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PROJETO MECÂNICO

DIMENSIONAMENTO DE UMA ALÇA ARTICULADA
(UTILIZAÇÃO DO MÉTODO DOS ELEMENTOS FINITOS)

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1985

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Aos meus amigos da Poli e a todos que de alguma forma me ajudaram neste trabalho, meus agradecimentos.

Carlos Yoshio Fujihara

SUMÁRIO

A essência deste projeto consiste no dimensionamento de um componente mecânico. Trata-se de uma alça articulável composta de dois olhais.

Esta peça é de uso corrente dentro de uma unidade de perfuração petrolífera. Tem como função suspender um equipamento (cabeça de injeção - descrito adiante) ligando-o a um gancho, que por sua vez, movimenta-se verticalmente através de um guincho.

Outro ponto relevante neste projeto é a utilização do método dos elementos finitos. Trata-se de um método mais apurado, cujo desenvolvimento e uso vem se aumentando cada vez mais, juntamente com a evolução dos computadores.

A escolha deste componente mecânico deve-se ao fato de que o conjunto pino-olhal serem elementos mecânicos de grande utilização, não só dentro de uma sonda petrolífera mas também em muitos outros casos como o é em se tratando de transporte de cargas e ligações entre estruturas.

O método dos elementos finitos será utilizado - justamente para obter as tensões resultantes na região do olhal cujos resultados serão confrontados com os resultados obtidos através de cálculos tradicionais como os critérios de cisalhamento, tração e esmagamento. Outros critérios também serão abordados.

A aplicação do método dos elementos finitos se fez através do programa NAVSAP que se encontra disponível no CCE (Centro de Computação Eletrônica da USP).

Toda parte referente à peça bem como sua utilização dentro de uma sonda petrolífera, apresentada adiante tem o respaldo material da Equipamentos Villares S.A., especificamente da seção de sondas petrolíferas.

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PARTE A - APRESENTAÇÃO DA PEÇA.

Trata-se de uma alça em cujas extremidades está localizada um olhal. É através do olhal e do pino que a alça se articula junto à carcaça da "cabeça de injeção" - (Fig.A.1).

É pela parte superior da alça que todo o conjunto - abaixo é suspenso através de um gancho.

Esta alça é fabricado em aço-liga (SAE 4140) forjado com tratamento térmico posterior. Inicialmente ela se encontra em forma de uma barra sendo dobrada posteriormente, dando o aspecto final de uma alça.

Seu peso total está em torno de 607,5 kg.

Para o dimensionamento do mesmo será considerado a carga máxima suportada por uma sonda particular, no caso, 455 toneladas.

Veja desenho 1.

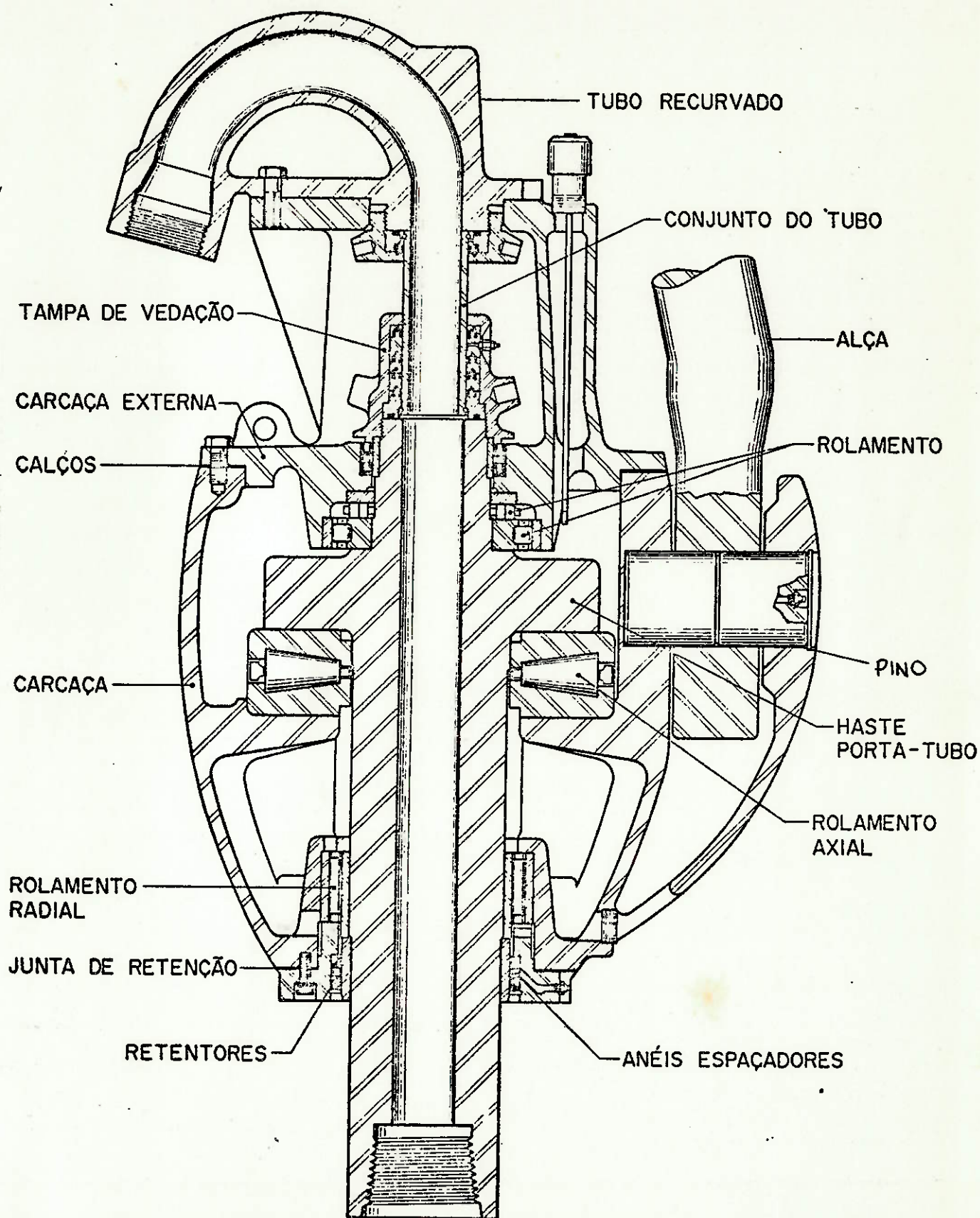
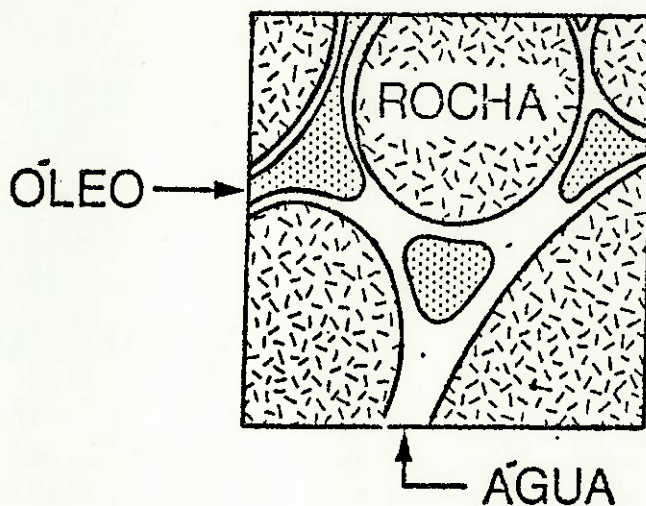


FIG. A.1 - Cabeça de Injeção
com a alça e o pino

PARTE B - FUNDAMENTOS SOBRE PERFURAÇÃO DE PETRÓLEO.

1. POÇOS DE PETRÓLEO.

O petróleo, mistura complexa de hidrocarbonetos, - normalmente se encontra preenchendo os vazios das rochas porosas ou fraturadas situadas a grandes profundidades.



Os poços são normalmente locados pela geologia - que após estudo detalhado de uma área pode prever a existência de uma rocha a determinada profundidade, com características próprias e adequadas para a acumulação de hidrocarbonetos. No - entanto, somente através da perfuração pode ser feita a constatação da existência do petróleo .

Para esta perfuração, é empregada a sonda de perfuração, se perfurado em terra, ou plataforma de perfuração, se operando no mar.

1.1- Classificação.

Didaticamente, os poços são classificados em:

1.1.1- Quanto a Finalidade.

- A)- Exploratórios - São poços que objetivam explorar as formações da área em estudo.
- B)- Desenvolvimento- Após a confirmação da viabilidade econômica do reservatório, são perfurados poços para colocá-los em produção.

C)- Poço de extensão ou delimitatório - Delimitar um campo ou um reservatório já descoberto.

D)- Poços especiais.

1.1.2- Quanto a Profundidade.

A)- Raso - Até 1.000 m

B)- Médio - Entre 1.000 a 2.500 m

C)- Profundo - Acima de 2.500 m.

1.1.3- Quanto ao Percurso.

A)- Vertical

B)- Direcional.

2. MÉTODOS DE PERFURAÇÃO.

Basicamente, há dois métodos de perfuração: a percussão e a rotação. Eles devem proporcionar um meio de erudir ou fraturar as formações, remover o material fraturado até a superfície, sustentar as paredes do poço e impedir a produção dos fluidos das diversas formações encontradas.

2.1- Método de Perfuração a Percussão.

Consiste em se golpear a formação com uma broca - em forma de cinzel. A maioria dos poços pioneiros na Pennsylvânia e ainda hoje utilizam-se deste método, onde o solo é relativamente duro e consolidado.

2.2- Método de Perfuração Rotativo.

Por este método, as rochas são perfuradas pelas ações de fricção e corte devidas aos efeitos de rotação e peso aplicados sobre a broca, auxiliada pela hidráulica que promove a remoção dos cascalhos até a superfície.

O movimento de rotação pode ser transmitido a - broca desde a superfície ou a partir de determinado ponto da tubulação de perfuração que se estende desde a superfície até a broca. Assim, temos os métodos chamados: rotativo convencional e com turbina.

2.2.1- Método Rotativo Convencional ("Rotary Drilling").

Neste método, a rotação a ser transmitida à broca provém da mesa rotativa posicionada na superfície - .Na parte superior da coluna de perfuração existe uma haste de ^{seção} hexagonal ou quadrada que desliza livremente dentro da mesa rotativa. Deste modo, a mesa transmite rotação à haste quadrada que por sua vez a transmite à coluna de perfuração, indo girar finalmente a broca - (Fig.B.1).

A coluna de perfuração exerce ainda duas outras - importantes funções: aplicação de peso sobre a broca, através dos comandos de perfuração e circulação de um fluido especial que é injetado na parte superior da haste quadrada por intermédio da cabeça de injeção. Este, por sua vez, é acoplada a uma mangueira de borracha fixa e flexível que conduz o fluido recebido das bombas.

O fluido especial dito de perfuração ou lama, além de outras funções, refrigera a broca e remove os cascalhos - cortados até a superfície. Ali é feita a separação dos cascalhos e o fluido de perfuração é tratado e posteriormente conduzido a um tanque, do qual é succionado pela bomba, reiniciando o ciclo.

Todo o conjunto constituído pela broca, coluna de perfuração, haste quadrada e cabeça de injeção fica suspenso pelo gancho que é movido verticalmente por um sistema de polias chamado bloco-catarina. O bloco se apoia na torre que - por sua vez transmite toda a carga à subestrutura e esta à fundação ou base.

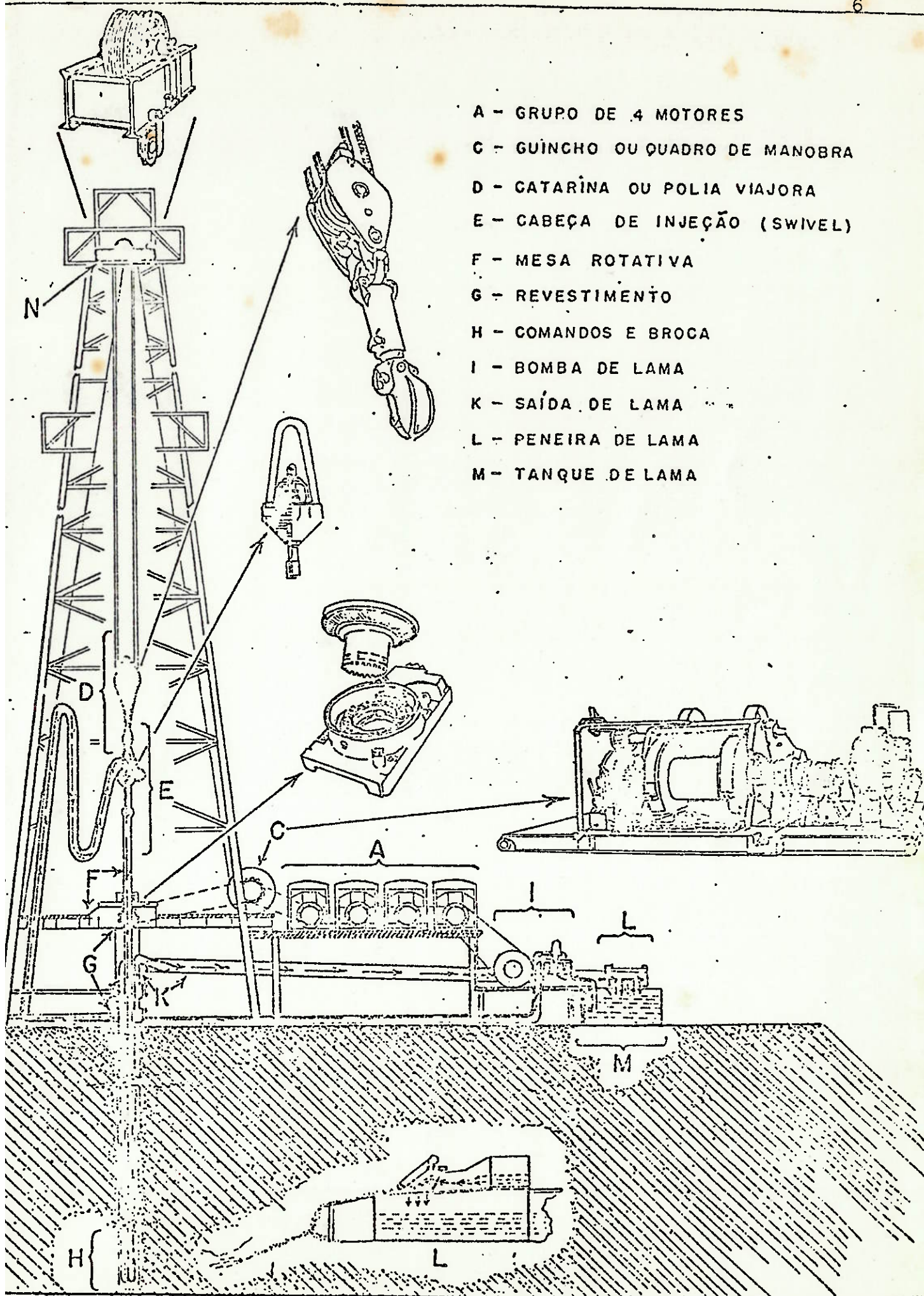


FIG. B-1 - EQUIPAMENTOS DE UMA SONDA ROTATIVA

2.2.2- Método de Perfuração a Turbina ("Turbo Drilling").

O método utiliza os mesmos equipamentos empregados no rotativo convencional. A diferença consiste na adaptação de uma turbina logo acima da broca a qual é acionada pelo fluido de perfuração.

3. EQUIPAMENTOS DE PERFURAÇÃO DE SUBSUPERFÍCIE.

3.1- Broca.

A broca é o elemento situado na extremidade inferior da coluna de perfuração. Sua finalidade é retirar pequenos fragmentos ou cascalhos das formações. Para tanto, ela recebe peso, rotação e o fluido de perfuração - (Figs. B2 a 5):

3.2- Coluna de Perfuração.

A coluna de perfuração é constituída de: comandos de perfuração, tubos de perfuração e substitutos -(Figs.B6 a 9). Tem por função:

- a) Aplicação de peso sobre a broca;
- b) Rotação da broca;
- c) Permitir a circulação do fluido de perfuração até a broca.

4. EQUIPAMENTOS DE PERFURAÇÃO DE SUPERFÍCIE.

4.1- Equipamentos do Sistema de Manejo de Cargas.

4.1.1- Elementos de Sustentação.

4.1.1.1- Fundações ou Bases ("Foundations").

