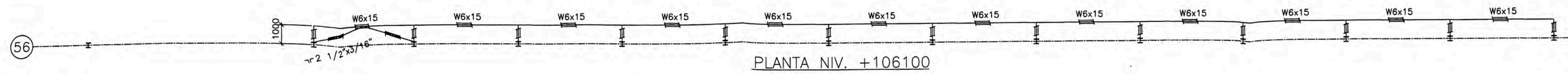
NOTAS GENERALES:

- LA CANTIDAD DE BULONES INDICADA EN LOS DETALLES DE UNIONES, TIENE CARACTER INDICATIVO. LA CANTIDAD DEFINITIVA LA DETERMINARA EL FABRICANTE DE ACUERDO A LOS ESFUERZOS EN LOS ELEMENTOS DE LA UNION
- EL DIAMETRO MINIMO DE LOS BULONES SERA 3/4", SALVO INDICACION EN CONTRARIO.-

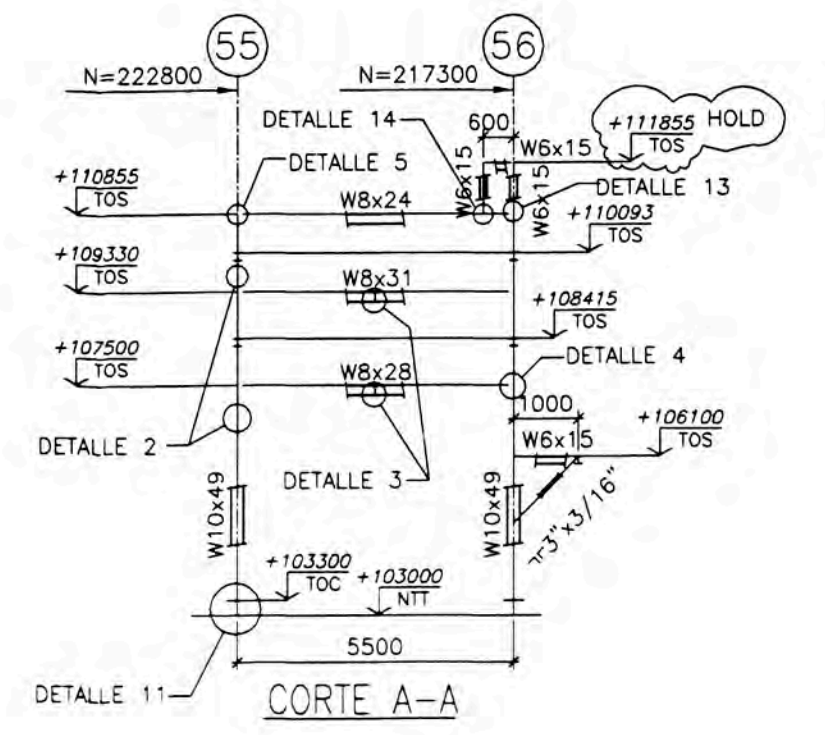
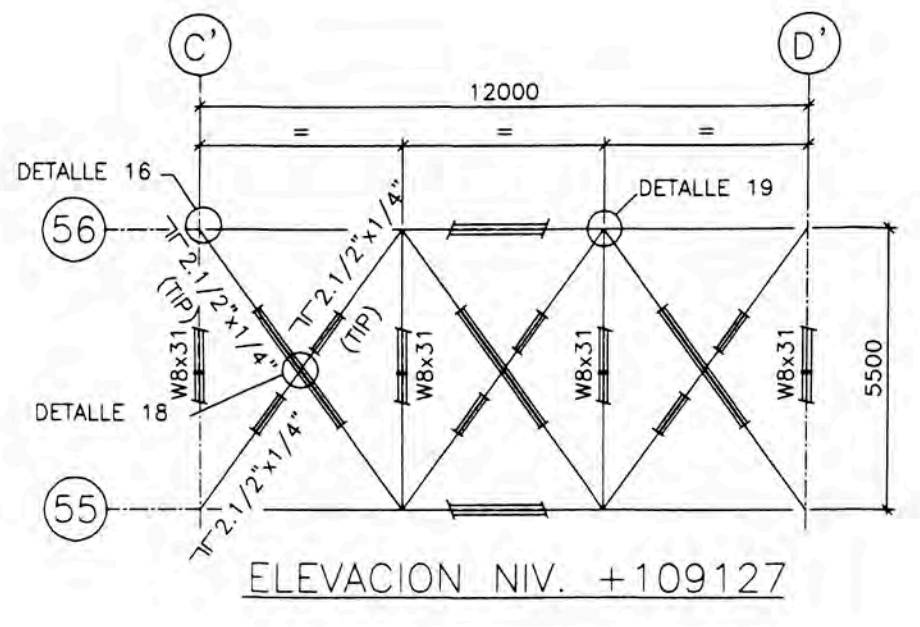
REFERENCIAS:

PCAM-0200-PL-S-003: PARRAL PRINCIPAL 2- DETALLES.-  
 BOP : BOTTOM OF PLATE.-  
 TOC : TOP OF CONCRETE.-  
 NTT : NIVEL TERRENO TERMINADO.-

A EMISION PARA COMENTARIOS		12/07/02	RF	COR	JC
REV.	DESCRIPCION	FECHA	EJEC.	REV.	APR.
		CONSORCIO SADE SKANSKA-LATINTECNA-JJC CLIENTE: PLUSPETROL PERU CORPORATION S.A. OBRA: EPC1 CAMISEA			
		PROYECTO EPC1 CAMISEA TITULO: MALVINAS PLANT PARRAL PRINCIPAL 2 DETALLES CONSTRUCTIVOS			
INGENIERIA DE PROYECTO		ESCALA	DOCUMENTO N°:	REVISION:	
		1:10	PCAM-0200-PL-S-004	A	
		Reemplaza a:	Hoja: 01 de 1		



ELEVACION EJES 55 y 56



NOTAS GENERALES:

1. TODOS LOS PERFILES Y CHAPAS ESTRUCTURALES SERAN DE CALIDAD ASTM A36.-
2. LOS BULONES PARA LAS CONEXIONES ESTRUCTURALES SERAN GALVANIZADOS Y DE CALIDAD ASTM A325, SALVO INDICACION EN CONTRARIO.-
3. LOS ELECTRODOS SERAN DE CALIDAD E70XX DE ACUERDO CON AWS D1.1.-
4. EL DIAMETRO MINIMO DE LOS BULONES ESTRUCTURALES SERA 3/4".-
5. LAS ESTRUCTURAS SE IGNIFUGARAN DE ACUERDO A LA ESPECIFICACION TECNICA "PIPING & EQUIPMENT INSULATION / FIREPROOFING, SELECTION & INSTALLATION", PCAM-0100-ET-C-0003-B.-
6. A TODAS LAS SUPERFICIES IGNIFUGADAS SE LES APLICARA EL "PRIMER COAT" INDICADO EN LA ESPECIFICACION "SELECTION AND APPLICATION OF PROTECTIVE COATINGS" PCAM-0100-ET-X-0002-E, EN TABLE A, CORRESPONDIENTE A LA "CLASSIFICATION OF SURFACE 1".-
7. A LAS SUPERFICIES QUE NO TENGAN PROTECCION IGNIFUGA SE APLICARA EL ESQUEMA COMPLETO DE PINTURA INDICADO EN EL ITEM 6.-
8. LOS CORDONES DE SOLDADURA NO INDICADOS TENDRAN UN CATETO IGUAL AL 0.7 DEL ESPESOR MINIMO A UNIR.-
9. LOS ESFUERZOS PARA EL CALCULO DE CONEXIONES NO INDICADOS EN LAS BARRAS DE ARRIOSTRAMIENTOS Y RETICULADOS SE TOMARAN IGUAL A LA CAPACIDAD PORTANTE DE LA BARRA A TRACCION.-

REFERENCIAS:

PCAM-0200-PL-S-006: PARRAL ZONA TURBOCOMPRESORES- DETALLES.-  
 TOS : TOP OF STEEL.-  
 TOC : TOP OF CONCRETE.-  
 NTT : NIVEL TERRENO TERMINADO.-