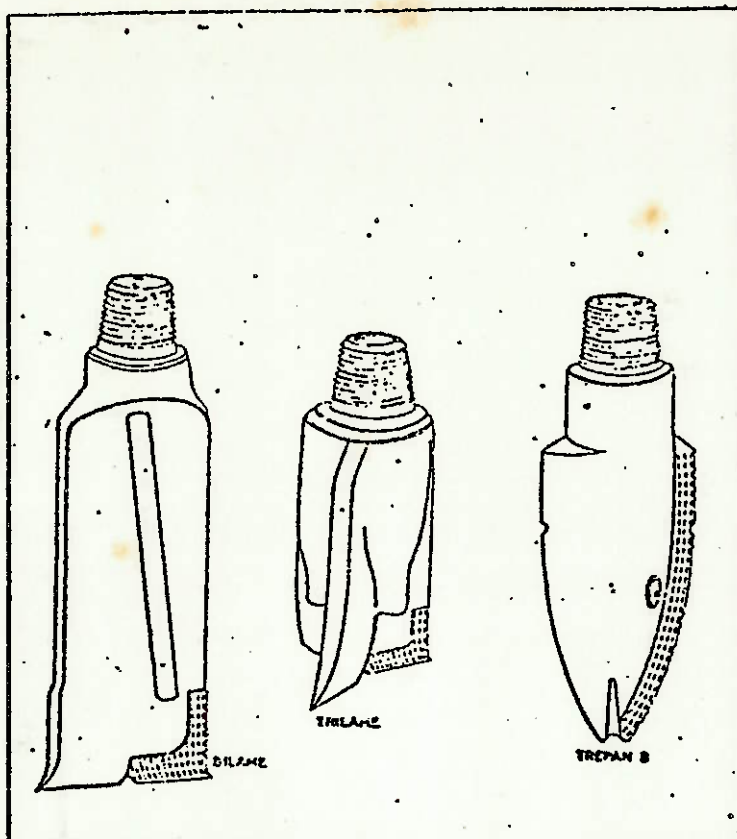


FIG. B-2 - BROCA DRAGA OU DE LÂMINAS

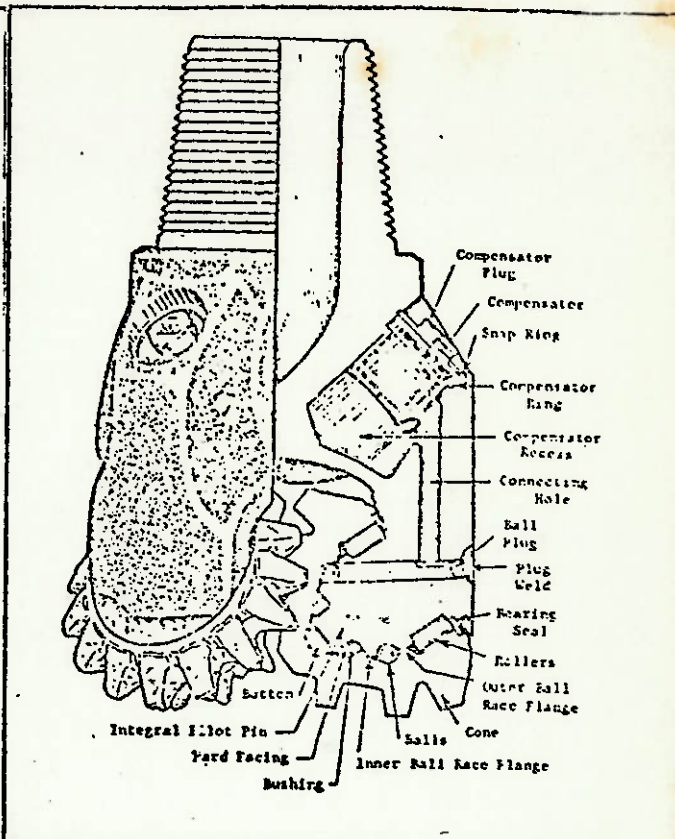


FIG. B-3 - BROCA DE CONES DENTADA

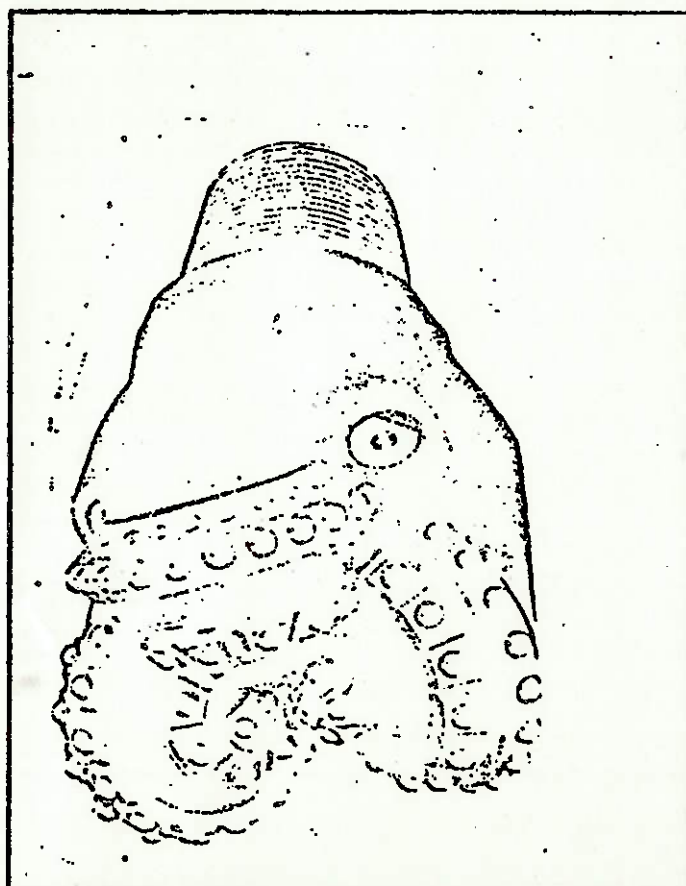


FIG. B-4 - BROCA DE CONES COM BOTÕES DE TUNGSTÊNIO

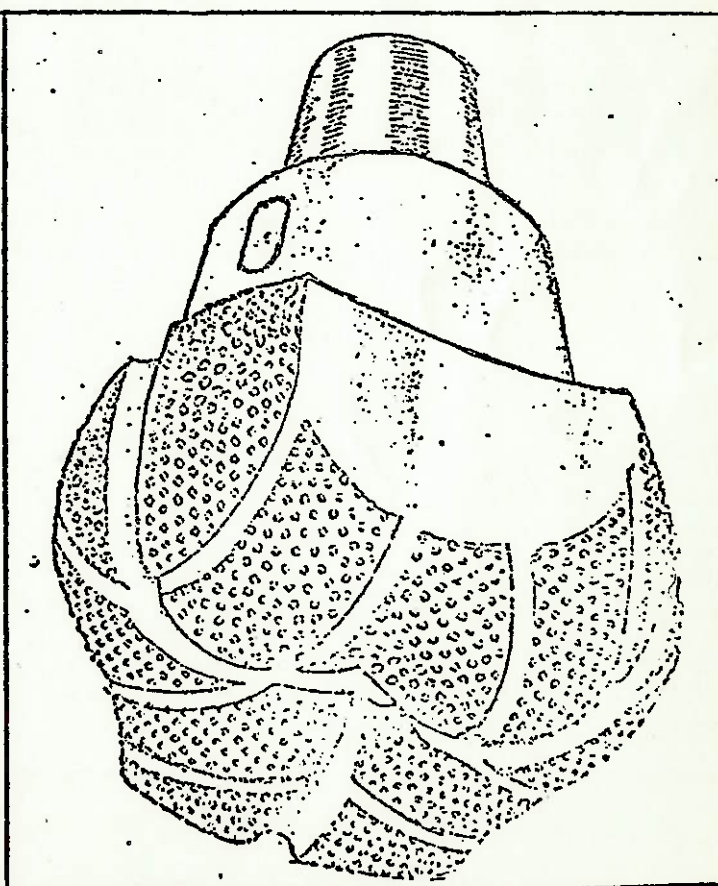


FIG. B-5 - BROCA DE DIAMANTES

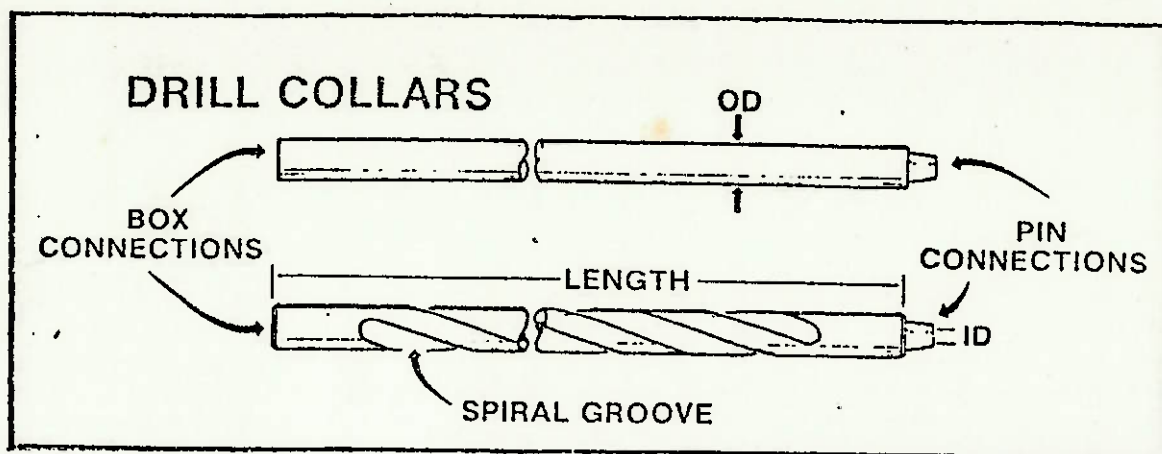


FIG. B-6 - COMANDOS DE PERFURAÇÃO

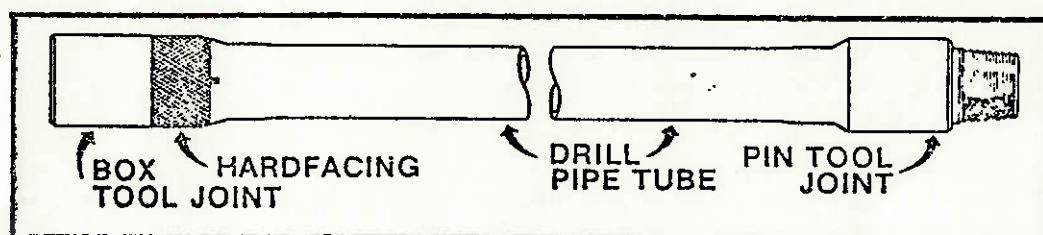


FIG. B-7 - TUBOS DE PERFURAÇÃO

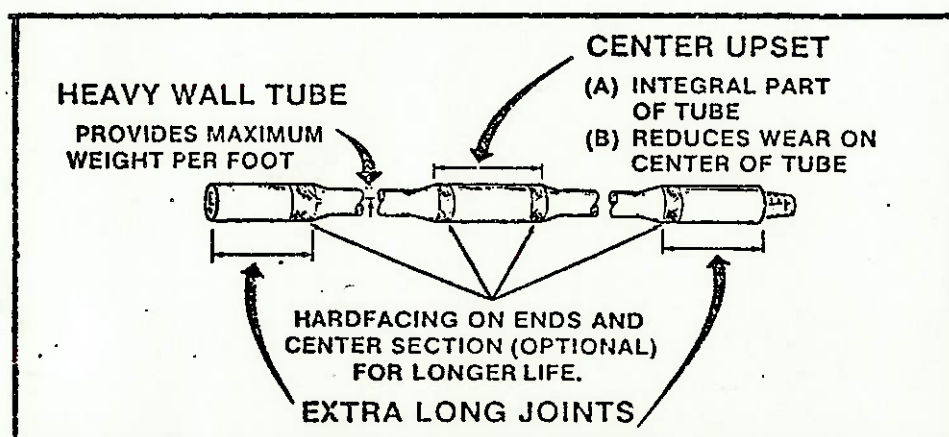


FIG. B-8 - TUBOS DE PERFURAÇÃO PESADOS (HWD)

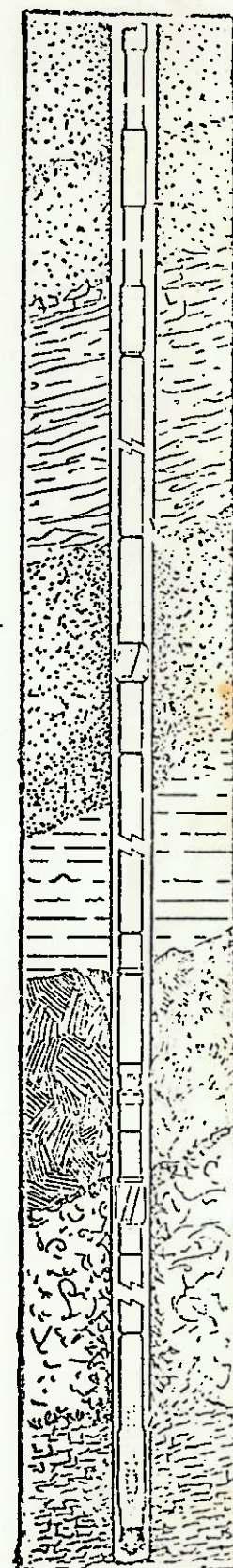


FIG. B-9 - ESQUEMA DE UM POÇO

Devem suportar com segurança, as cargas para as -
quais a torre e a própria subestrutura foram dimensionadas.

As cargas atuantes numa fundação são decorrentes
do:

- a) peso da torre, com sua carga máxima;
- b) peso da subestrutura;
- c) peso da mesa rotativa com sua carga;
- d) peso do quinho completo (transmissão, motores,
etc).

As fundações; bem como as subestruturas, são padro
nizadas e devem ser rígidas a fim de resistir às deflexões, vi
brações e deslocamentos.

Elas podem ser de concreto, de madeira, em grelhas
de aço e tipos especiais.

4.1.1.2- Subestruturas ("Substructures").

A torre não pode ser pousada diretamente sobre o -
solo para se dispor de um espaço para trabalho abaixo da plata
forma. Este espaço é função do tipo de sonda e das pressões -
das formações esperadas, tendo em vista a necessidade de se -
utilizar os equipamentos de segurança contra erupções (B.O.P.)

4.1.1.3- Torre ("derrick").

É o equipamento fundamental à função de elevação -
da coluna, promovendo uma carga vertical para permitir as mano
bras.

- a) seções de manobra:

Consiste no agrupamento de dois, três ou quatro
tubos de perfuração ou comando para ganhar tempo nas manobras.

- b) tipos de torre:

- Convencionais - Foram as primeiras a serem em-

pregadas e não são portáteis - (Fig.B10).

- Mastros ("mast") -São portáteis e, por isso, mais utilizadas - (Fig.B11).

4.1.2 - Elementos de Acionamento e Controle.

4.1.2.1- Guincho ("Draw work").

É um equipamento em estrutura de aço soldado, com tambores de levantamento principal e auxiliar (se necessário), comandados por meio de correntes, "sprockets" e embreagens - pneumáticas, sendo que sua unidade de potência pode ser composta por um ou mais motores diesel ou elétricos : (Fig.B12).

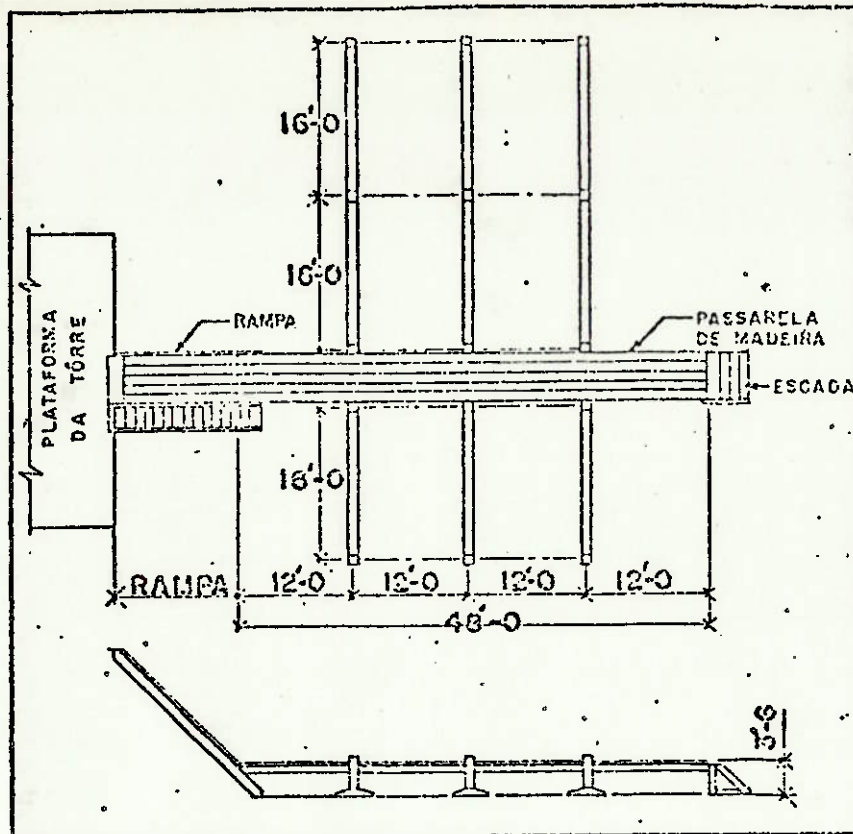
O guincho é responsável pelos trabalhos de elevação, abaixamento e sustentação de toda a coluna de perfuração, como também em certos casos o responsável pela transmissão de potência para a mesa rotativa.

4.1.2.2- Bloco de Coroamento ("Crown Block").

É o bloco de polias localizado no topo do mastro, - através do qual este sustenta todo o sistema de perfuração da sonda - (Fig.B13).

4.1.2.3- Catarina ("Travelling Block").

É o elemento complementar do sistema de polia. Consta, como o bloco de coroamento, de diversas polias que giram - em torno de um eixo. Possui a dupla função de suportar o peso da coluna (quando perfurando ou circulando) e de elevar ou - abaixar a mesma coluna (quando manobrando) ou outro equipamento pesado - (Fig.B14).