ESPECIFICACIONES TECNICAS

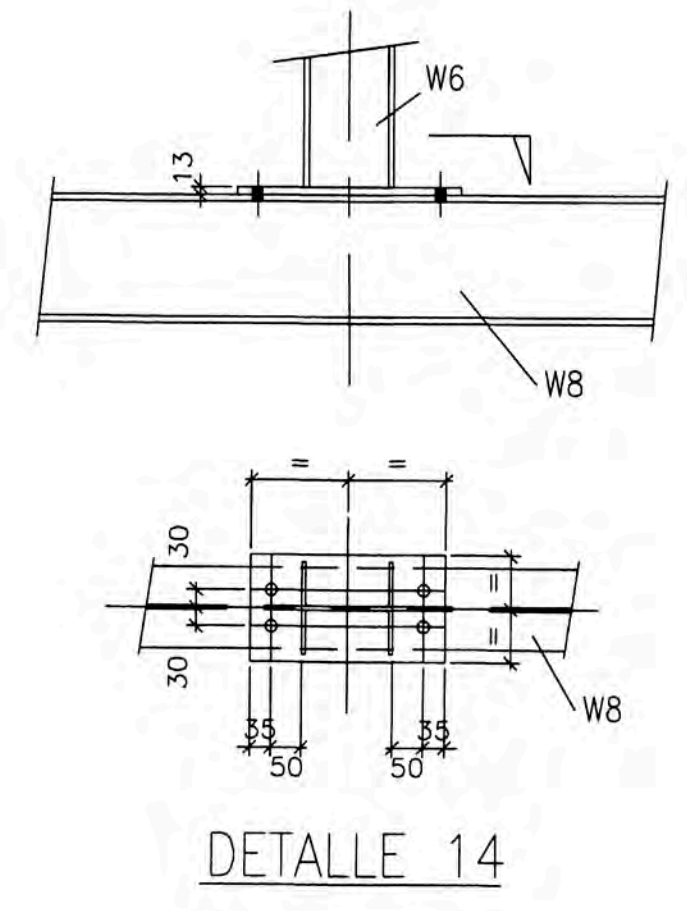
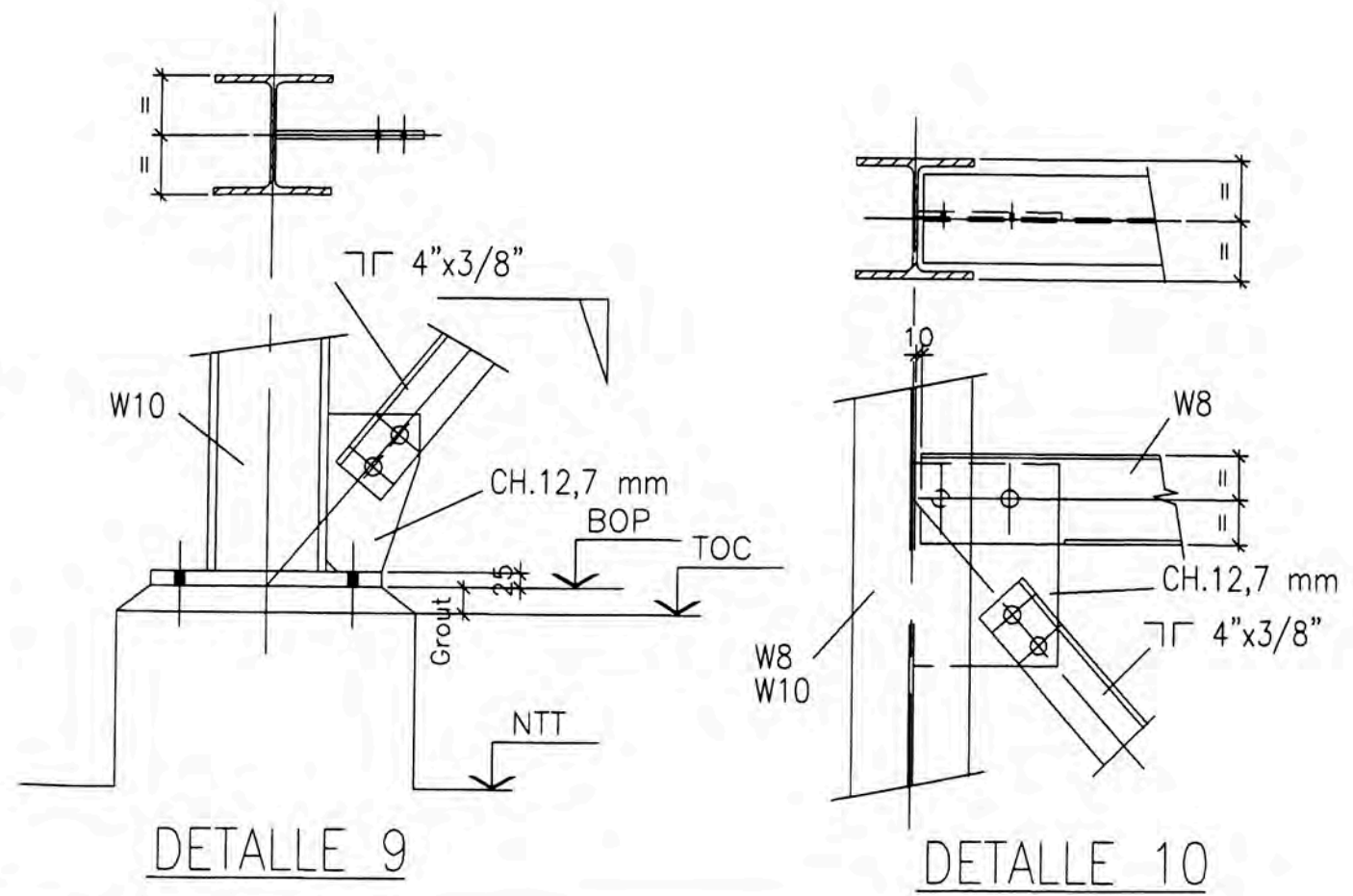
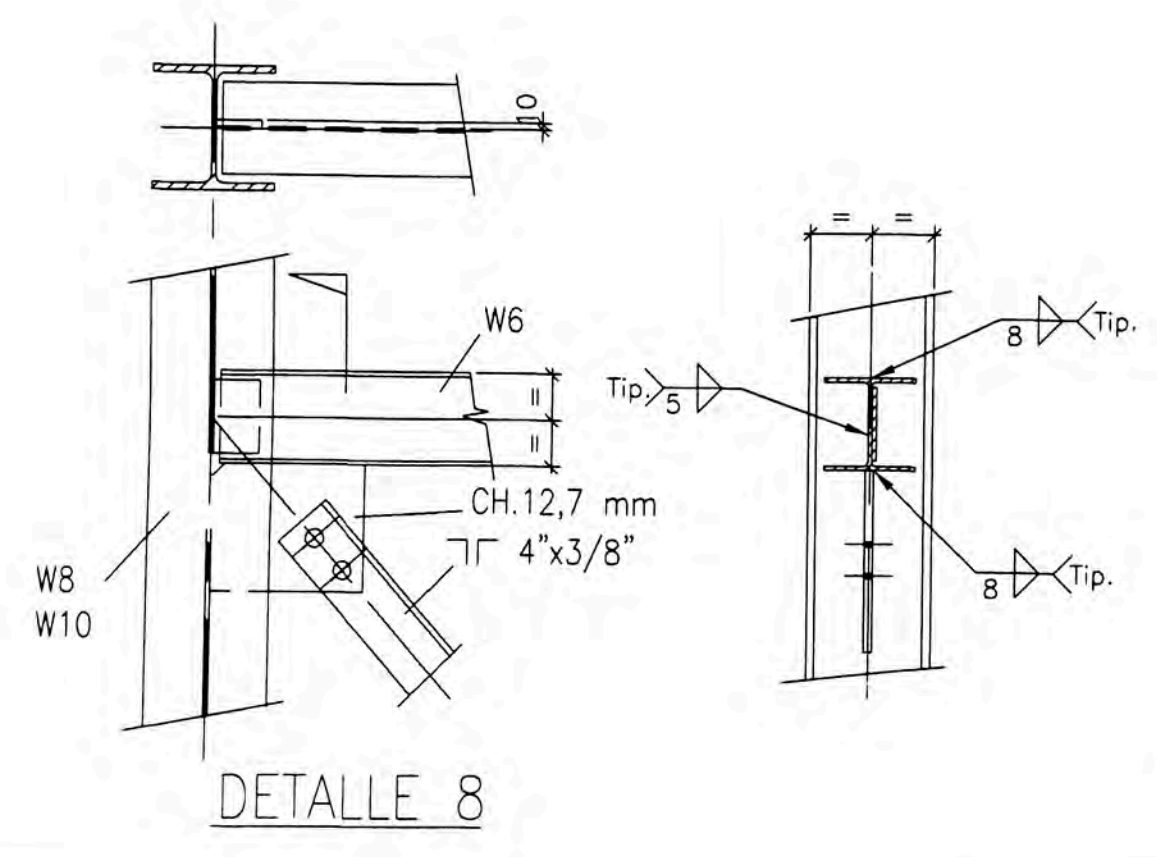
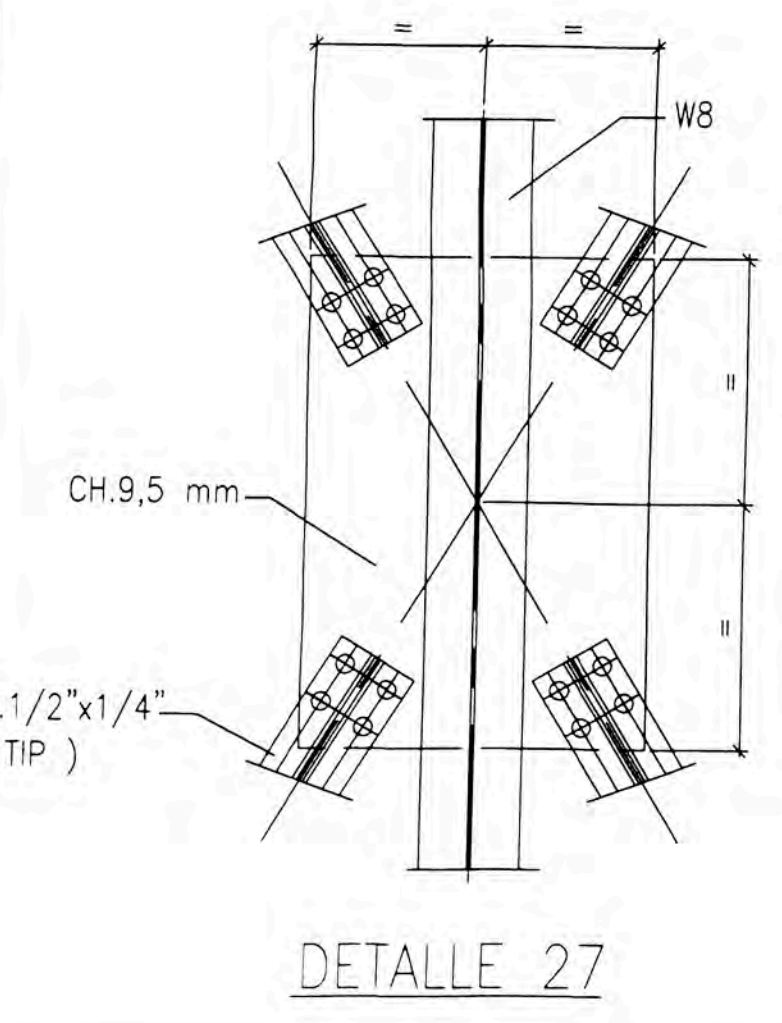
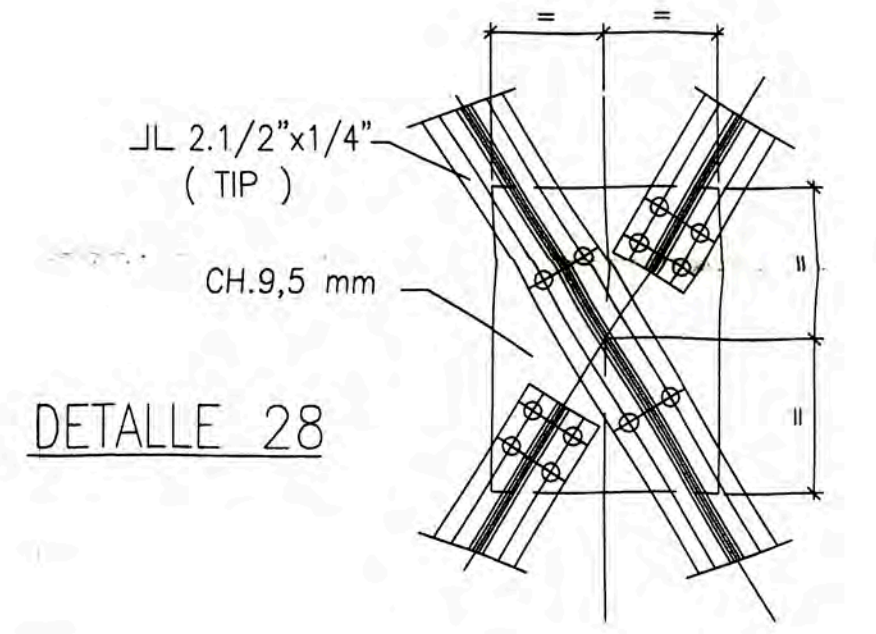