- ESTALEIRO DE TUBOS

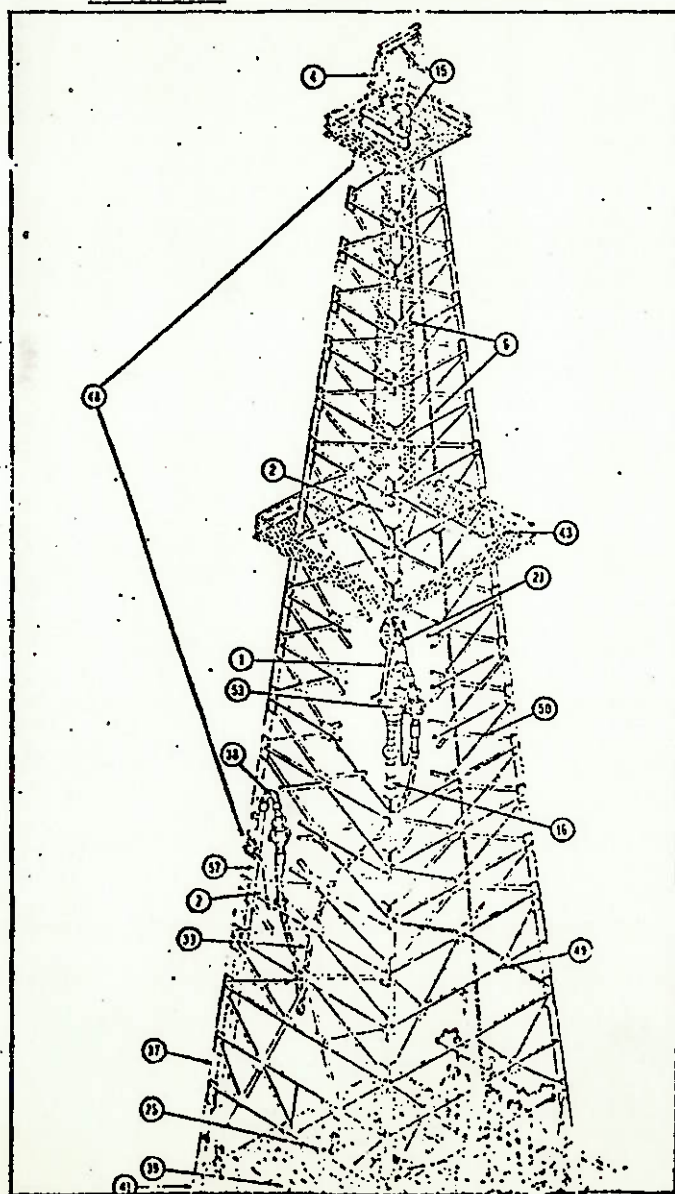


FIG. B-10 - TORRE

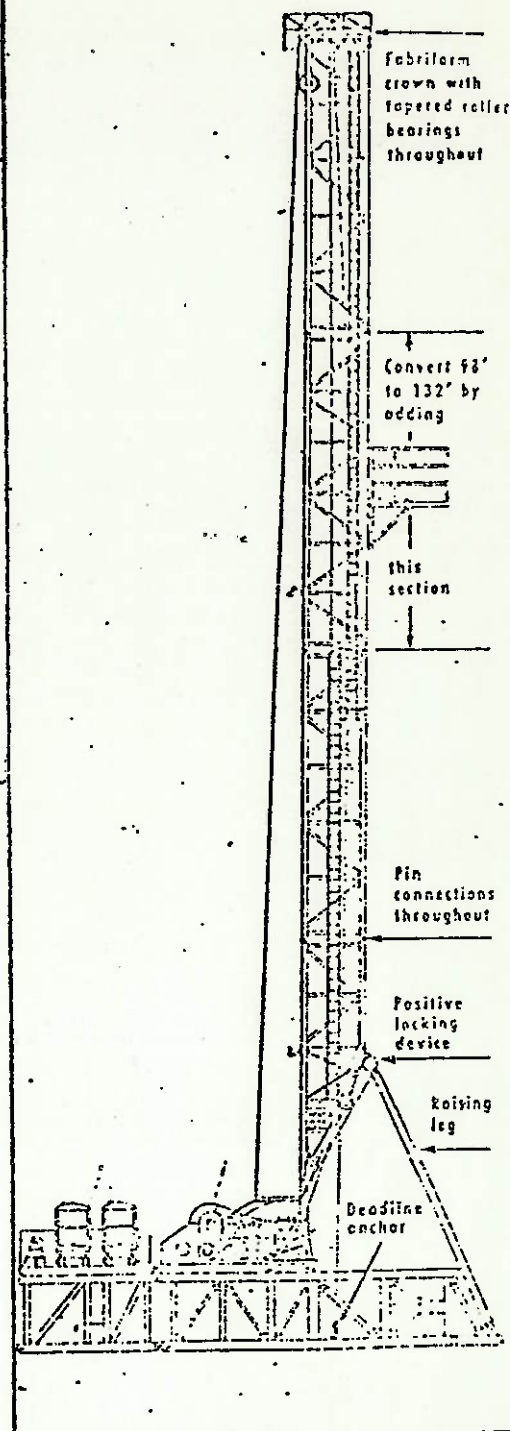


FIG. B-11 - MASTRO

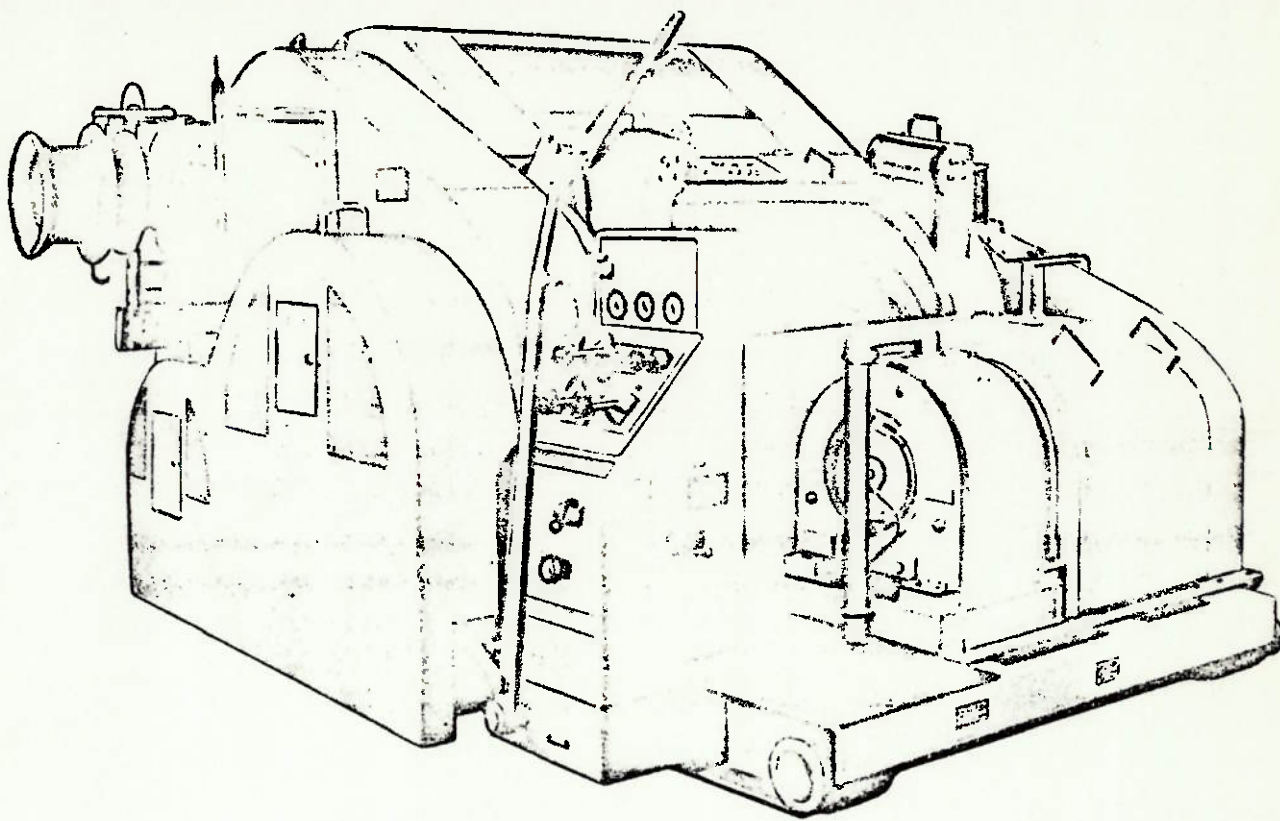
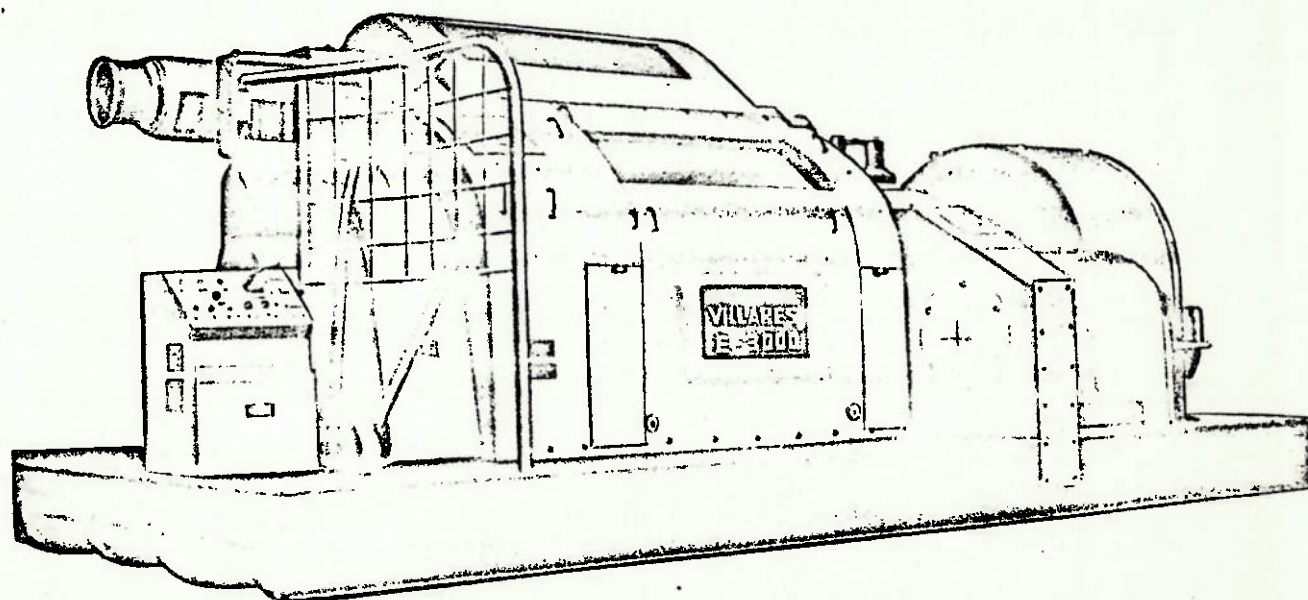


FIG. 12 . GUINCHO



4.1.2.4- Gancho ("Hook").

É o elemento complementar da catarina. Vem ligado logo abaixo desta ou acoplado a ela - (Fig.B15).

4.1.2.5- Elevador ("Elevator").

O elevador nada mais é que um colar bipartido que é adaptado aos comandos e tubos de perfuração, de revestimento e de produção para sua movimentação - (Fig.B16).

4.2- Equipamentos do Sistema de Rotação.

Tem a finalidade de propiciar rotação à coluna de perfuração que transmite à broca. Os equipamentos são:

4.2.1- Mesa Rotativa ("Rotary Table")

Tem como função, transmitir rotação à coluna; permitir livre deslizamento da haste quadrada e suportar as colunas de perfuração ou de revestimento, quando apoiadas nas cunhas. Pode ser acionado pelos motores do guincho ou por um motor independente - (Fig.B17).

4.2.2- Haste Quadrada ("Kelly").

Sua função primordial é transmitir a torção proveniente da mesa rotativa à coluna de perfuração.

É um tubo de seção quadrada ou hexagonal, podendo ser também octagonal e chanfrada que é conectada no topo da coluna de perfuração. Na extremidade superior é adaptada à cabeça de injeção - (Fig.B18).

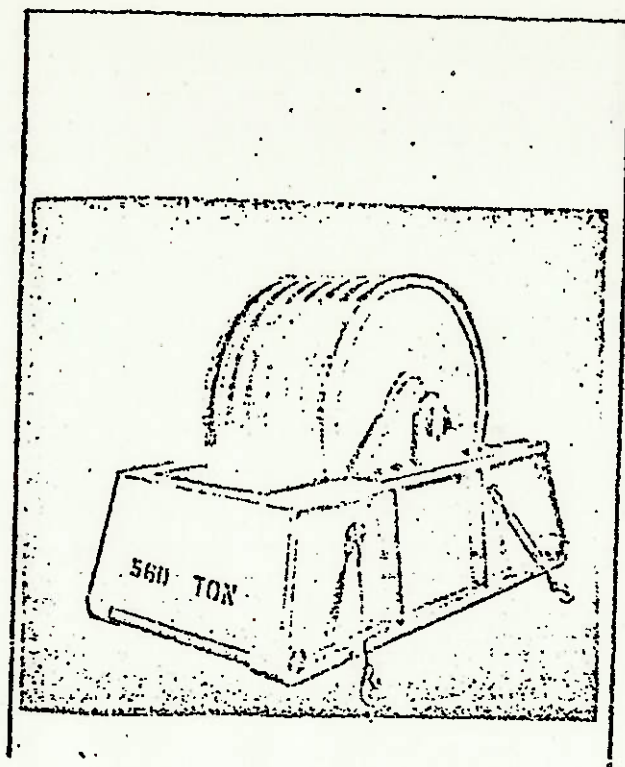


FIG. B-13 - - BLOCO DE COROAMENTO

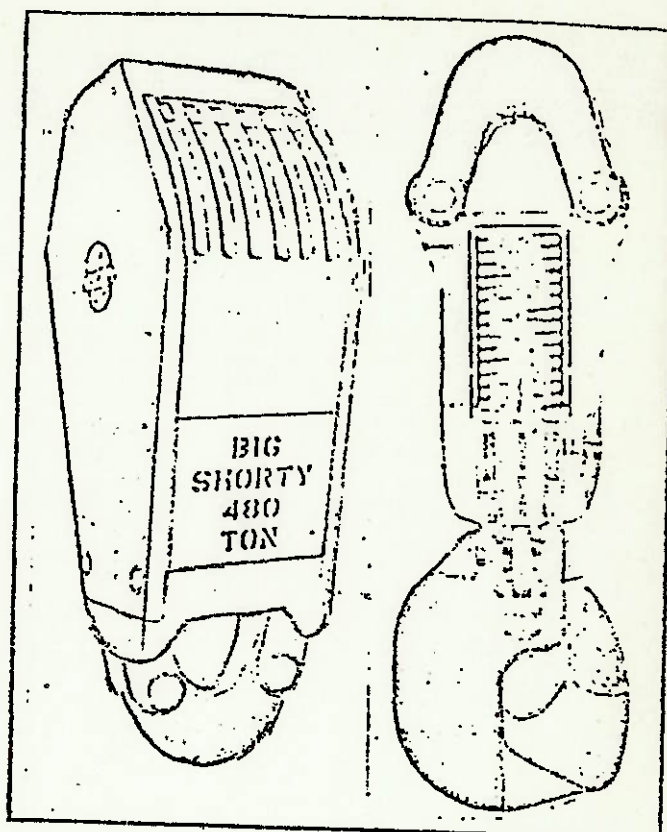


FIG. B-14 - CATARINA E CANCHOS NAO INTEGRADOS

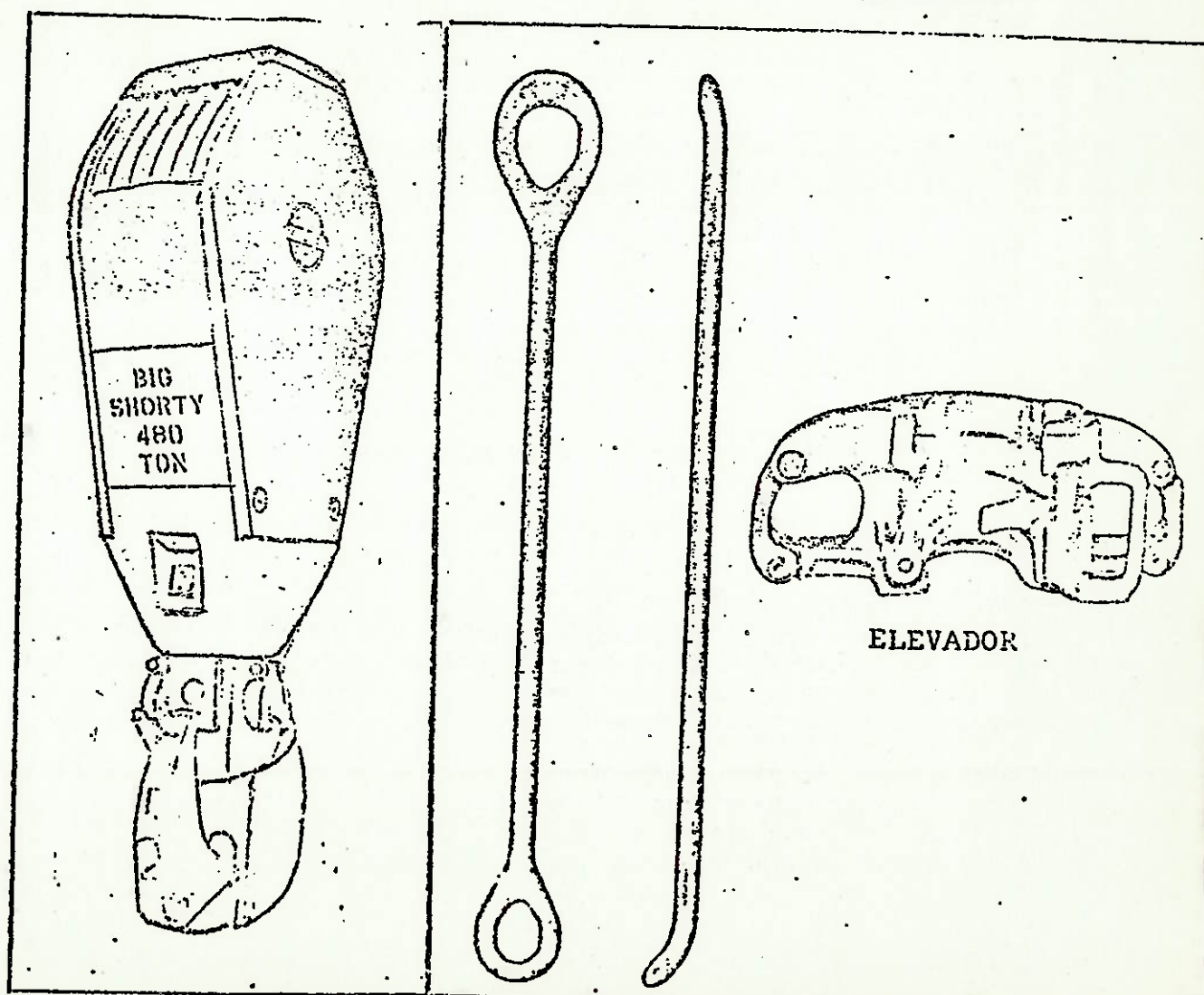


FIG. B-15 - GANCHO E CA-

FIG. B-16 - ELEVADOR E SEUS BRACOS

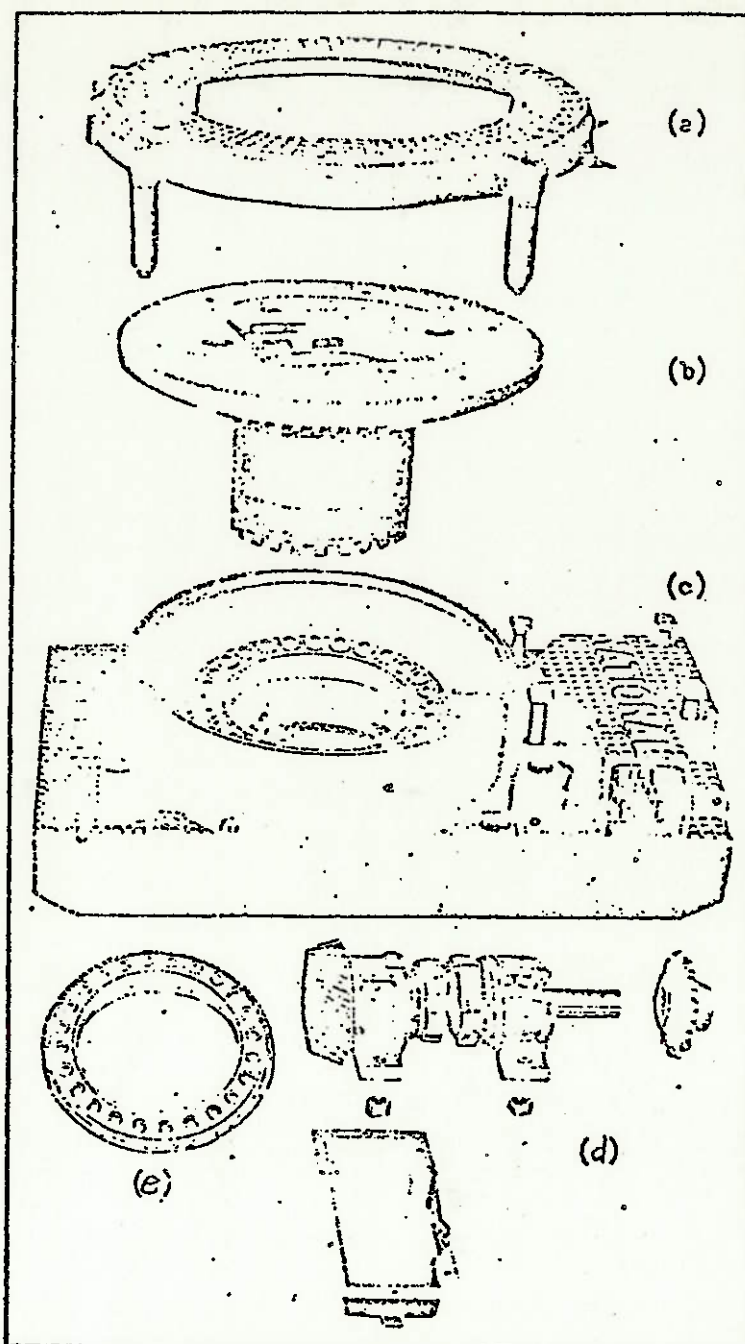


FIG. 8-17(a)- ELEMENTOS PRINCIPAIS DA MESA ROTATIVA

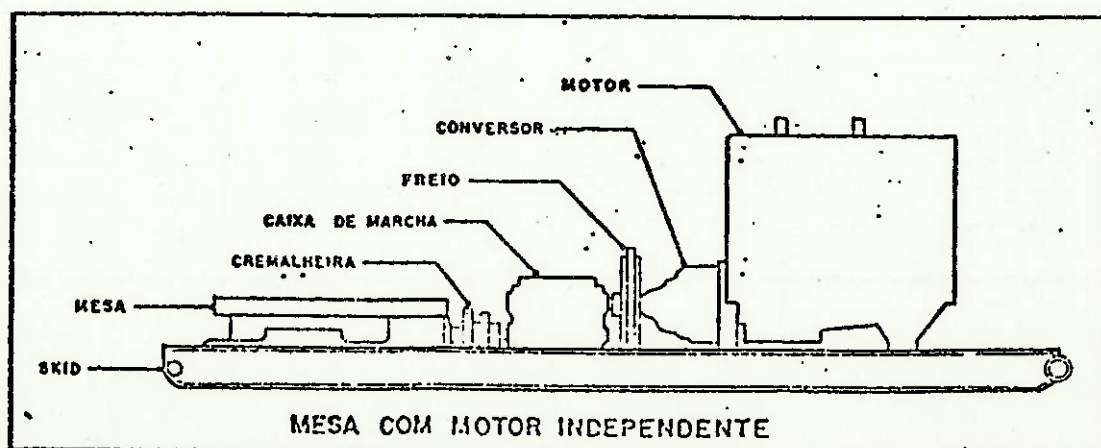


FIG. 8-17(b)- AÇIONAMENTO DA MESA

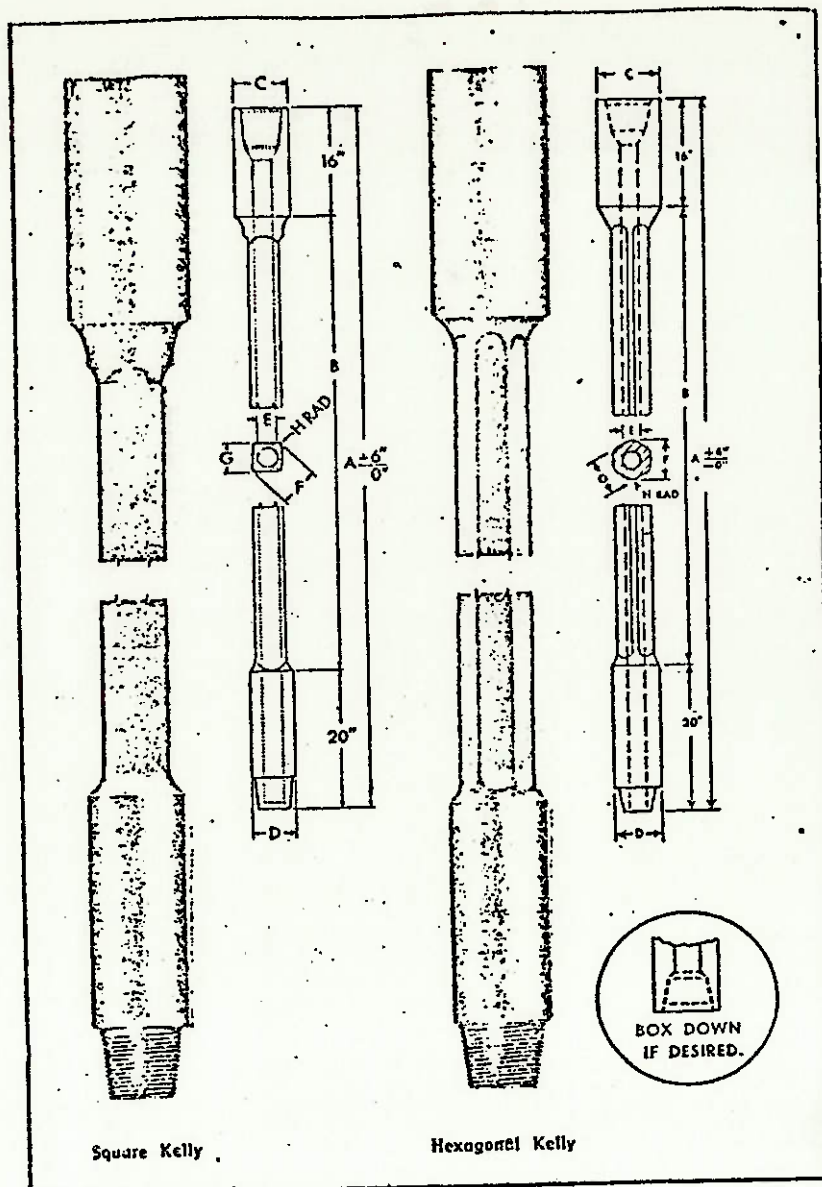


FIG. B.18(a) HASTE QUADRADA (KELLY)

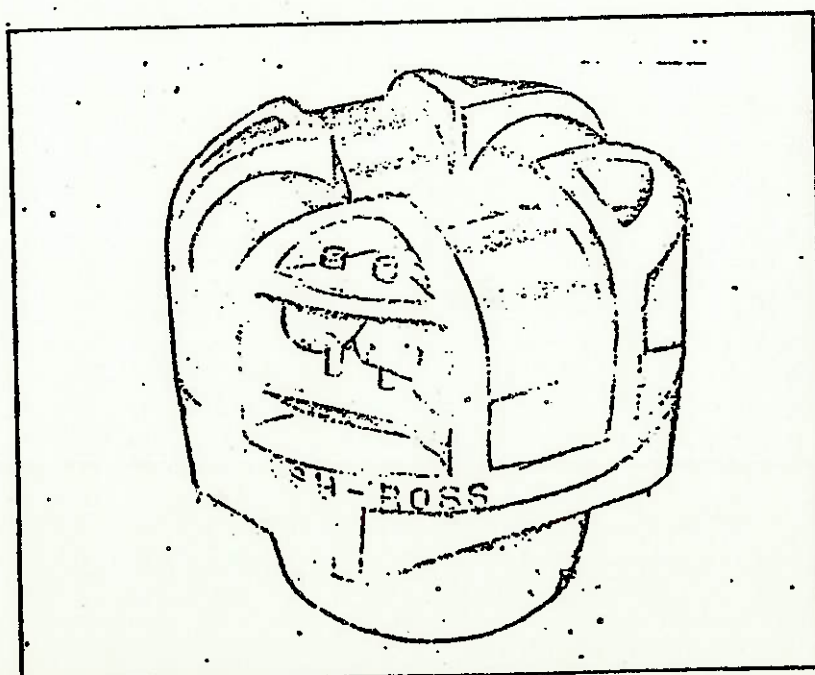


FIG. B.18(b) BUCHA DA HASTE QUADRADA

4.2.3- Cabeça de Injeção ("Swivel").

É o equipamento que serve de ligação entre os elementos não girante (mangueira de lama) e girante (coluna de perfuração). Fica suspensa pelo gancho, através de sua* alça e recebe em sua extremidade inferior a haste quadrada que permanece continuamente ligada à cabeça de injeção - (Fig.B19).

Funções:

- a) permitir livre rotação da coluna de perfuração, mesmo durante sua movimentação vertical;
- b) suspender a coluna de perfuração por intermédio da haste quadrada;
- c) possibilitar a passagem do fluido de perfuração para dentro da coluna de perfuração.

4.3- Equipamentos do Sistema de Circulação.

É o sistema que reúne maior número de equipamentos, sendo responsável por muitas funções de uma sonda petrolífera - (Fig.B20).

a) Sistema de injeção e alta pressão:- constituído pelas motobombas centrífugas de alimentação, bombas de lama, tubos bengala, mangueira rotativa e cabeça de injeção. Este sistema permite a sucção do fluido de perfuração, depositado em tanques apropriados, injetando-o, a alta pressão, dentro do poço perfurado.

b) Sistema de limpeza:- remove a maior parte possível de partículas sólidas, provenientes da ação da broca ou desprendidas da parede do poço. É composto de peneiras, desareadores, dessiltadores e depuradores. No caso de surgimento -

* Que é o objeto de estudo.

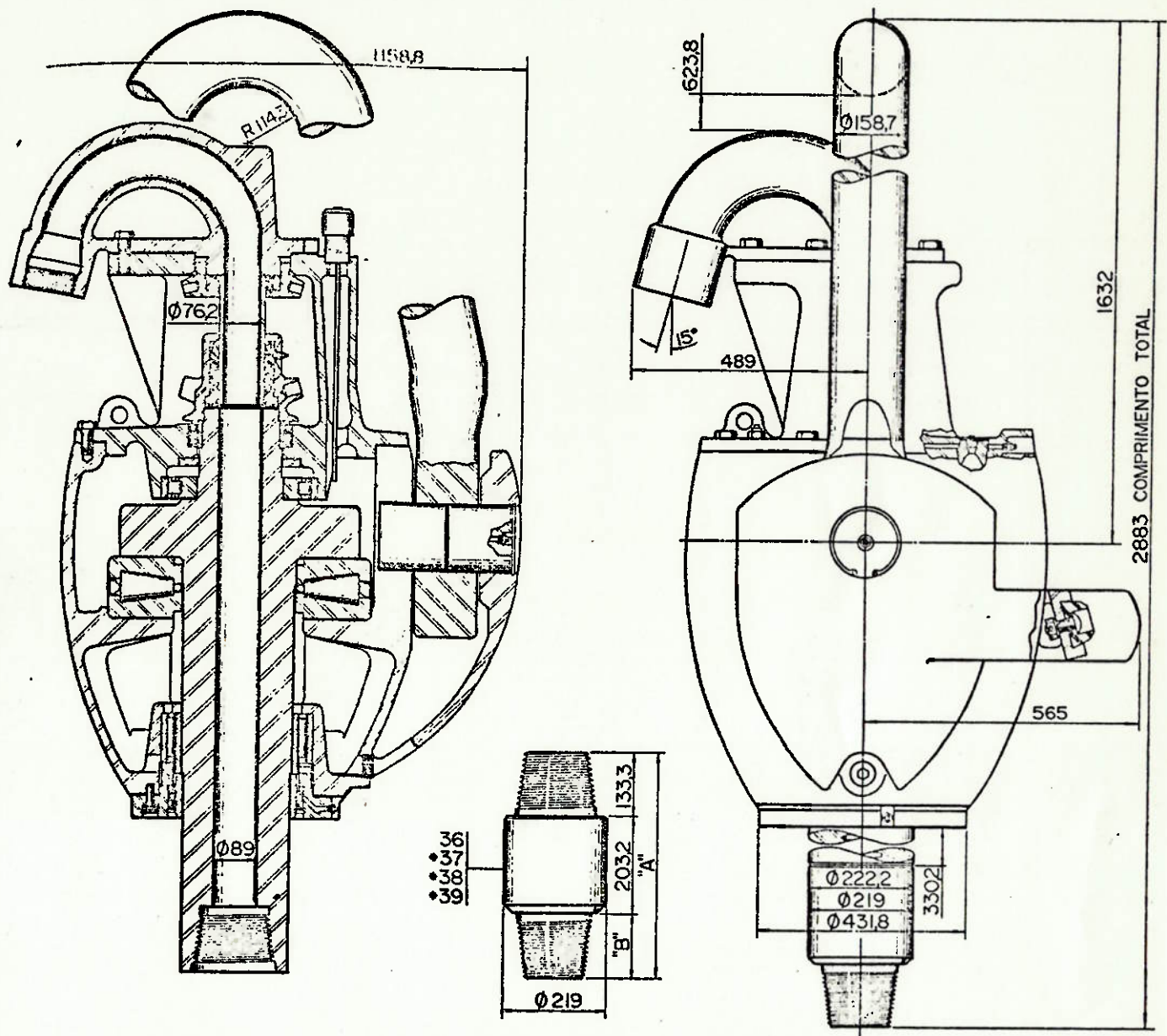


FIG. 8-19 . CABEÇA DE INJEÇÃO (SWIVEL)

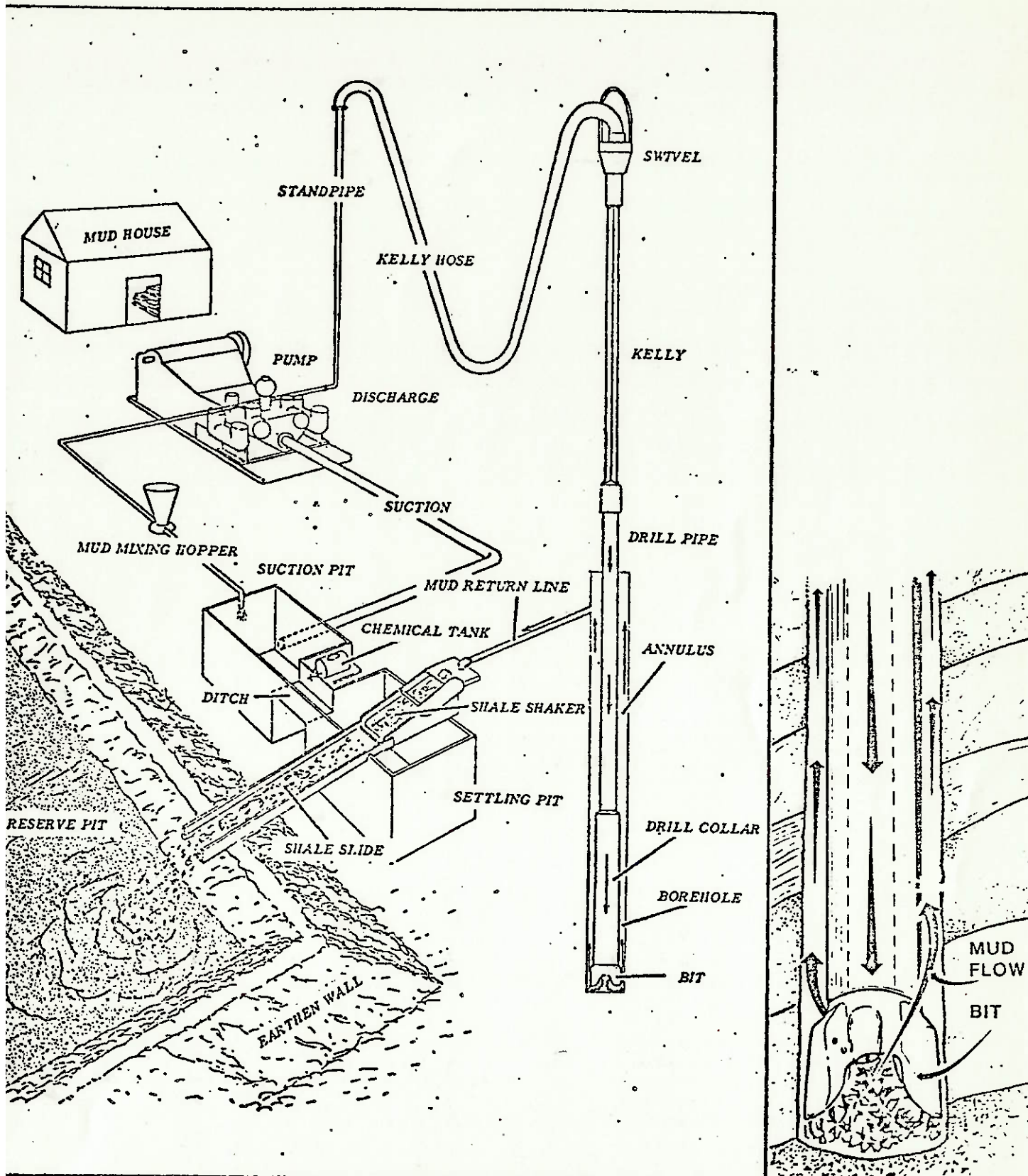


FIG. 8-20 - ESQUEMA DE CIRCULAÇÃO DA LAMA

de gás, utilizam-se, ainda os separadores de gás e os desgaseificadores.

c) Sistema de armazenamento e de produção do fluido é composto por tanques de lama, funil misturador, agitadores e pistolas de lama, com a finalidade de preparar e armazenar o fluido de perfuração.

d) Fluido ou lama de perfuração: é um preparado químico que visa transportar os resíduos de perfuração para fora do poço, lubrificar e refrigerar a broca, permitir que os resíduos sejam liberados ao atingirem a superfície, reter partículas e resíduos em suspensão quando a circulação cessa, controlar a pressão hidrostática no subsolo prever flutuabilidade da coluna de perfuração e contribuir, ao máximo, para a obtenção de informações do subsolo.

4.4- Equipamentos para Geração de Energia.

Pode ser mecânico ou elétrico. Sendo mecânico, o guincho e as bombas de lama são acionadas por motores diesel. A mesa rotativa, por sua vez, é acionada pelo próprio guincho e os demais acessórios da sonda recebem energia elétrica de um pequeno grupo moto-gerador auxiliar.

No caso de geração de energia através de sistema elétrico, os motores diesel do guincho e das bombas de lama são substituídos por motores elétricos. A mesa também pode ser acionada por motor elétrico próprio, dispensando o acoplamento ao guincho.

5. OPERAÇÕES DE PERFURAÇÃO.

Determinada a locação, pela geologia, tem início a preparação da base ou fundação. Esta, normalmente é construída com a previsão de receber determinada sonda, tendo em vista as suas dimensões, características, etc.

Estando a base preparada, procede-se com a desmontagem da sonda, com o seu deslocamento e, simultaneamente, com a sua montagem.

Feita a montagem das partes principais da sonda - inicia-se a perfuração do poço. Esta, é composta das seguintes operações (que algumas vezes pode não ocorrer):

a) Operações Rotineiras ou Normais:

- Perfuração e conexão;
- Circulação;
- Manobra.

b) Operações Específicas:

- Descida do revestimento;
- Cimentação;
- Perfilagem.

c) Operações Especiais:

- Testemunhagem;
- Pescaria;
- Controle na perfuração de poços verticais e direcionais;
- Controle de "Kicks".

6. PERFURAÇÃO NO MAR.

As operações de perfuração no mar pouco diferem das suas similares em terra quando se emprega unidades fixas e auto eleváveis. Mesmo utilizando unidades flutuantes a diferença não é muito grande a excessão da cabeça de poço que fica posicionada no fundo do mar - (Fig.B21).

Quanto ao tipo de ancoragem, tem-se:

6.1- Plataformas Fixas.

São estruturas apoiadas no fundo do mar por meio de estacas, sapatas, casco inteiro com o objetivo de permanecerem no local por longo tempo - (Fig.B22).

6.2- Plataformas Móveis.

6.2.1- Auto-Eleváveis ou "Jack-Up".

São unidades que se apoiam no fundo do mar por meio de pernas que se movimentam verticalmente. Podem ser rebocáveis ou auto-propulsoras e, geralmente, se destinam à perfuração de poços embora possam ser empregadas para a produção - (Fig.B23).

6.3- Plataformas Submersíveis.

São plataformas apoiadas no fundo do mar, em geral, rebocáveis, auto-suficientes, destinadas à perfuração de poços. Os tubulões permitem a flutuação da estrutura enquanto o afundamento se processa pelo enchimento por cima dos mesmos tubulões.

6.4- Plataformas Semi-Submersíveis.