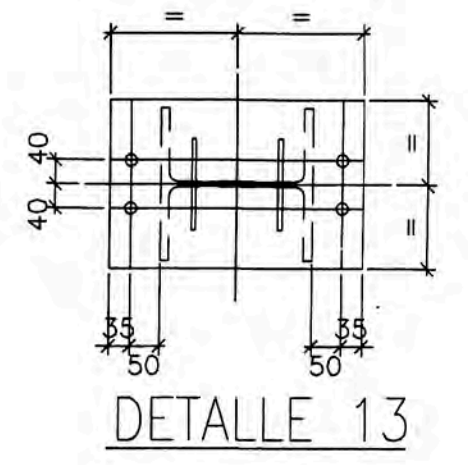
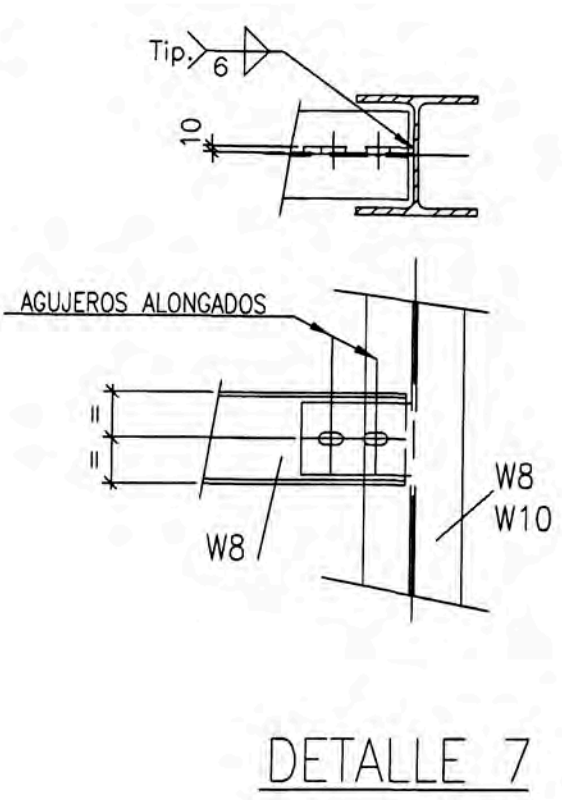
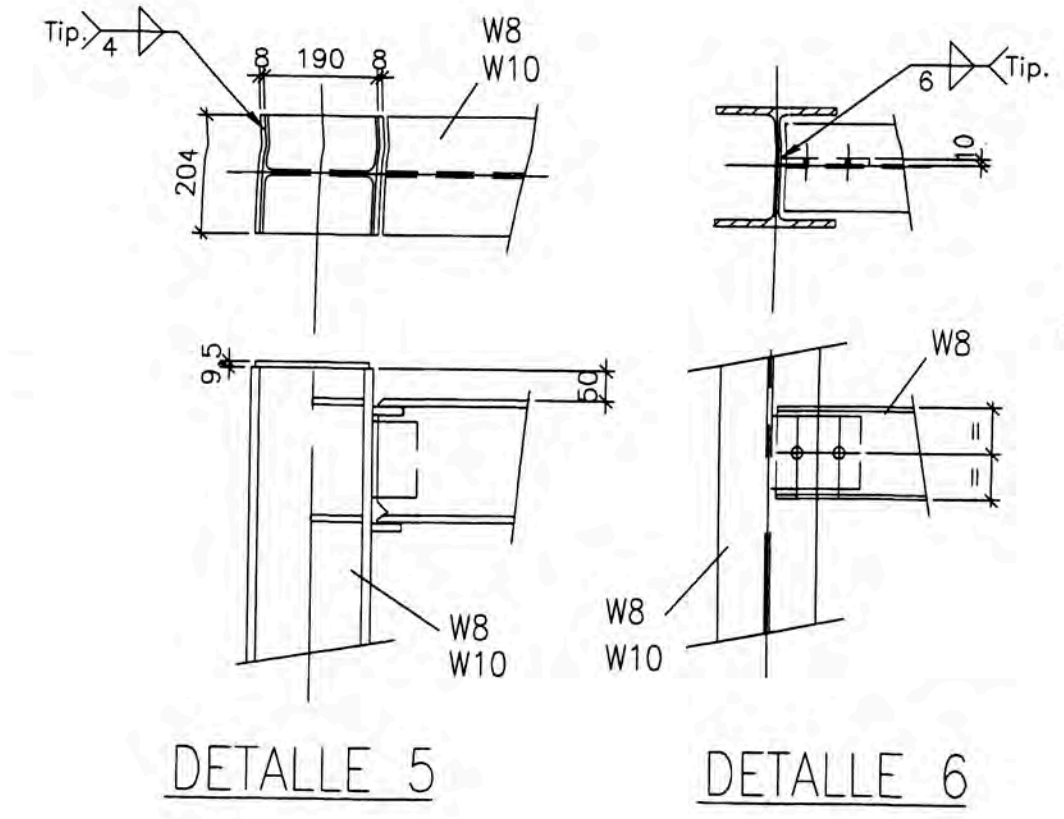
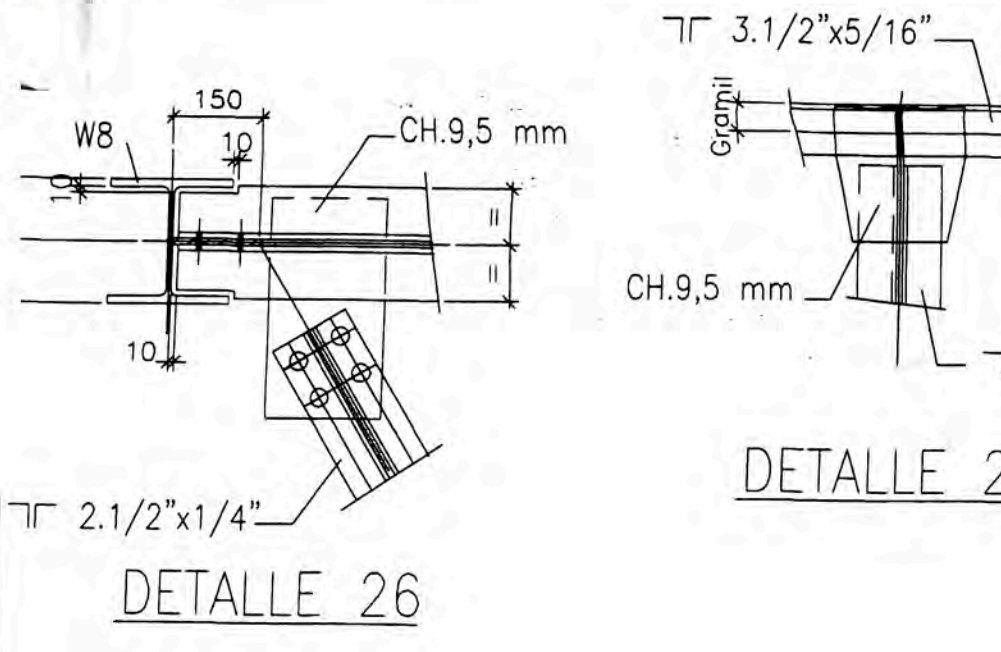
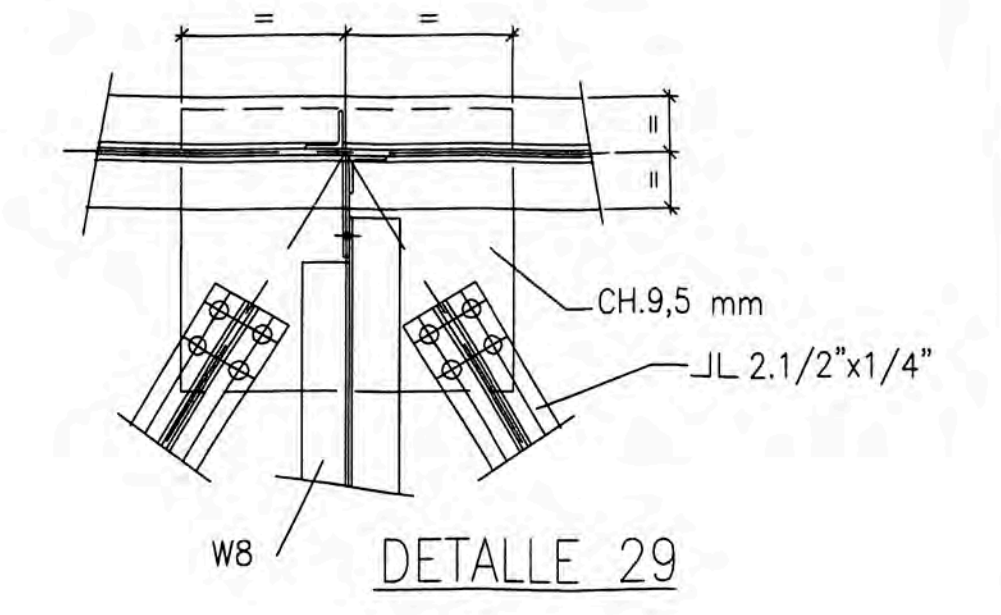
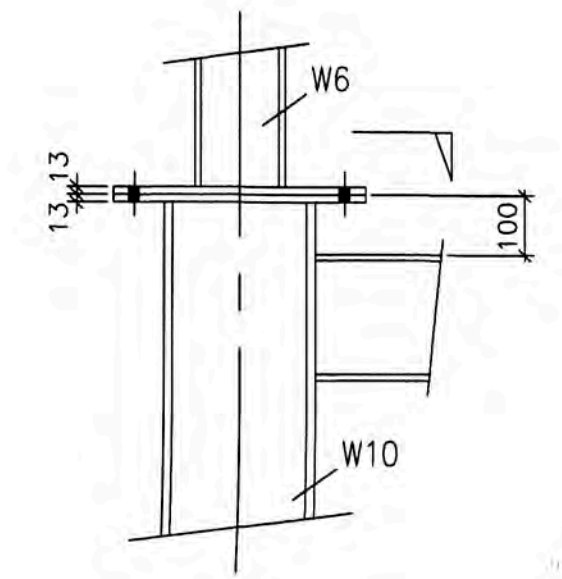
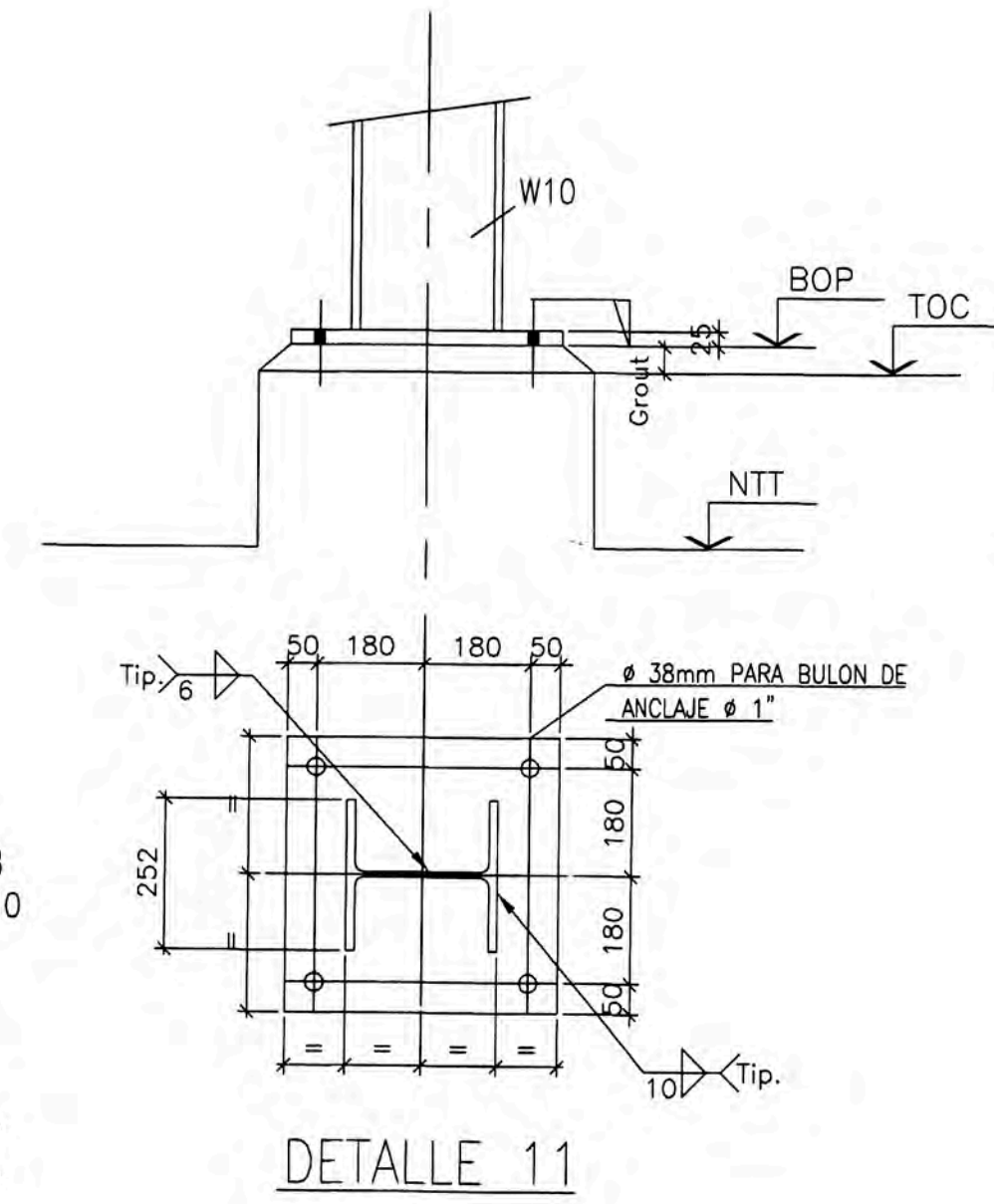
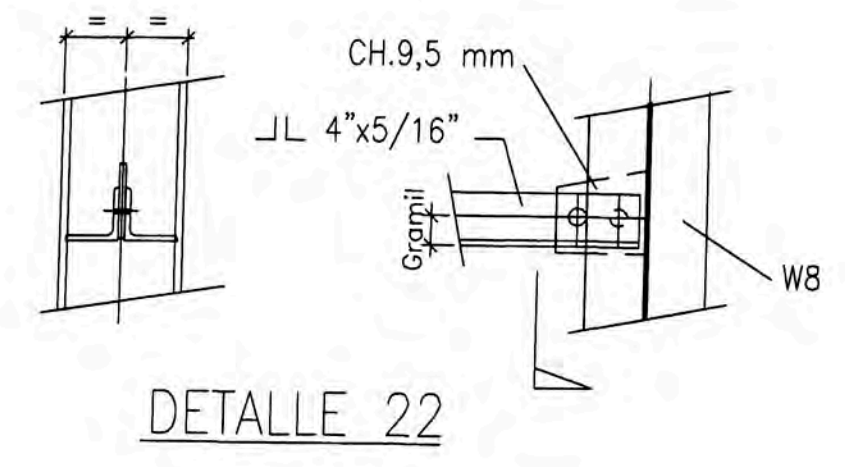
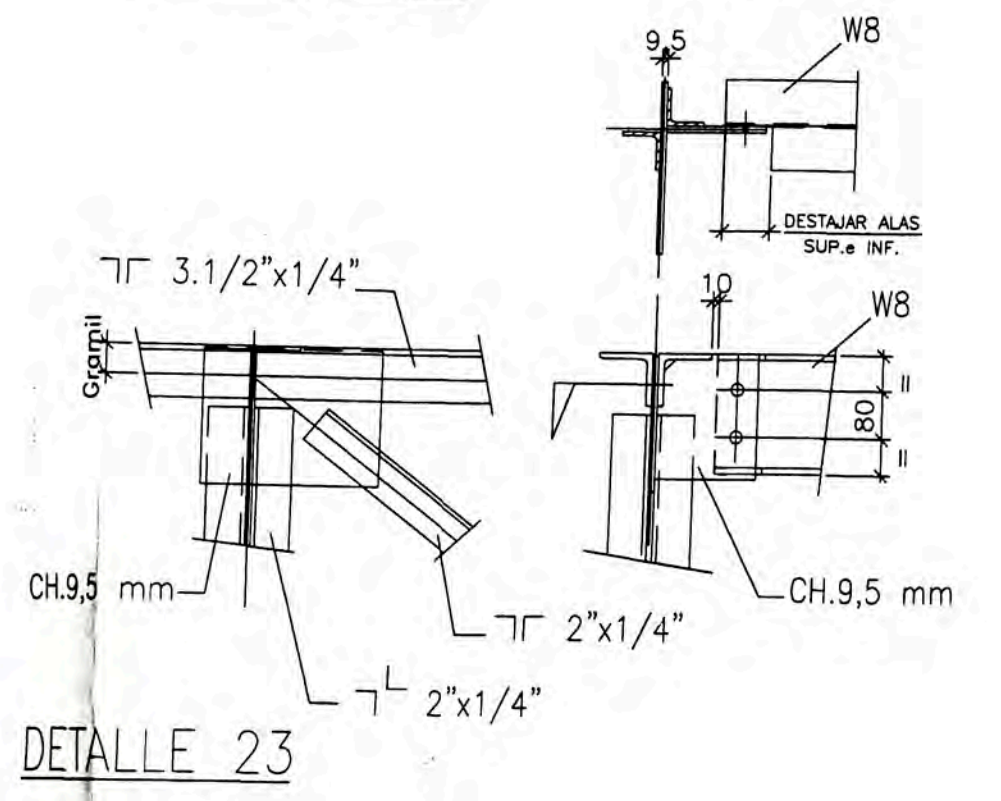
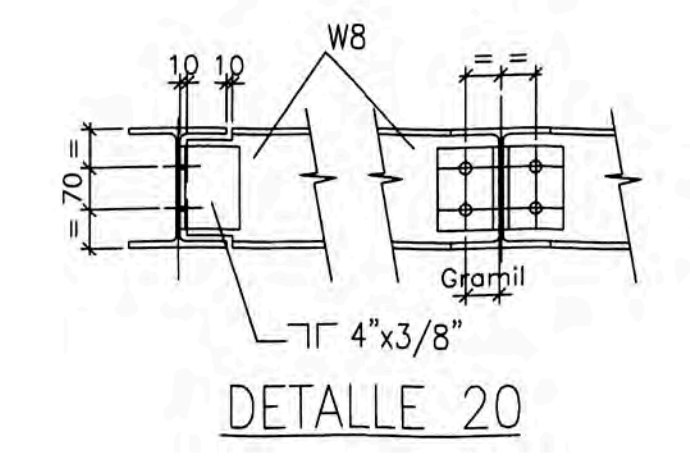
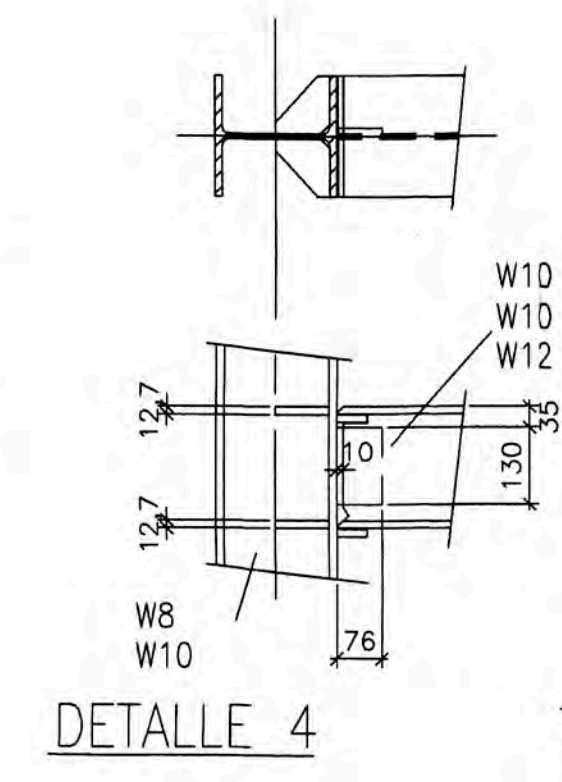
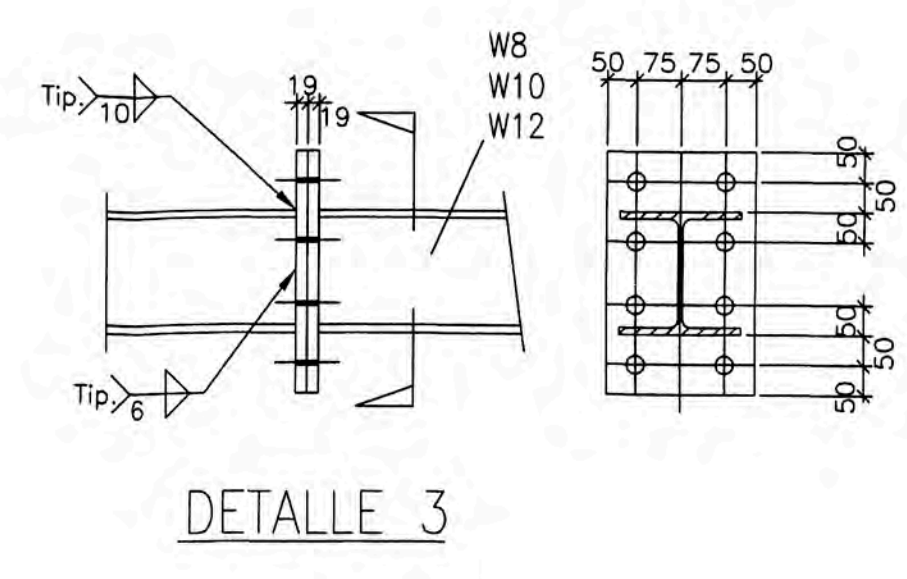