São estruturas flutuantes, ancoradas no fundo, rebo

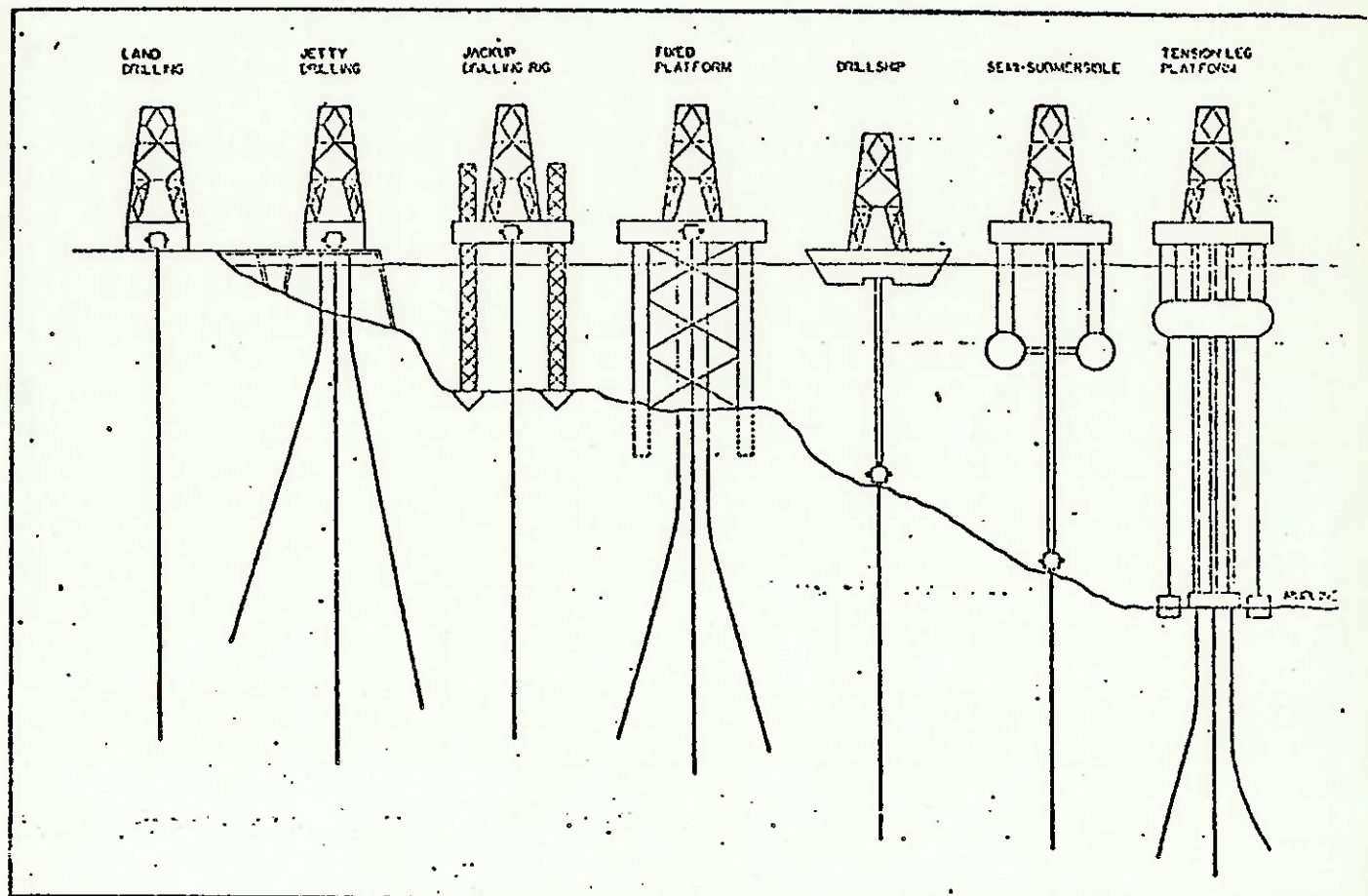
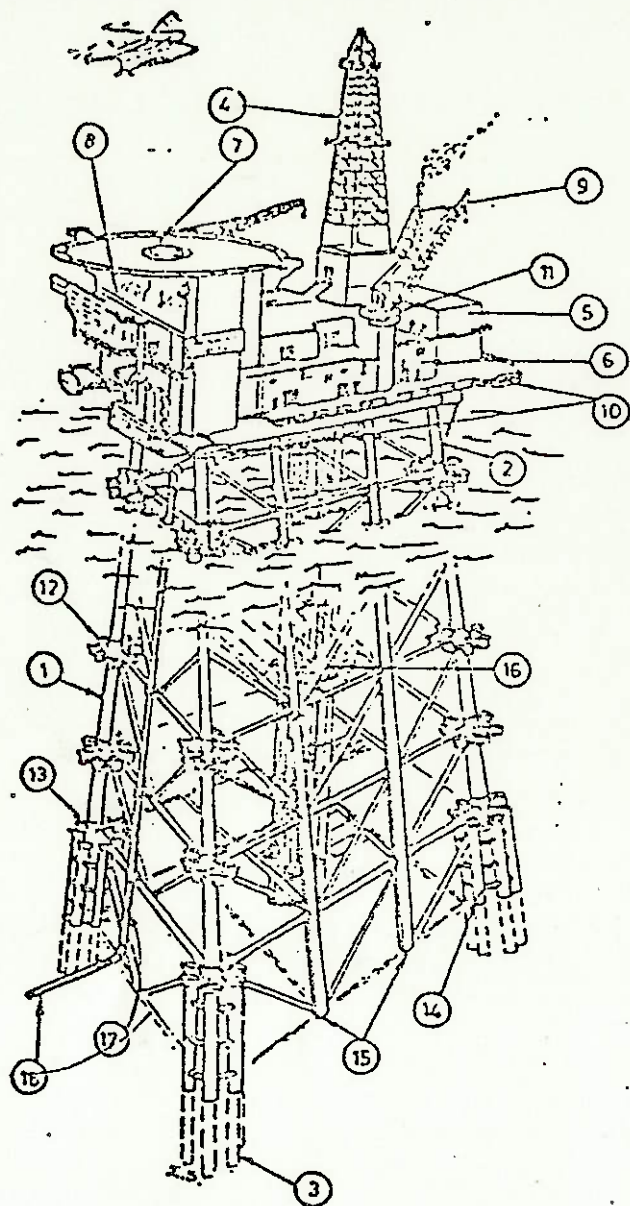
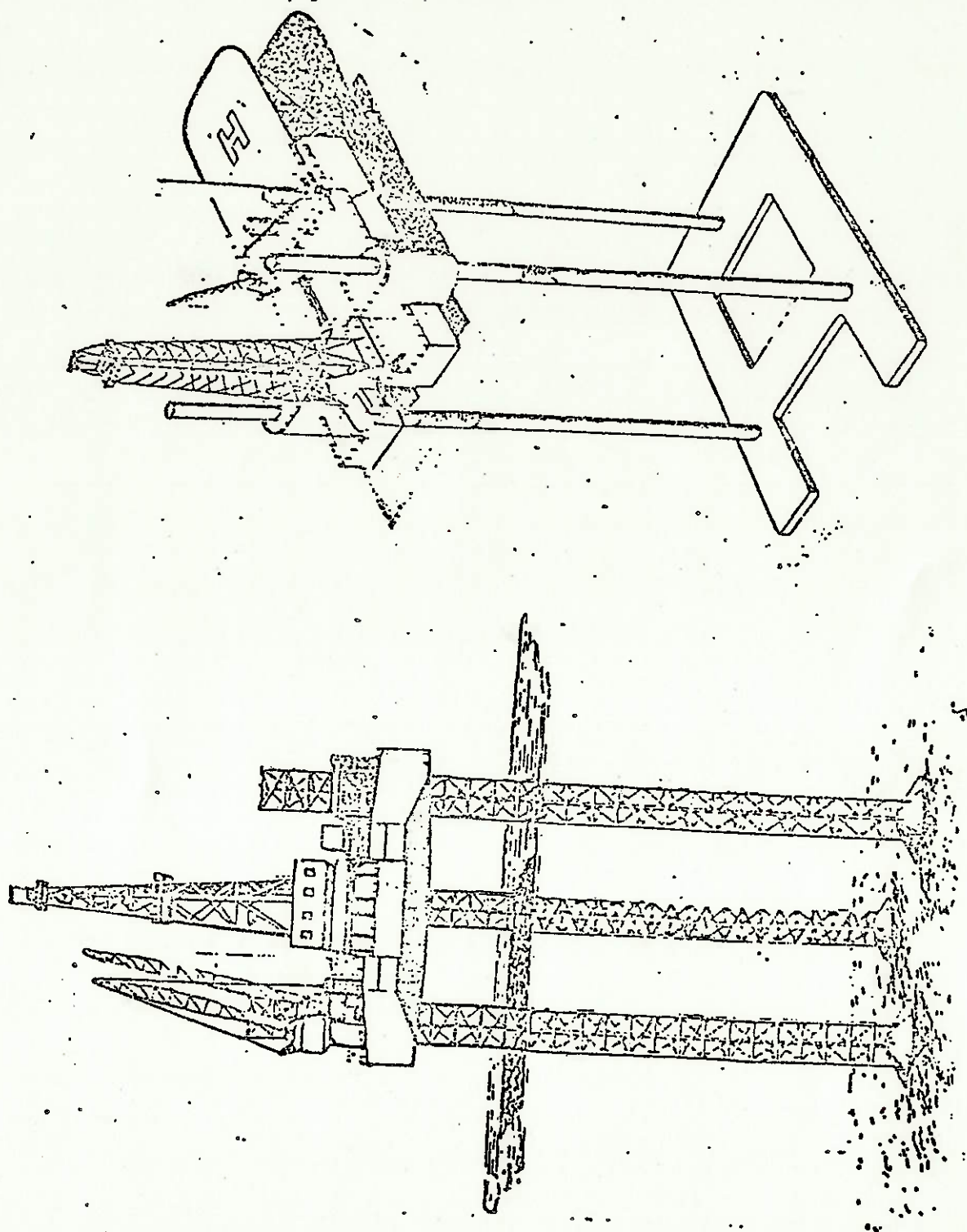


FIG. 8.21 - TIPOS DE PLATAFORMAS



- 1) SUBESTRUTURA DA JAQUETA
- 2) ARMAÇÃO DE SUPORTE DOS MÓDULOS
- 3) ESTACAS
- 4) TORRE DE PERFURAÇÃO
- 5) MÓDULO DE PERFURAÇÃO
- 6) MÓDULOS DE PRODUÇÃO
- 7) HELIPORTO
- 8) MÓDULO DE ALOJAMENTO
- 9) QUEIMADOR
- 10) BOTE SALVA VIDAS
- 11) GUINDASTE GIRATÓRIO
- 12) GUIAS DAS ESTACAS
- 13) PERNAS-GARRAFAS
- 14) CAMISAS DAS ESTACAS
- 15) TRILHOS DE LANCAMENTO
- 16) TUBOS CONDUTORES DE PERFURAÇÃO
- 17) RISER DE PRODUÇÃO
- 18) OLEODUTO SUBMARINO

FIG. 8-22 - PLATAFORMA FIXA DE PERFURAÇÃO E PRODUÇÃO



SAPATAS INDIVIDUALS

"MAT SUPPORTED"

FIG. 8.23 - PLATAFORMAS AUTO-ELEVÁVEIS

cáveis ou auto-propelidas, auto-suficientes, destinadas à perfuração - (Fig.B24 e 25).

6.5- Navios.

São estruturas flutuantes auto-propulsoras, de formas aerodinâmicas, auto-suficientes e destinadas à perfuração - de poços - (Fig.B26).

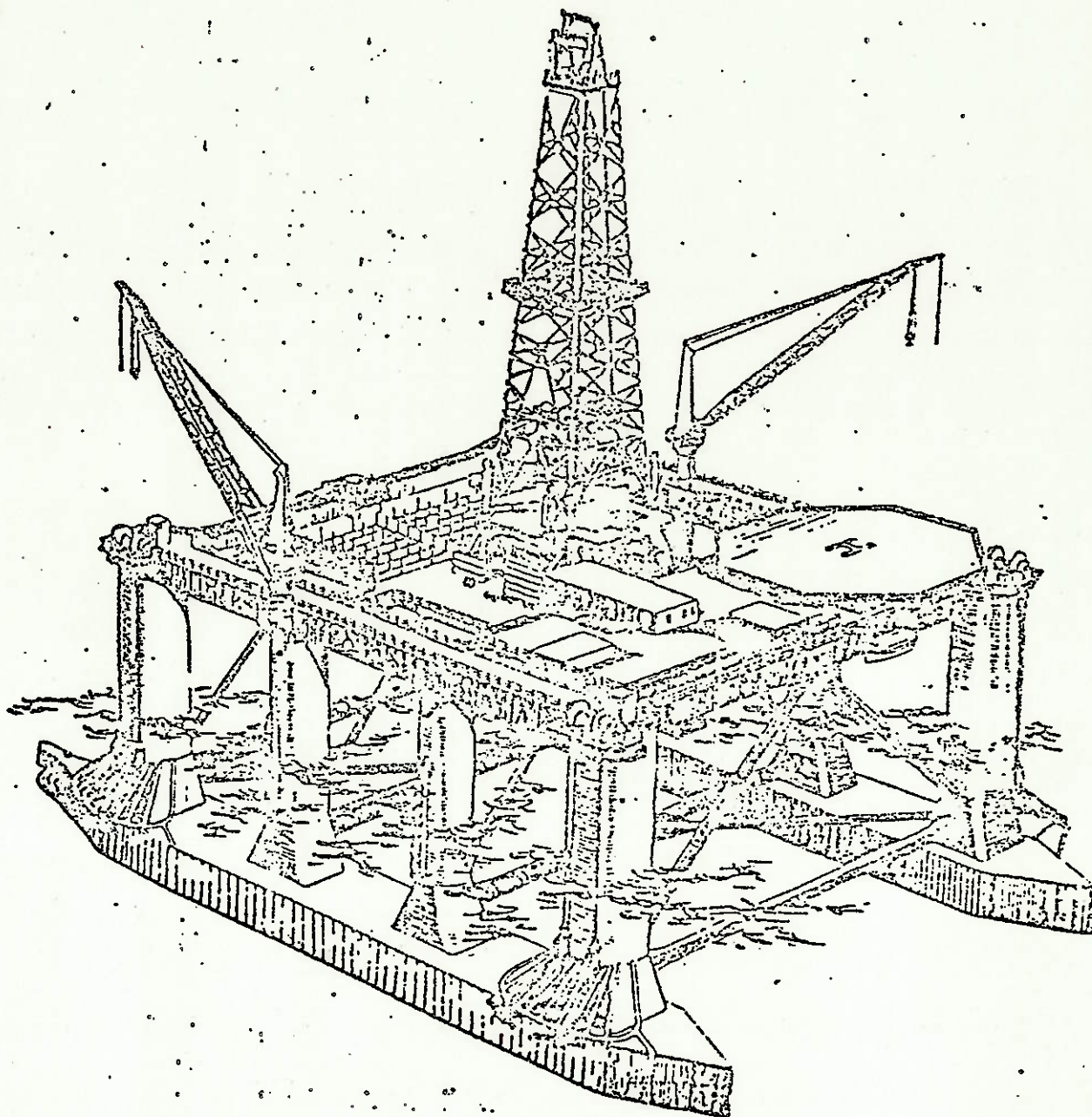


FIG. 8.24 - PLATAFORMA SEMI-SUBMERSIVEL

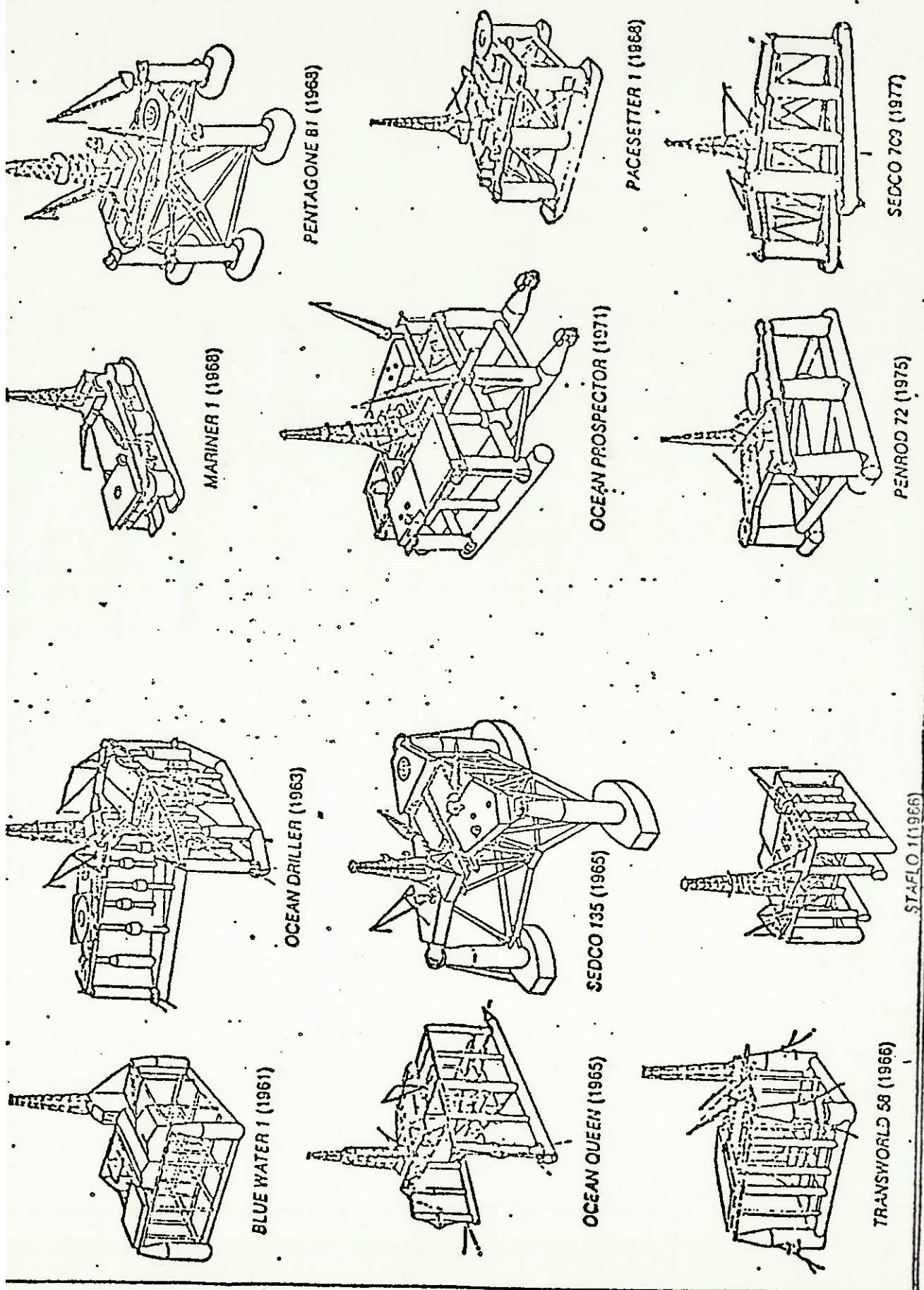


FIG. 8.25 - VÁRIOS TIPOS DE SEMI-SUBMERSÍVEIS

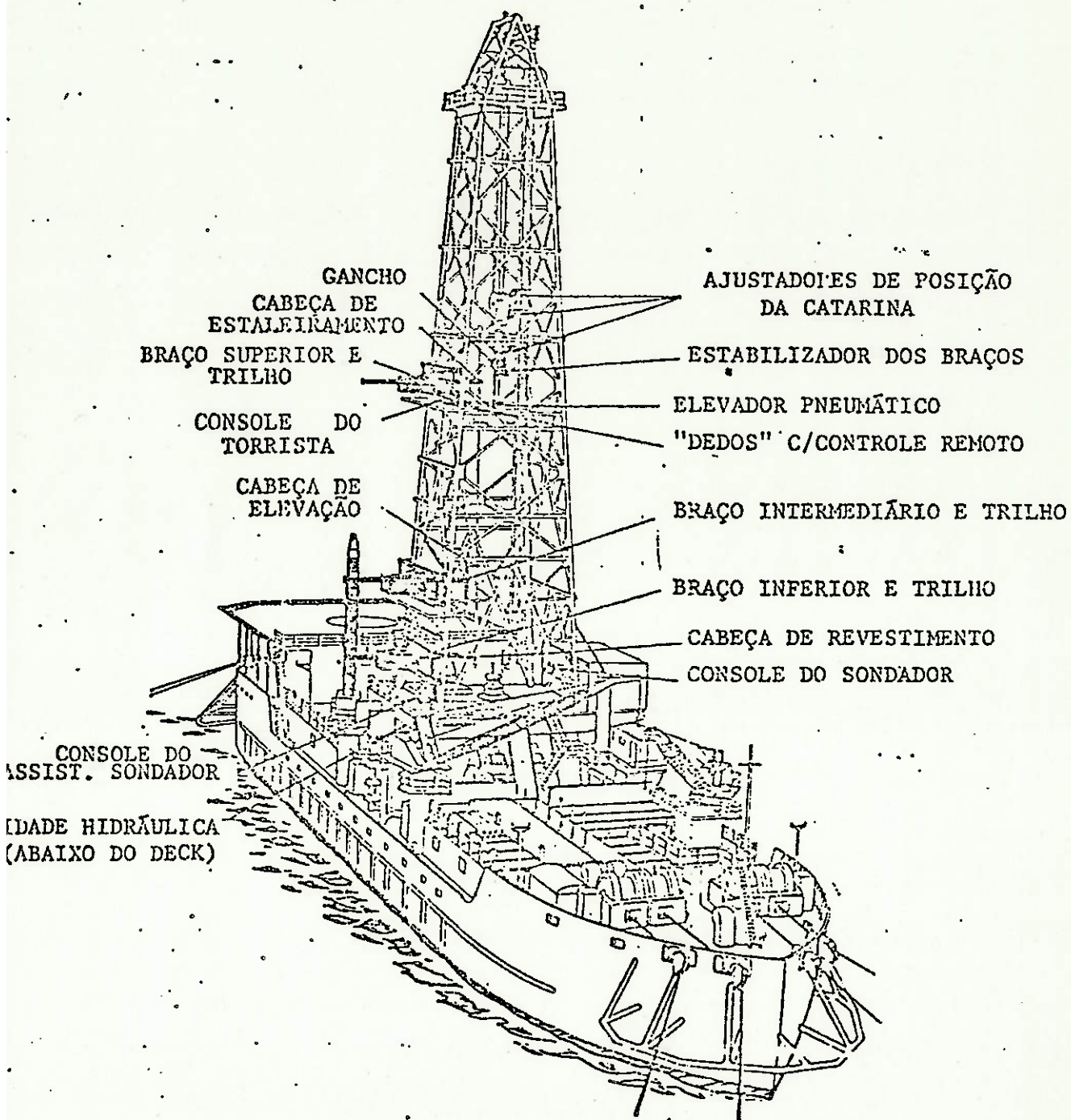
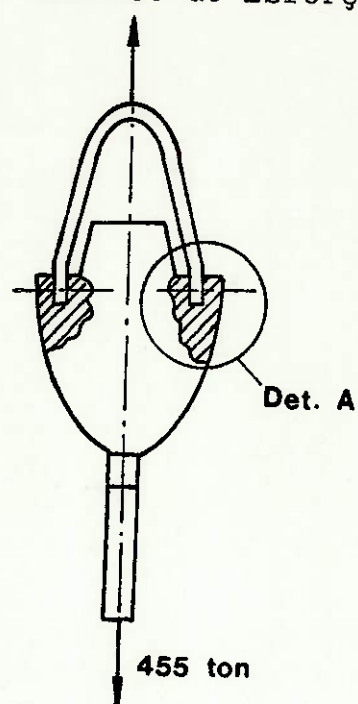


FIG. B.26 - NAVIO DESTINADO À PERFURAÇÃO DE POÇO

PARTE C - DIMENSIONAMENTO DO OLHAL

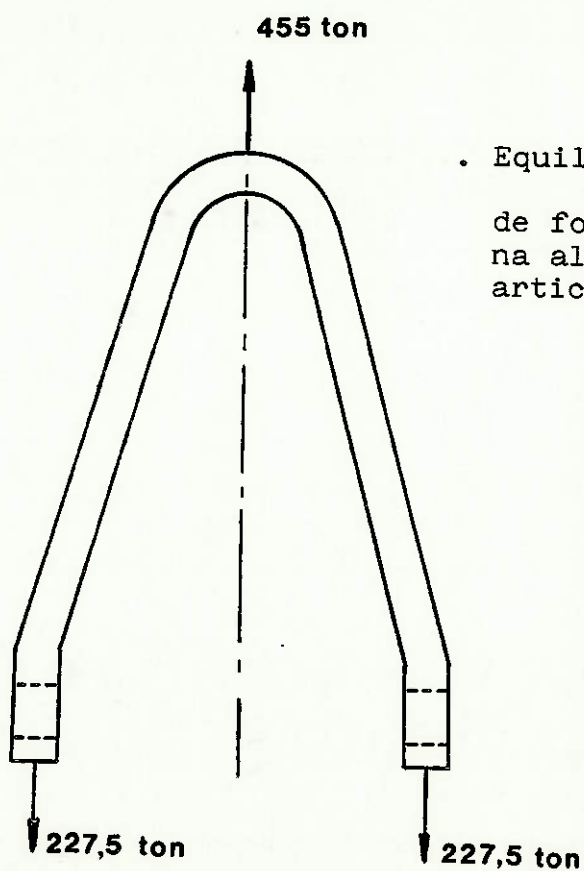
1. VERIFICAÇÃO A TRAÇÃO, CISALHAMENTO E ESMAGAMENTO.

1.1- Análise de Esforços.



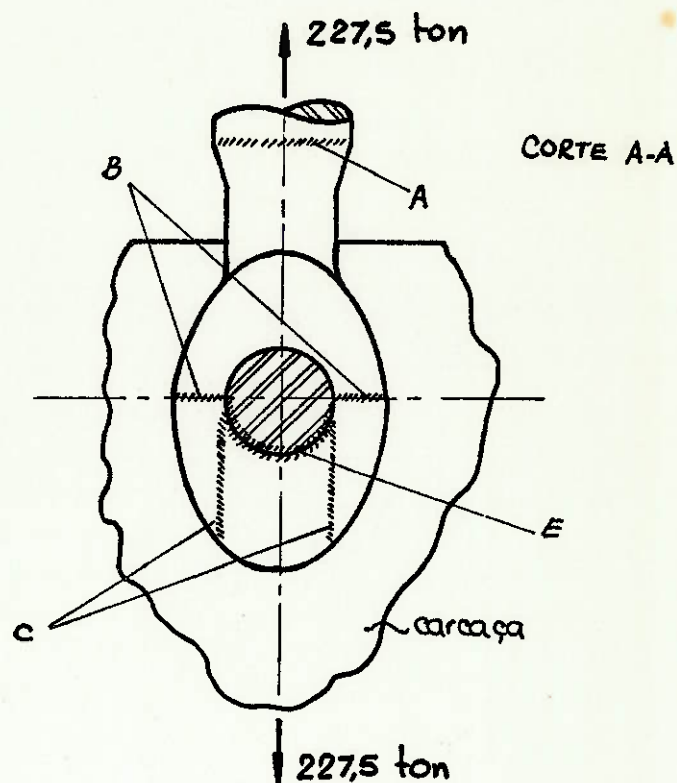
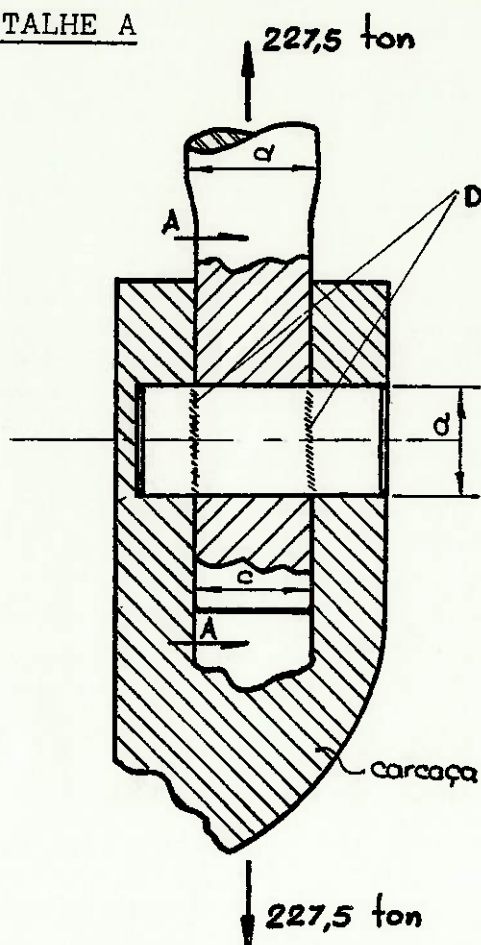
Força atuante
na cabeça de
injeção.

CARGA (capacidade) = 455 ton.
ESTÁTICA



. Equilíbrio
de forças
na alça
articulada

DETALHE A



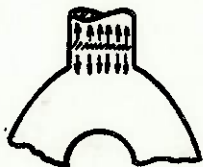
Não faremos os cálculos dimensionais à carcaça.

Faremos sim, com relação ao olhal e o pino.

1.2- Análise das Tensões Admissíveis com Vista ao Dimensionamento do Pino e do Olhal.

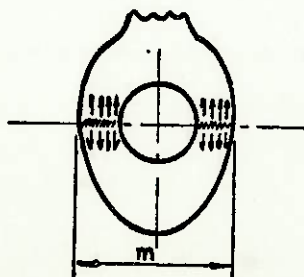
CONDIÇÕES CRÍTICAS PARA ANÁLISE:

- a) Tração na Haste do Olhal $\text{seção} = \frac{\pi d^2}{4}$



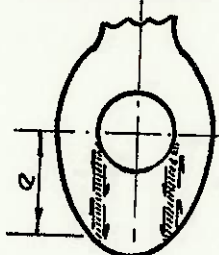
$$\frac{F}{A} = \frac{F}{\frac{\pi d^2}{4}} = \frac{227.500}{\frac{\pi d^2}{4}} = \frac{289.662}{d^2} \quad (1)$$

- b) Tração na Haste na Região do Furo - seção = $(m-a) c$



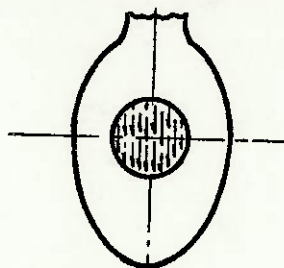
$$\frac{F}{A} = \frac{F}{(m-a)c} = \frac{227.500}{(m-a)c} \quad (2)$$

c) Cisalhamento da Haste na Região do Furo



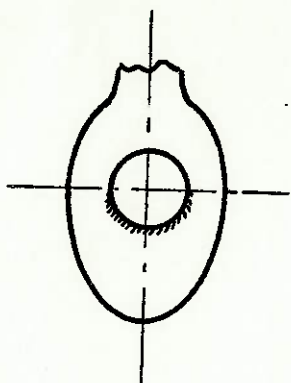
$$\tau = \frac{F}{2e.c} = \frac{227.500}{2.e.c} = \frac{113.750}{e.c} \quad (3)$$

d) Cisalhamento do Pino.



$$\tau = \frac{F}{A} = \frac{F}{\frac{2 \cdot \pi \cdot a^2}{4}} = \frac{227.500}{\frac{2 \cdot \pi \cdot a^2}{4}} = \frac{114.831}{a^2} \quad (4)$$

e) Esmagamento da Haste pelo Pino.

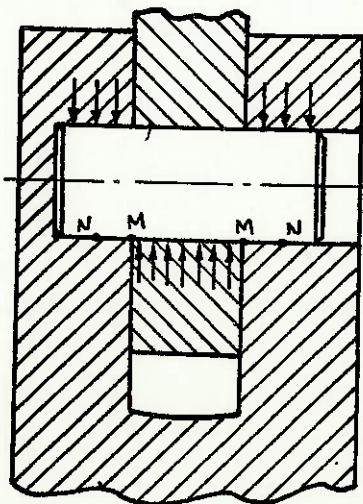


considera-se a área projetada $A = a.c$

$$\sigma = \frac{F}{A} = \frac{F}{a.c} = \frac{227.500}{a.c} \quad (5)$$

Obs: Supõe-se a princípio que não haja folga entre pino e o furo do olhal.

f) O Pino Atuando como uma Viga.



Hipótese: O pino se comporta como uma viga simples com - carga uniformemente distribuída, baseiando-se numa ajustagem deslizante tanto na haste como na carcaça.

O comprimento da viga, - poderia ser tomado entre os pontos médios dos la-

dos da carcaça, o que estaria favorecendo a segurança (N-N). Entretanto, quando houver alguma deflexão, o contato se dará nos pontos M ou em algum outro local muito próximo deles. Por isto será usado o comprimento $c = \text{MM}$ ao invés de N-N.

• Momento fletor máximo $M = \frac{Pc}{8}$ onde $P = 227.500 \text{ kgf}$

• Seção circular $J = \frac{\pi a^4}{64}$

• $M = \sigma \frac{J}{\frac{a}{2}} \rightarrow \frac{Pc}{8} = \sigma \frac{\pi a^3}{32}$

$$\sigma = \frac{Pc \cdot 4}{a^3 \pi} = \frac{289.662 \times c}{a^3} \quad (6)$$

1.3- Material.

Tanto para o pino quanto para a alça, será usado o mesmo material.

Material: SAE 4140

AISI 4140

DIN 1722S 42 Cr Mo 4

a) Escopo- Aço liga, próprio para beneficiamento, laminado - ou forjado com tratamento térmico de recozimento.

b) Composição Química.

C	0,38	a	0,43 %
Mn	0,75	a	1,00 %
Si	0,20	a	0,35 %
Cr	0,80	a	1,10 %
Mo	0,15	a	0,25 %
P	0,035 % máx		
S	0,040 % máx		

c) Propriedades Mecânicas.

Limite de resistência (kgf/mm^2)	66
Limite de escoamento (kgf/mm^2)	42
Alongamento $L_0 = 50 \text{ mm}$	25% min
Dureza Brinell	197 HB

d) Microestrutura

- . Deve ser constituída por ferrita na forma de grãos e per_lita esboroadas.
- . Tamanho do grão: 5 a 8 (ASTM . E.112)

Obs: Aço-liga beneficiado DUREZA BRINELL = 269 a 302 HB

Limite de resistência (kgf/mm^2)	78 a 87
Limite de escoamento (kgf/mm^2)	59 a 69

c) Valores para Projeto

- . Tensão de escoamento: $\sigma_e = 64 \text{ kgf/mm}^2$
a tração
- . Tensão de escoamento: $\tau_e = 35 \text{ kgf/mm}^2$
- . Fator de segurança adotado $\gamma = 3,5$
em relação ao escoamento:
- . Tensão admissível à tração: $\bar{\sigma}_t = 18,3 \text{ kgf/mm}^2$
- . Tensão admissível ao cisalhamento : $\bar{\tau} = 10 \text{ kgf/mm}^2$
- . Tensão admissível de compressão : $\bar{\sigma}_c = 18,3 \text{ kgf/mm}^2$

1.4- Cálculo das Incógnitas: d, m, a, c, e

6 Equações

$$(1) \rightarrow 18,3 \geq \frac{289 \ 662}{d^2} \rightarrow d \geq 125 \text{ mm}$$

$$(4) \rightarrow 10 \geq \frac{144.831}{a^2} \rightarrow a \geq 120 \text{ mm}$$

$$(5) \rightarrow 18,3 \geq \frac{227.500}{a \cdot c} \rightarrow c \geq \frac{9.100}{a} \quad (7)$$

$$(6) \rightarrow 18,3 = 289 \frac{662}{a^3} \cdot c \rightarrow 18,3 = 289.662 \frac{9100}{a^4}$$

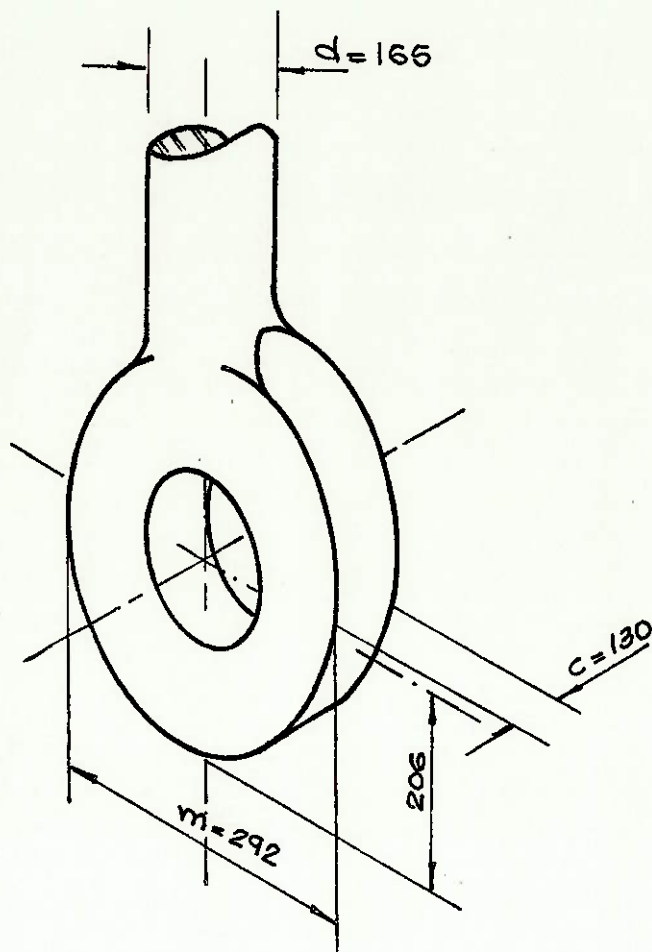
$$\rightarrow a \geq 110 \text{ mm}$$

$$(7) \rightarrow c \geq \frac{9100}{a} = 76 \text{ mm} \rightarrow c \geq 76 \text{ mm}$$

$$(3) \rightarrow 10 \geq \frac{113 \ 750}{e \cdot c} \rightarrow c \geq \frac{113 \ 750}{10 \cdot 76} = 149 \text{ mm}$$

$$(2) \rightarrow 18,3 \geq \frac{227.500}{(m-a) \cdot c} \rightarrow (m-a) \geq \frac{227 \ 500}{18,3 \cdot 76} \rightarrow m \geq 284$$

1.5- Dimensões Adotadas.



2. VERIFICAÇÃO POR OUTROS MÉTODOS

2.1- Verificação do Olhal, utilizando-se da teoria das barras Curvas*.

Obs: Supõe-se não haver folga entre pino e o furo do olhal, e o pino ser absolutamente rijo.

A tensão de tração máxima ocorre no intradorso, nas seções transversais ao eixo da barra, e sua grandeza pode ser dada pela seguinte fórmula:

$$\sigma_{\text{máx}} = \alpha \frac{8P}{r^2 r_2 t}$$

onde P = carga total no olhal

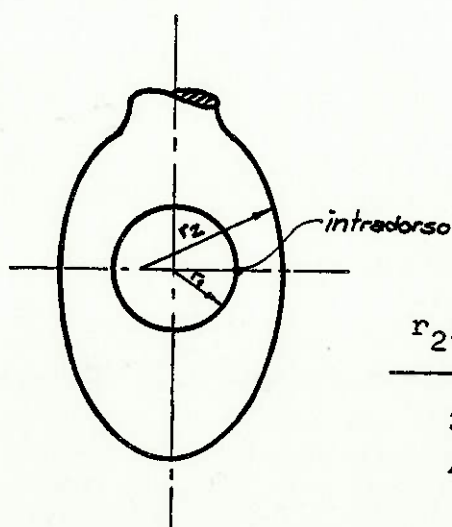
t = espessura do olhal

r_2 = raio de curvatura externo na seção do intradorso

r_1 = raio de curvatura interna

α = coeficiente numérico

$$\alpha = f \left(\frac{r_2}{r_1} \right)$$



Dados:

t = 130 mm

D = 227.500 kgf

r_2 = 254 mm

r_1 = 70,25 mm

r_2/r_1	α
2	4,30
4	4,39

$$\frac{r_2}{r_1} = 3,6157$$

Por interpolação

$$\alpha = 4,3279$$

* Ref.4 - vol.1 págs. 393 e 394.

$$\sigma_{\text{máx}} = \frac{4,3279 \times 8 \times 227.500}{\pi^2 \times 254 \times 130} = 24,2 \text{ kgf/mm}^2$$

$$\sigma_{\text{máx}} = 24,2 < \sigma_{\text{esc}} = 64 \text{ kgf/mm}^2$$

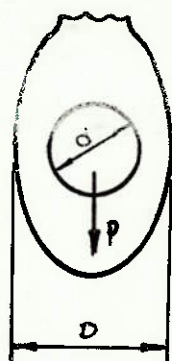
Coeficiente de segurança $\sigma = \frac{\sigma_{\text{esc}}}{\sigma_{\text{máx}}} = \frac{64}{24,2} = 2,6$

2.2- Verificação do Olhal, Segundo a Fórmula de Lamé *

$$\sigma_{\text{máx}} = \frac{Q(D^2 + d^2)}{D^2 - d^2}$$

onde $Q = \frac{P}{dt}$

(pressão específica)



Dados:

$$D = 292 \text{ mm}$$

$$d = 140,5 \text{ mm}$$

$$t = 130 \text{ mm}$$

$$P = 227.500 \text{ kgf}$$

$$\sigma_{\text{máx}} = \left(\frac{227.500}{140,5 \cdot 130} \right) \frac{(292^2 + 140,5^2)}{(292^2 - 140,5^2)}$$

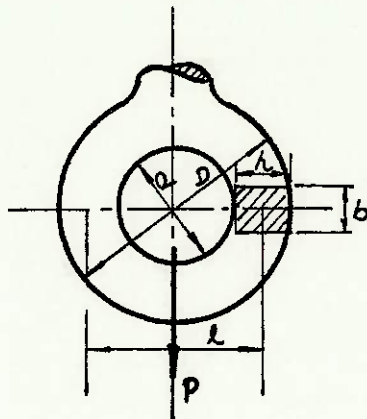
$$\sigma_{\text{máx}} = 19,96 \text{ kgf/mm}^2 < \sigma_{\text{esc}} = 64 \text{ kgf/mm}^2$$

Coeficiente de Segurança $\gamma = \frac{\sigma_e}{\sigma_{\text{máx}}} = \frac{64}{19,96} = 3,2$

* Ref. 3 (Rudenko) pág.103

2.3- Verificação do Olhal, Segundo Cálculos da "Sumitomo"

1.



Dados Geométricos

$$d = 140,5 \text{ mm}$$

$$D = 292 \text{ mm}$$

$$h = 76 \text{ mm}$$

$$b = 130 \text{ mm}$$

$$P = 227.500 \text{ kgf.}$$

2. Valor de

$$a) \quad p/ \quad D \geq 3d \quad \longrightarrow$$

$$l = 2d$$

$$b) \quad p/ \quad D \geq 3d \quad \longrightarrow$$

$$l = \frac{D + d}{2}$$

$$D = 292 \leq 3d = 421,5$$

$$\therefore \quad l = \frac{292 + 140,5}{2} = 216,25 \text{ mm}$$

$$3. \quad a) \quad M = \frac{P}{8} \quad (\text{Momento}) \longrightarrow M = \frac{227500 \cdot 216,25}{8} = 6.149.609 \text{ kgf/mm}$$

$$b) \quad Z = \frac{bh^2}{6} \quad (\text{módulo de resistência}) \longrightarrow Z = \frac{130 \cdot 76^2}{6} = 125.147 \text{ mm}^3$$

$$c) \quad A = b \cdot h \quad (\text{seção}) \longrightarrow A = 9880 \text{ mm}^2$$

$$d) \quad \sigma = \frac{P}{2A} + \frac{M}{Z} \quad (\text{tensão}) \longrightarrow \sigma = \frac{227.500}{2 \times 9880} + \frac{6149.609}{125.147} = 11,5 + 49 = 60,7 \text{ kgf/mm}^2$$

$$\sigma = 60,7 > \sigma_{\text{admissível}}$$

$$\sigma = 60,7 < \sigma_{\text{escoamento}}$$

3. ESTUDO SOBRE A ÁREA E TENSÃO DE CONTATO ENTRE PINO E OLHAL.

3.1- Considerações.

Em decorrência dos resultados relativos a uma carga pontual de 227.500 kgf aplicado no olhal, não serem um tanto quanto compatíveis com a realidade, e também limitado pelo tempo de processamento disponível no programa NAVSAP, surgiu a necessidade de um estudo mais qualitativo com relação à verdadeira área de contato entre o pino e o olhal, bem como as forças que aí interagem.

Obtendo-se estes dados, os mesmos serão transpostos ao bloco de carregamento do programa NAVSAP, a fim de conhecermos e analisarmos os esforços em outras regiões do olhal.