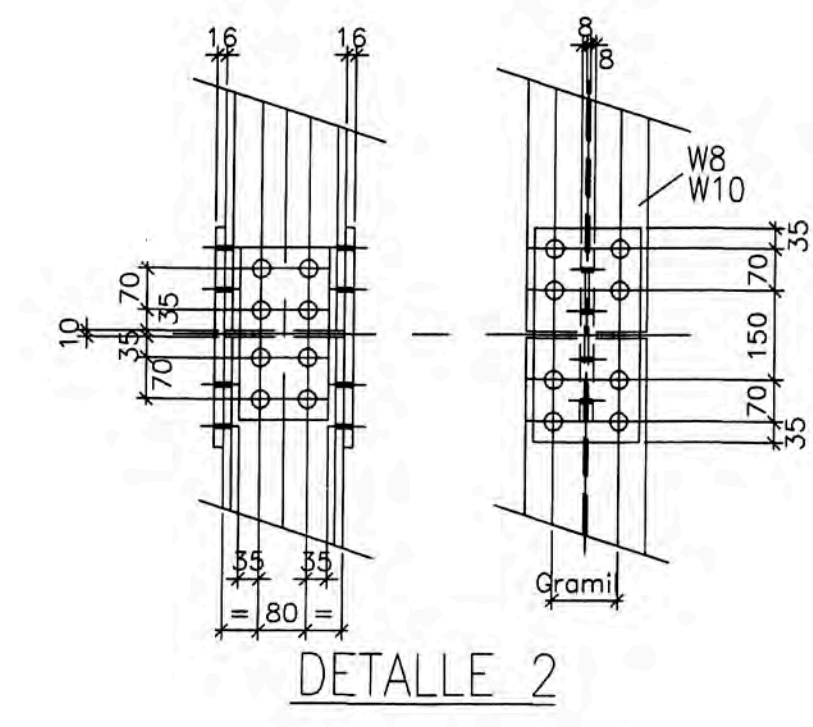
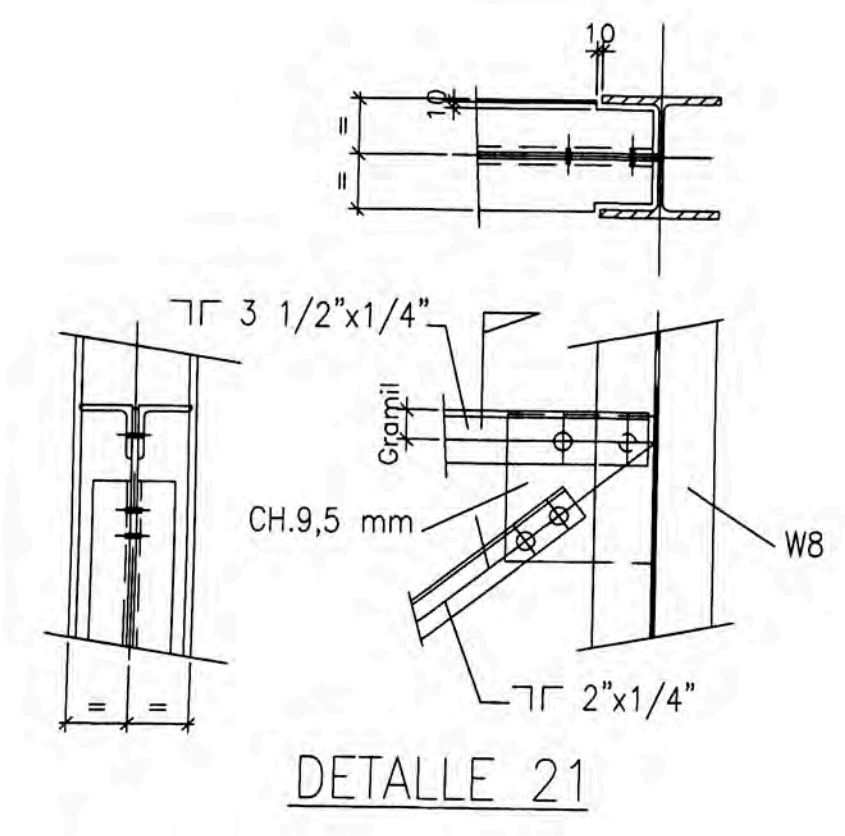
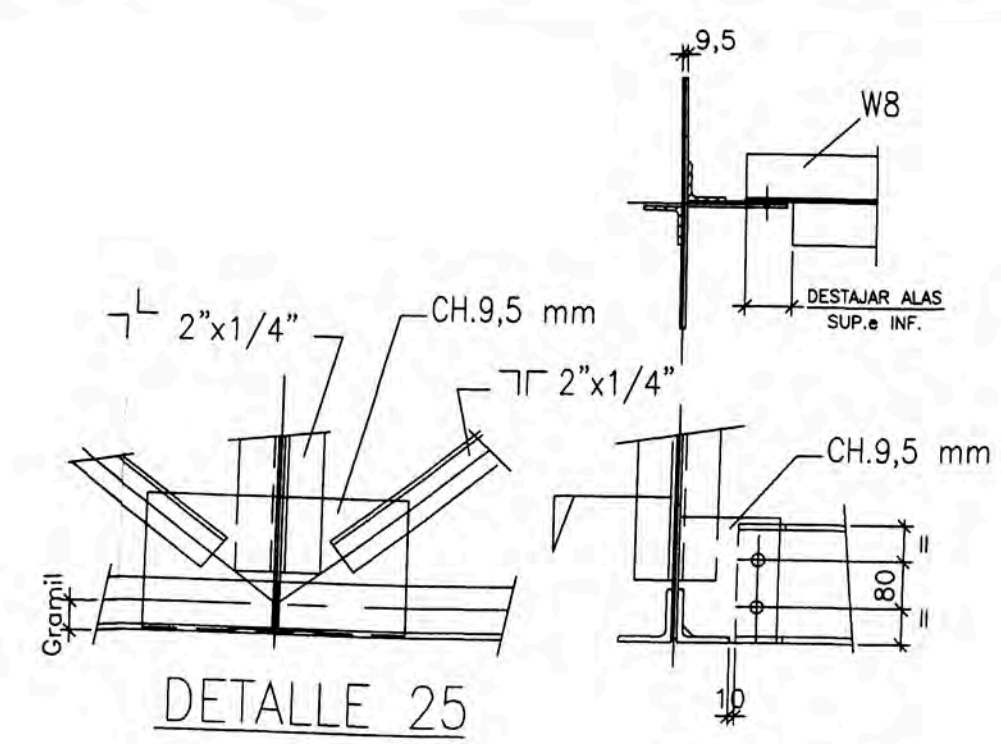
STRUCTURAL STEEL DESIGN: PCAM-0100-ET-S-0002-A.-  
 SELECTION AND APPLICATION OF PROTECTIVE COATINGS CON ANEXO COMPLEMENTARIO: PCAM-0100-ET-X-0002-E.-  
 PIPING & EQUIPMENT INSULATION / FIREPROOFING, SELECTION AND INSTALLATION: PCAM-0100-ET-C-0003-B.-  
 CONSTRUCTION PRACTICE FOR STEEL FABRICATION AND ERECTION: PCAM-0100-ET-S-0004-A.-