Este estudo, está baseado nos textos publicados - pela ESDU (Engineering Sciences Data Unit). Volume 9 (Contacts stresses - artigo 78035) encontrados na Divisão de Metalurgia do IPT.

3.2- Parte Teórica.

Fenômenos de Contato:- Tensões, deflexões e áreas de contato para carregamentos em componentes elásticos e não lubrificados.

3.2.1- Notação e Unidades.

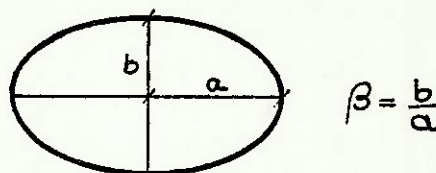
- | | |
|---|----------|
| A. Parâmetro geométrico do corpo, representando a metade da menor curvatura relativa principal. | m^{-1} |
| a. Maior semi-eixo da elipse de contato, direção x | m |
| B. Parâmetro geométrico do corpo representando a metade da maior curvatura relativa principal | m^{-1} |
| b. Menor semi-eixo da elipse de contato, direção y | m |

Ca. Coeficiente adimensional associado a $\underline{a}$, usado na equação (9).	
Cb. Coeficiente adimensional associado a $\underline{b}$, usado na equação (10).	
Cf. Coeficiente adimensional associado a $f_{z_{\text{máx}}}$.	
C $_{\beta}$. Coeficiente adimensional associado a β , usado na equação (11)	
C $_{\delta}$. Coeficiente adimensional associado a δ , usado na equação (12)	
E . Módulo de elasticidade de Young	N/m ²
$f_{z_{\text{máx}}}$ - Compressão máxima ou Hertziana	N/m ²
K . Constante do material, dado por $\frac{(1 - \sigma^2)}{\pi E}$	m ² / N
L . Comprimento do contato retangular	m
P . Carga total aplicado normalmente	N
p . Pressão na superfície de contato	N/m ²
R . Raio de curvatura principal do corpo	m
W . Parâmetro de cálculo	
β - Razão entre os semi-eixos da elipse, dado por b/a	
δ . Redução da separação entre 2 pontos sobre o eixo de simetria	m
σ . Relação de Poisson	
ω . Ângulo entre os eixos x_1 e x_2	° grau
X,Y,Z- Eixos do sistema ortogonal	

3.2.2- Introdução.

Quando 2 corpos, cuja superfície de um ou de ambos é uma curva, são levados ao contato sob uma carga normal, uma deformação elástica proporciona um aumento da área elíptica de contato. Em alguns casos por exemplo: esfera contra esfera, esfera contra placa e cilindros idênticos cruzados em um certo ângulo, a área de contato é circular. Em outros casos (cilindro contra cilindro com eixos paralelos, cilindros em ranhuras cilíndricas e cilindro sobre placa) o semi-eixo maior da elipse é muito mais longo do que em relação ao semi-eixo menor, e assim, a área de contato pode ser considerada como retangular.

A razão dos eixos da elipse β , é função da geometria do corpo e da orientação dos raios principais de curvatura enquanto que o comprimento dos semi-eixos são funções das propriedades do material e da carga aplicada.



Em ordem estabelece-se a geometria de contato e avalia-se as tensões dos mesmos. A partir dos dados dos materiais (σ , E, K) (TABELA I), os raios de curvatura e o ângulo entre os eixos principais, o cálculo pela TABELA II pode ser usado em conjunto com as Figs. 1 a 6 sendo que através das equações, determinam-se qualquer ou todas as tensões e dimensões desconhecidas. A TABELA III fornece um programa de calculadora, para a resolução do problema. As equações para contato circular e retangular estão resumidas na TABELA IV. Para um caso elíptico geral, as Figs. 7 e 8 podem ser usadas para determinar diretamente os valores de máxima tensão de compressão.

Esta teoria é válida para todas as chapas, exceto quando os raios principais de curvatura de um corpo é infinitamente pequeno ou indeterminado (é o caso da borda de uma faca), ou quando a zona de contato é relativamente largo (é o caso de

cilindros de raios de curvatura similar).

3.2.3- Geometria de Contato.

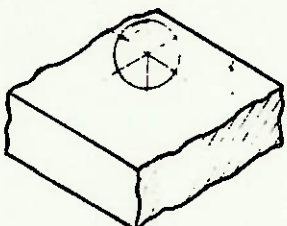
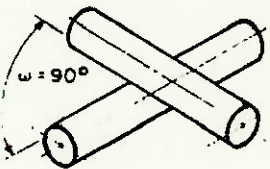
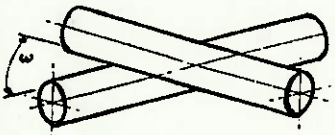
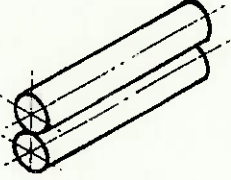
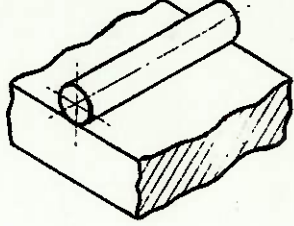
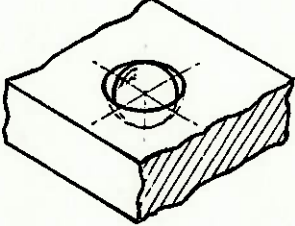
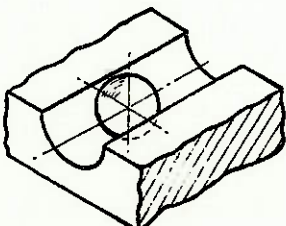
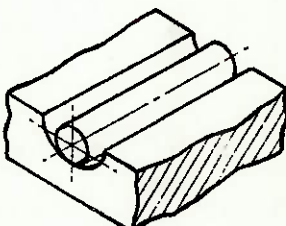
A zona de contato é sempre contornado por uma elipse cuja relação do menor para o maior eixo situa-se entre 0 e 1.

3.2.3.1- Curvatura Principal.

* R_{11} e R_{12} são os raios de curvatura principal da superfície do corpo 1 no ponto de contato e R_{21} e R_{22} são os raios de curvatura principal do corpo 2 no mesmo ponto de contato. A e B são constantes cujos valores dependem da magnitude das curvaturas principais e do ângulo ω entre os planos em que as curvaturas principais estão (veja Esquema (i)).

Muitos problemas envolvem corpos com qualquer raio principal infinito (por exemplo, placa plana) ou finitas e iguais raios de curvatura (por exemplo, esferas). Combinações de corpos e outras associações de chapas comumente praticadas são mostradas no Esquema (ii) aonde podem ser vistas que os raios principais de curvatura podem ser positivas (superfícies convexas) ou negativas (superfícies côncavas).

* O 1º índice é do corpo, o 2º é do plano.

 (c) Sphere on sphere (non-conformal) $R_{11} = R_{12}, R_{21} = R_{22}$ Contact shape is circular	 (b) Sphere on plate (non-conformal) $R_{11} = R_{12}, R_{21} = R_{22} = \infty$ Contact shape is circular	 (c) Cylinder on cylinder (non-conformal) $R_{12} = R_{22} = \infty$ Contact shape is circular when $\omega = 90^\circ$ and cylinders are of equal diameter.
 (d) Cylinder on cylinder (non-conformal) $R_{12} = R_{22} = \infty$ Contact shape is elliptical when $0^\circ < \omega < 90^\circ$ and $R_{11} \neq R_{22}$	 (e) Cylinder on cylinder (non-conformal) $R_{12} = R_{22} = \infty$ Contact shape is an ellipse of infinite length (i.e. rectangular) when $\omega = 0^\circ$	 (f) Cylinder on plate (non-conformal) $R_{12} = R_{21} = R_{22} = \infty$ Contact shape is an ellipse of infinite length (i.e. rectangular)
 (g) Sphere in socket (conformal) $R_{11} = R_{12}, R_{21} = R_{22}(\text{negative})$ Contact shape is circular	 (h) Sphere in groove (conformal) $R_{11} = R_{12}, R_{21} = \infty, R_{22} \text{ is negative}$ Contact shape is elliptical	 (i) Cylinder in groove (conformal) $R_{12} = R_{22} = \infty, R_{21} \text{ is negative}$ Contact shape is an ellipse of infinite length (i.e. rectangular)

Se os planos principais não coincidem ($\omega \neq 0$) (Esquema (i) e (ii) ítem d), então:

$$A = \frac{1}{4} \left\{ \frac{1}{R_{11}} + \frac{1}{R_{12}} + \frac{1}{R_{21}} + \frac{1}{R_{22}} - \left[\left(\frac{1}{R_{11}} - \frac{1}{R_{12}} \right)^2 + \left(\frac{1}{R_{21}} - \frac{1}{R_{22}} \right)^2 + 2 \left(\frac{1}{R_{11}} - \frac{1}{R_{12}} \right) \left(\frac{1}{R_{21}} - \frac{1}{R_{22}} \right) \cos 2\omega \right]^{1/2} \right\} \quad (2a)$$

$$B = \frac{1}{4} \left\{ \frac{1}{R_{11}} + \frac{1}{R_{12}} + \frac{1}{R_{21}} + \frac{1}{R_{22}} + \left[\left(\frac{1}{R_{11}} - \frac{1}{R_{12}} \right)^2 + \left(\frac{1}{R_{21}} - \frac{1}{R_{22}} \right)^2 + 2 \left(\frac{1}{R_{11}} - \frac{1}{R_{12}} \right) \left(\frac{1}{R_{21}} - \frac{1}{R_{22}} \right) \cos 2\omega \right]^{1/2} \right\} \quad (2b)$$

onde a notação para os planos principais de curvatura devem - ser escolhidos tais que $B \geq A$.

3.2.3.2- Contato Circular.

Quando os semi-eixos maior e menor forem de iguais comprimentos, a área de contato é circular e $a = b$. Neste caso, $\beta = 1$ e $(A/B) = 1$ e as Figs. 1 e 2 mostram que os coeficientes C_a , C_b , C_β e C_δ têm valores iguais a 1. Assim:

$$(a)_{\beta=1} = (b)_{\beta=1} = \left\{ \left[\frac{3 P \pi}{4} (k_1 + k_2) \right] \left[\frac{R_{11} R_{21}}{R_{11} + R_{21}} \right] \right\}^{1/3} \quad (3)$$

$$\beta = 1 \quad (4)$$

$$(\delta)_{\beta=1} = \left\{ \left[\frac{3 P \pi}{4} (k_1 + k_2) \right]^2 \left[\frac{R_{11} + R_{21}}{R_{11} R_{21}} \right] \right\}^{1/3} = 0,75 \frac{P \pi}{a} (k_1 + k_2) \quad (5)$$

3.2.3.3- Contato Retangular.

Quando a elipse é teoricamente de comprimento infinito e $\beta = 0$ e $(A/B) = 0$, o maior semi-eixo a é infinito. Este tipo de contato é exemplificado por 1 cilindro com eixos paralelos. Nestas circunstâncias, a largura da elipse é dado por:

$$(b)_{\beta=0} = \left\{ 4 \left(\frac{P}{L} \right) (k_1 + k_2) \left[\frac{R_{11} R_{21}}{R_{11} + R_{21}} \right] \right\}^{1/2} \quad (6)$$

onde (P/L) é a carga por unidade de comprimento ao longo do contato.

Para corpos de mesmo material:

$$(\delta)_{\beta=0} = 2 \left(\frac{P}{L} \right) k \left[\frac{2}{3} + \ln \frac{4R_{11}}{b} + \ln \frac{4R_{21}}{b} \right] \quad (7)$$

As figs.1 e 2 não podem ser usadas quando $\beta = 0$ e $(A/B) = 0$ porque algumas das quantidades são infinitas.

3.2.3.4- Contato Elíptico.

Quando a relação (A/B) tem que ser calculado pelas equações 1 e 2, Fig.1 e 2 podem ser usados para obter-se os valores dos coeficientes C_a , C_b , C_β e C_δ e substituídos dentro das equações de 8 a 12 que dão as dimensões do contato elíptico e outras relações.

$$a = \frac{C_a W}{(A+B)} \left(\frac{A}{B} \right)^{-1/3} \quad (8)$$

$$b = \frac{C_b W}{(A+B)} \left(\frac{A}{B} \right)^{-1/3} \quad (9)$$

$$\beta = C_\beta \left(\frac{A}{B} \right)^{2/3} \quad (10)$$

$$\delta = \frac{C_\delta W^2}{(A+B)} \left(\frac{A}{B} \right)^{1/3} \quad (11)$$

aonde
$$W = \left[\frac{3P\pi}{4} (k_1 + k_2) (A+B)^2 \right]^{1/3} \quad (12)$$

Obs.: O desenvolvimento dessas equações é dado no apêndice A do referido artigo.

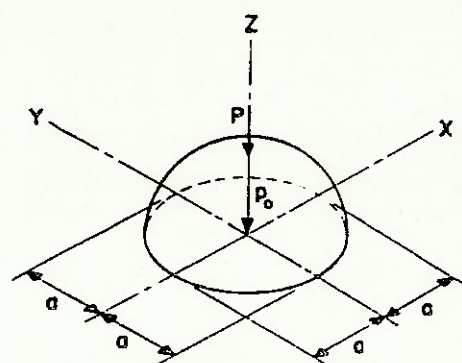
3.2.4- Superfície de Tensão.

As Figs. 7 e 8 podem ser usadas para determinar-se o valor de $f_{z_{\max}}$

3.2.4.1- Contato Circular.

$$\beta = 1,0$$

$$A/B = 1,0$$



$$\text{Área Projetada} = \pi a^2$$

$$\text{Pressão Média} = P/\pi a^2$$

$$(a=b)$$

Esquema (iii)

A distribuição da pressão é dada por:

$$(p)_{\beta=1,0} = p_0 \left\{ 1 - \frac{x^2+y^2}{a^2} \right\}^{1/2} \quad (13)$$

A máxima tensão na superfície ocorre no centro do contorno do elipsoide de revolução e é dado por:

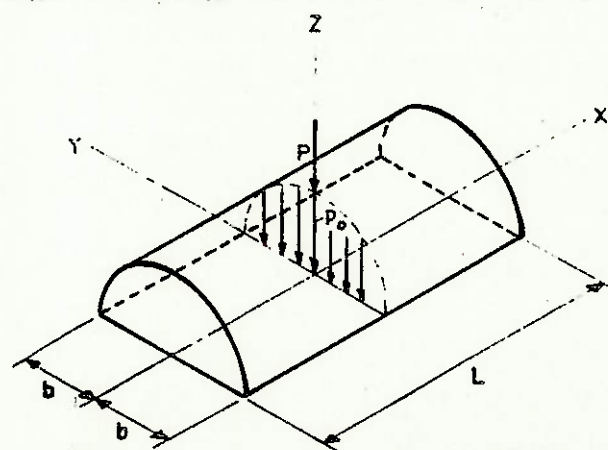
$$P_o = \frac{1,5 P}{\pi a^2} = -f_{z_{\max}} \quad (14)$$

Quando as dimensões são desconhecidas, a seguinte equação pode ser usada:

$$f_{z_{\max}} = - \left\{ \frac{6 P}{\pi^5 (k_1 + k_2)^2 \left[\frac{R_{11} + R_{21}}{R_{11} R_{21}} \right]^2} \right\}^{1/3} \quad (15)$$

3.2.4.2- Contato Retangular.

Se a superfície de contato é um longo e estreito - retângulo, $\beta = 0$ e $(A/B) = 0$ a distribuição da pressão p através da largura dá área de contato é representada por coordenada de uma semi-elipse (veja Esq. (iv)).



Área Projetada = $2bL$

Pressão Média = $P/2bL$

Esquema (iv)

A distribuição da pressão p é dada por:

$$(p)_{\beta=0} = p_0 \left[1 - \frac{y^2}{b^2} \right]^{1/2} \quad (16)$$

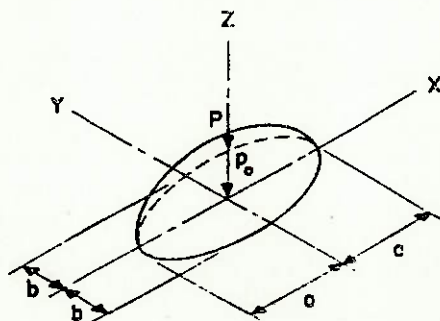
A máxima tensão ocorre no centro de contorno elíptico e é dado por:

$$(p_0)_{\beta=0} = \left(\frac{P}{L} \right) \frac{2}{\pi b} = -f_{z \text{ máx}} \quad (17)$$

Quando a largura é desconhecida, a seguinte equação pode ser usada:

$$(f_{z \text{ máx}})_{\beta=0} = - \left\{ \left(\frac{P}{L} \right) \frac{1}{\pi^2 (k_1 + k_2)} \left[\frac{R_{11} + R_{21}}{R_{11} \cdot R_{21}} \right] \right\}^{1/2} \quad (18)$$

3.2.4.3- Contato Elíptico.



Área Projetada = πab

Pressão Média = $P/\pi ab$

Esquema (v)

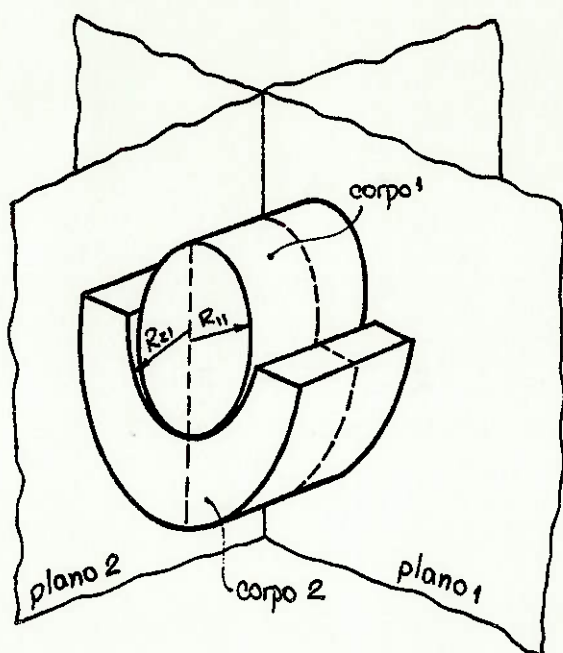
A distribuição de pressão é dada por:

$$P = P_0 \left\{ 1 - \frac{x^2}{a^2} - \frac{y^2}{b^2} \right\}^{1/2} \quad (19)$$

$$\text{onde } P_0 = \frac{1,5 P}{\pi a b} = - f_{z \text{ máx}} \quad (20)$$

$$\text{ou } f_{z \text{ máx}} = - C_f \frac{2 W}{\pi^2 (k_1 + k_2)} \quad (21)$$

3.3- Aplicação: Pino e Olhal.