REQUISICIONES DE INGENIERIA

FABRICACION DE PARRALES: PCAM-0200-RI-S-001-A.-

A EMISION PARA COMENTARIOS		12/07/02	PAE	COR	JC
REV.	DESCRIPCION	FECHA	EJEC.	REV.	APR.
CONSORCIO SADE SKANSKA-LATINTECNA-JJC					
CLIENTE: PLUSPETROL PERU CORPORATION S.A. OBRA: EPC1 CAMISEA					
			PROYECTO EPC1 CAMISEA		
INGENIERIA DE PROYECTO			TITULO MALVINAS PLANT PARRAL E-O ZONA TURBOCOMPRESORES DISPOSICION GENERAL		
ESCALA 1:150		DOCUMENTO N°: PCAM-0200-PL-S-005		REVISION: A	
Reemplaza a:		Hoja: 01 de 1		Toda la informacion contenida en la presente documentacion es confidencial y de propiedad de Pluspetrol, siendo prohibida su reproduccion o copia, total o parcial, sin autorizacion previa.	





**NOTAS GENERALES:**

- LA CANTIDAD DE BULONES INDICADA EN LOS DETALLES DE UNIONES, TIENE CARACTER INDICATIVO. LA CANTIDAD DEFINITIVA LA DETERMINARA EL FABRICANTE DE ACUERDO A LOS ESFUERZOS EN LOS ELEMENTOS DE LA UNION
- EL DIAMETRO MINIMO DE LOS BULONES SERA 3/4", SALVO INDICACION EN CONTRARIO.-

**REFERENCIAS:**

PCAM-0200-PL-S-005: PARRAL ESTE-OESTE TURBOCOMPRESORES.-  
 BOP : BOTTOM OF PLATE.-  
 TOC : TOP OF CONCRETE.-  
 NTT : NIVEL TERRENO TERMINADO.-

A EMISION PARA COMENTARIOS		12/07/02	PAE	COR	JC
REV.	DESCRIPCION	FECHA	EJEC.	REV.	APR.
		CONSORCIO SADE SKANSKA-LATINTECNA-JIC			
CLIENTE:		PLUSPETROL PERU CORPORATION S.A.			
OBRA:		EPC1 CAMISEA			
INGENIERIA DE PROYECTO		PROYECTO EPC1 CAMISEA			
		TITULO MALVINAS PLANT PARRAL E-O ZONA TURBOCOMPRESORES DETALLES CONSTRUCTIVOS			
Toda la informacion contenida en el presente documento es propiedad de pluspetrol, siendo prohibido su reproducción o copia, total o parcial, sin autorizacion previa.		ESCALA	DOCUMENTO N°:	REVISION:	
		1:10	PCAM-0200-PL-S-006	A	
		Reemplaza a:		Hoja: 01 de 1	