Dados:

$$P = 227.500 \text{ kgf} = 2.230.392 \text{ N}$$

corpo 1:

$$R_{11} = 69,825 \text{ mm}$$

$$R_{12} = \infty$$

corpo 2

$$R_{21} = -70,25 \text{ mm}$$

$$R_{22} = \infty$$

$$L = 130 \text{ mm}$$

$$K_1 = K_2 = 1,38 \cdot 10^{-12} (\text{m}^2/\text{N}) \quad (\text{TABELA I})$$

. Podemos admitir que o contato seja retangular

$$\beta = 0$$

$$(A/B) = 0$$

. Largura da elipse:

$$(6) \rightarrow b = \left\{ 4 \left(\frac{P}{L} \right) (k_1 + k_2) \left| \frac{R_{11} R_{21}}{R_{11} + R_{21}} \right| \right\}^{1/2}$$

$$b = \left\{ 4 \left(\frac{2230392}{0,130} \right) 2 \cdot 1,38 \cdot 10^{-12} \left[\frac{69,825 \cdot 10^{-3} \cdot (-70,25) \cdot 10^{-3}}{69,825 \cdot 10^{-3} + (-70,25) \cdot 10^{-3}} \right] \right\}^{1/2}$$

$$\therefore \boxed{b = 46,8 \text{ mm}}$$

. deslocamento:

$$(7) \rightarrow \delta = 2 \left(\frac{P}{L} \right) k \left[\frac{2}{3} + \ln \frac{4R_{11}}{b} + \ln \frac{4R_{21}}{b} \right]$$

$$\delta = 2 \left(\frac{2230392}{0,130} \right) 1,38 \cdot 10^{-12} \left[\frac{2}{3} + \ln \frac{4(69,825) \cdot 10^{-3}}{0,0468} + \ln \frac{4(70,25) \cdot 10^{-3}}{0,0468} \right]$$

$$\therefore \boxed{\delta = 0,2011 \text{ mm}}$$

A máxima tensão é:

$$(17) \rightarrow p_0 = \left(\frac{P}{L} \right) \frac{2}{\pi b} = \left(\frac{2230392}{0,130} \right) \frac{2}{\pi \cdot 0,0468}$$

$$\boxed{p_0 = 23,8 \text{ kgf/mm}^2} < \sigma_{adm} \quad \underline{\underline{OK!}}$$

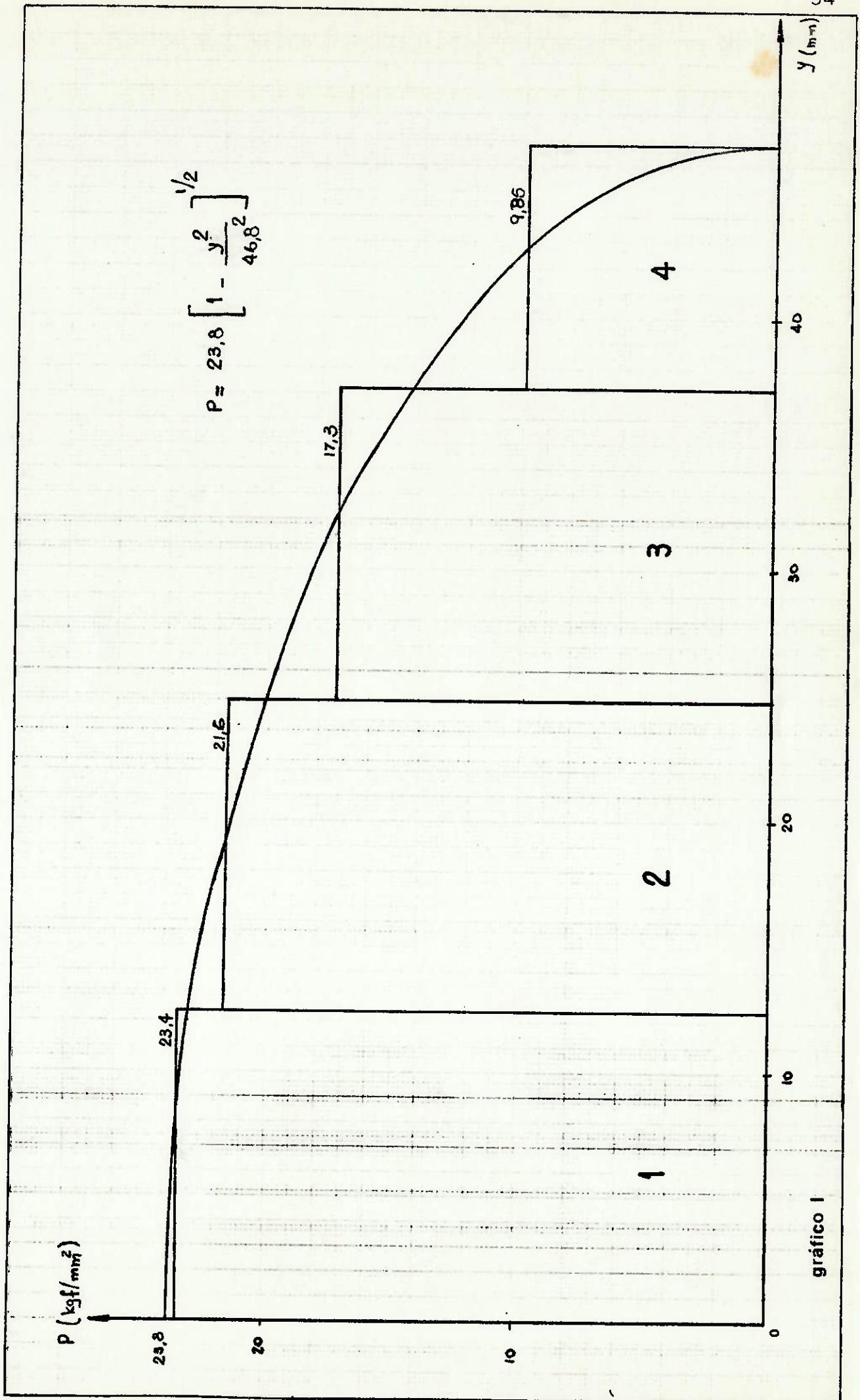
A distribuição de pressão é:

$$(16) \rightarrow p = p_0 \left[1 - \frac{y^2}{b^2} \right]^{1/2}$$

$$\boxed{p = 23,8 \left[1 - \frac{y^2}{(46,8)^2} \right]^{1/2}}$$

$$\text{onde } \begin{cases} p \text{ em kgf/mm}^2 \\ y \text{ em mm} \end{cases}$$

Obs.: Veja gráfico I



Body material	ν	SI		British	
		$E \times 10^{-9}(\text{N/m}^2)^\ddagger$	$k \times 10^{12}(\text{m}^2/\text{N})^\ddagger$	$E \times 10^{-6}(\text{lbf/in}^2)^\ddagger$	$k \times 10^9(\text{in}^2/\text{lbf})^\ddagger$
ABS* (Acrylonitrilebutadienestyrene) unfilled*	0.35–0.4	1.65–2.7	169–99.	0.24–0.392	1160–680
Acrylic polymers* (e.g. Perspex)	0.38	2.79–3.0	97.6–90.8	0.405–0.435	672–626
Aluminium (inc. anodised)	0.33	68.9	4.11	10	28.4
Aluminium alloys	0.33–0.35	44.8–75.8	6.33–3.68	6.5–11	43.6–25.4
Aluminium bronze	0.25	103	2.90	15	20
Alumina (high density, sintered)	0.25–0.31	258–366	1.16–0.786	37.4–53.1	7.69–5.62
Beryllium	0.024–0.030	276–303	1.15–1.04	40–44	7.95–7.23
Beryllium-copper	0.34	131	2.15	19	14.8
Brass (70/30)	0.35	101	2.77	14.7	19.1
Bronze, sintered	0.34	110	2.55	16	17.6
Cadmium	0.44	68.9	3.72	10	25.7
Cast iron	0.21–0.30	96.5–145	3.15–2.0	14–21	21.7–13.8
Chromium	0.30	248	1.17	36	8.05
Constantan	0.33	162.4	1.75	23.56	12.04
Copper	0.30	110–117	2.63–2.47	16–17	18.1–17.0
Copper-nickel	0.34	68.9	4.08	10	28.2
Duralumin	0.35	70.8	3.95	10.3	27.12
Glass (flint)	0.25	55–69	5.43–4.32	8–10	37.3–29.8
Gold	0.42	68.9	3.80	10	26.2
Invar	0.26	148	2.01	21.4	13.9
Iron	0.30	207	1.40	30	9.66
Iron, sintered	0.30	207	1.40	30	9.66
Lead	0.41–0.45	15.2	17.5	2.2	120
Magnesium	0.25	41.4	7.21	6	49.7
Magnesium alloy	0.25	44.8	6.66	6.5	45.9
Molybdenum	0.3–0.32	275–296	1.05–0.97	40–43	7.24–6.64
Monel	0.25–0.32	168	1.77–1.70	24.4	12.2–11.7
Nickel	0.31	207	1.28	30	8.83
Nickel alloy	0.29–0.31	186–220	1.57–1.31	28–33	10.4–8.72
Nylon* (type 66, 'dry')*	0.40	3.2	83.6	0.464	576
Phosphor-bronze	0.34–0.38	110	2.56–2.48	16	17.6–17.0
Platinum	0.39	166	1.63	24	11.3
Polyethylene*	0.35	0.1–0.75	2790–372	0.014–0.11	20,000–2540
Polypropylene**	0.4	1.03	260	0.149	1790
Polystyrene**	0.35	2.76–4.14	101–67.5	0.4–0.6	698–466
PVC* (Polyvinylchloride) unplasticised*	0.41–0.42	2.7–3.0	98.1–87.4	0.39–0.435	679–603

Tabela I. Dados sobre o material

Body material	σ	SI		British	
		$E \times 10^{10}(\text{N/m}^2)\ddagger$	$k \times 10^{12}(\text{m}^2/\text{N})\ddagger$	$E \times 10^6(\text{lbf/in}^2)\ddagger$	$k \times 10^9(\text{in}^2/\text{lbf})\ddagger$
PTFE** (Polytetrafluorethylene)	0.53	0.35-0.59	654-388	0.05-0.085	4580-2690
Rubber	0.5	4.14	57.7	0.6	398
Silicon carbide	0.19	241-428	1.27-0.72	35-62	8.77-4.95
Silicon nitride	0.27	172-310	1.72-9.52	25-45	11.8-6.56
Silver	0.37	68.9	3.99	10	27.5
Steel, mild	0.3	207	1.40	30	9.40
Steel, stainless	0.28-0.30	190-215	1.54-1.35	27.6-31.2	10.6-9.28
Steel, tool	0.29	212	1.38	30.8	9.47
Steel, 0.75 per cent C	0.30	201	1.37	29.2	9.92
Tantalum	0.35	179-193	1.56-1.45	26-28	10.7-9.98
Tin	0.36	49.9	1.31	7.24	38.3
Titanium	0.34-0.4	107	2.63-2.50	15.5	18.2-17.3
Titanium alloy	0.33	117-121	2.42-2.34	17-17.5	16.7-16.2
Titanium carbide	0.2-0.21	372-414	0.82-0.74	54-60	5.66-5.07
Tungsten	0.28	411	71.4	59.6	49.2
Tungsten carbide	0.22	565-607	0.54-0.50	82.88	3.69-3.44
Vanadium	0.36	127-135	2.18-2.05	18.4-19.6	15.1-14.1
Zinc	0.25-0.28	90-105	3.32-2.79	13-15	23.0-19.6
Zirconium	0.37-0.41	89.6-96.5	3.07-2.74	13-14	21.1-18.9

cont/ Tabela I

Step	Parameter	Units	Material		Geometric dimensions between 1 and 2 mm								Comments
			E	Geometry	a, b, β	c	$r_{s,max}$	q_{max}	$f_{s,max}$	$(q_{max})_0$			
(1) ^{1,2}	P		N	lbf								Applied normal load	
(2) ^{2,3}	Material, body 1												
(3)	E_1		GPa, 10^9 N/m ²	lbf/in ²								Values from Table 1	
(4)	ν_1												
(5)	A_1		m ² , N	in ² , lbf									
(6) ^{2,3}	Material, body 2												
(7)	E_2		GPa, 10^9 N/m ²	lbf/in ²								Values from Table 1	
(8)	ν_2												
(9)	A_2		m ² , N	in ² , lbf									
(10) ^{4,8}	K_{11}		m	in								Principal curvature radii	
(11) ^{4,8}	K_{12}		m	in									
(12) ^{4,8}	K_{21}		m	in									
(13) ^{4,8}	K_{22}		m	in									
(14) ⁴	ω		degree	degree								If $\omega = 0^\circ$, see Equations (1)	
(15) ⁷	$(10)^{-1} - (11)^{-1}$		m ⁻¹	in ⁻¹								Gives $(1/R_{11} - 1/R_{12})$	
(16) ⁸	$(12)^{-1} - (13)^{-1}$		m ⁻¹	in ⁻¹								Gives $(1/R_{21} - 1/R_{22})$	
(17)	$\cos 2(14)$											Gives $\cos 2\omega$	
(18)	$(15)^2 + (16)^2$		m ⁻²	in ⁻²								Gives $(1/R_{11} - 1/R_{12})^2 + (1/R_{21} - 1/R_{22})^2$	
(19)	$2(15)(16)\cos(17)$		m ⁻²	in ⁻²								Gives $2(1/R_{11} - 1/R_{12})(1/R_{21} - 1/R_{22})\cos 2\omega$	
(20)	$[(18) + (19)]^{1/2}$		m ⁻¹	in ⁻¹								Gives square root of sum of above two expressions	
(21)	$(10)^{-1} + (11)^{-1} + (12)^{-1} + (13)^{-1}$		m ⁻¹	in ⁻¹								Gives $(1/R_{11} + 1/R_{12} + 1/R_{21} + 1/R_{22})$	
(22)	$(21) - (20)$		m ⁻¹	in ⁻¹								Gives $4A$	
(23)	$(21) + (20)$		m ⁻¹	in ⁻¹								Gives $4B$	
(24) ¹¹	$(22)(23)$											Gives A/B	
(25)	$[(22) + (23)]/4$		m ⁻¹	in ⁻¹								Gives $(A + B)$	
(26)	$(5) + (9)$		m ² /N	in ² /lbf								Gives $(k_1 + k_2)$	
(27)	$0.75\pi(1)(26)(25)^2$											Gives $0.75\pi\pi(k_1 + k_2)A + B)^2$	
(28)	$(27)^{1/2}$											Gives W (Equation (13))	
(29) ^{11,12}	C_a											From Figure 1 or 2 using value of A/B from (24). If $A/B = 0$, see Equations (6) and (7). If $A/B = 1.0$, continue with calculation procedure, or see Equations (3) and (5)	
(30) ¹²	C_b												
(31) ¹²	C_d												
(32) ^{11,12}	C_e												
(33) ¹²	C_f											From Figure 3 or 4 using value of A/B from (24). If $A/B = 0$, see Section 4.1.2	
(34)	$(29)(28)(24)^{-1/2}/(25)$		m	in								Gives a , (Equation (9))	
(35)	$(30)(28)(24)^{1/2}/(25)$		m	in								Gives b , (Equation (10))	
(36)	$(31)(24)^{2/3}$											Gives β , (Equation (11))	
(37) ⁷	$(32)(28)^2(24)^{1/3}/(25)$		m	in								Gives δ , (Equation (12))	
(38) ^{9,12}	$-2(33)(28)/[\pi^2(26)]$		N/m ²	lbf/in ²								Gives $f_{s,max}$, (Equation (28))	
(39)	q_{max}											From Figure 6 using value of A/B from (24) and value of σ from (4) or (8) according to which body is being analysed	
(40) ¹⁰	$(39)(38)$		N/m ²	lbf/in ²								Gives q_{max} (maximum sub-surface shear stress)	
(41)	$(z/b)_{q_{max}}$											From Figure 6, as comment (39)	
(42) ¹⁰	$(41)(35)$		m	in								Gives $z_{q_{max}}$ (depth of maximum shear)	
(43)	$f_{s,max}$											From Figure 5, as comment (39)	
(44) ⁹	$(43)(38)$		N/m ²	lbf/in ²								Gives $f_{s,max}$ (direct stress at surface)	
(45)	$f_{s,max}$											From Figure 5, see comment (39)	
(46) ⁹	$(45)(38)$		N/m ²	lbf/in ²								Gives $f_{s,max}$ (direct stress at surface)	
(47)	$(q_{max})_0$											From Figure 6, see comment (39)	
(48) ⁹	$[(47)(38)]_0$		N/m ²	lbf/in ²								Gives $(q_{max})_0$ (maximum shear stress at surface)	

(Numbers superior to step numbers refer to the footnotes to this table)

Tabela II - Processo de Cálculo

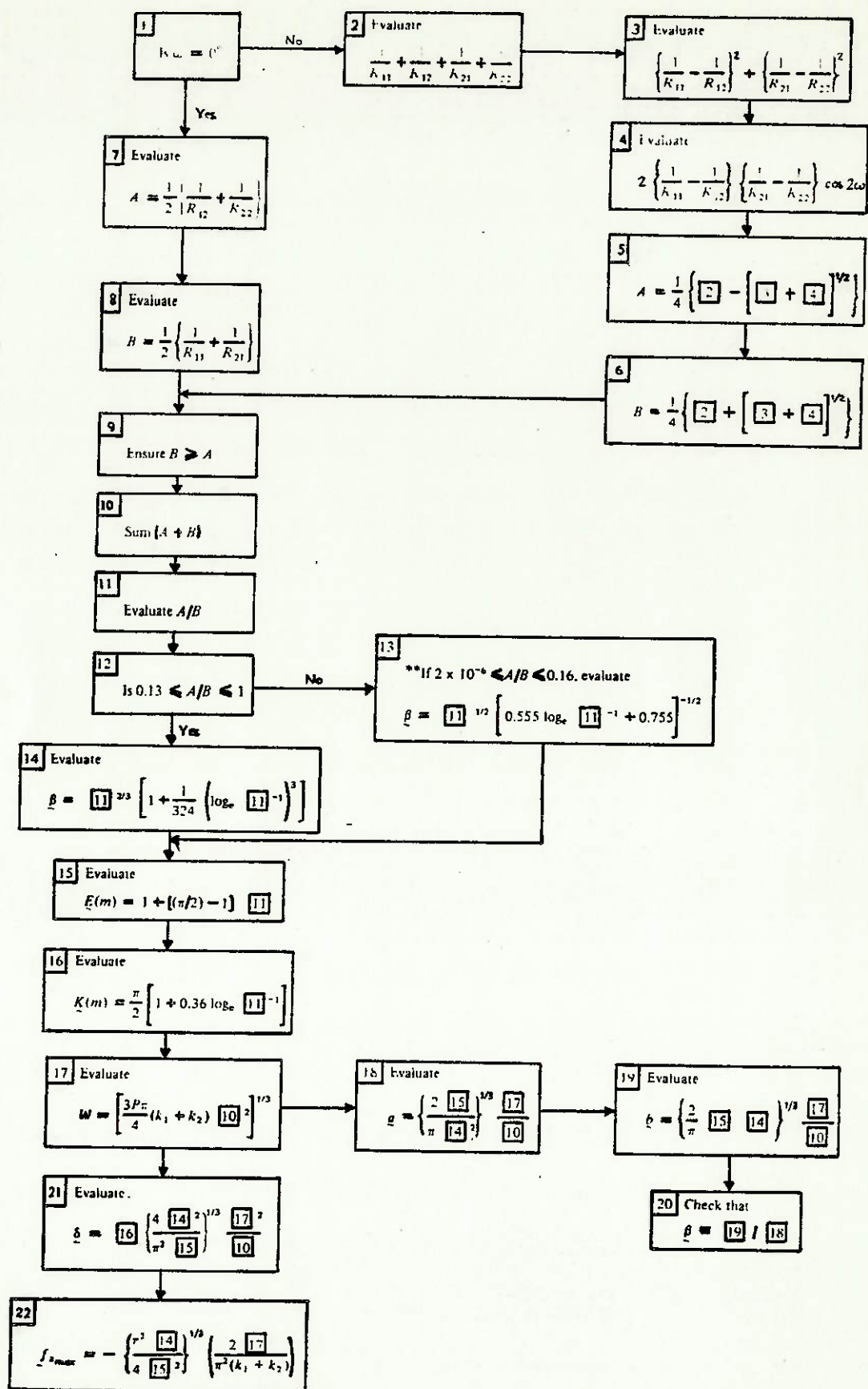


Tabela III - Diagrama de blocos para uso de uma calculadora programável.

Parameter	Circular contacts
A/b	1.0
β	1.0
a	$\left(\frac{3P\pi}{4} (k_1 + k_2) \left[\frac{R_{11}R_{21}}{R_{11} + R_{21}} \right] \right)^{1/3}$
b	Same as for a above
δ	$\left[\left(\frac{3P\pi}{4} (k_1 + k_2) \right)^2 \left[\frac{R_{11} + R_{21}}{R_{11}R_{21}} \right] \right]^{1/3}$
f_{zmax}	$-\left(\frac{6P}{\pi^5 (k_1 + k_2)^2} \left[\frac{R_{11} + R_{21}}{R_{11}R_{21}} \right]^2 \right)^{1/3}$

Parameter	Rectangular contacts*
A/B	0
β	0
a	Theoretically infinite
b	$\left(4 \left(\frac{P}{L} \right) (k_1 + k_2) \left[\frac{R_{11}R_{21}}{R_{11} + R_{21}} \right] \right)^{1/2}$
δ	$2 \left(\frac{P}{L} \right) k \left[\frac{2}{3} + \log_e \frac{4R_{11}}{b} + \log_e \frac{4R_{21}}{b} \right]$
f_{zmax}	$-\left(\left(\frac{P}{L} \right) \frac{1}{\pi^2 (k_1 + k_2)} \left[\frac{R_{11} + R_{21}}{R_{11}R_{21}} \right] \right)^{1/2}$

Tabela IV - Equações para Contato Circular e Retangular

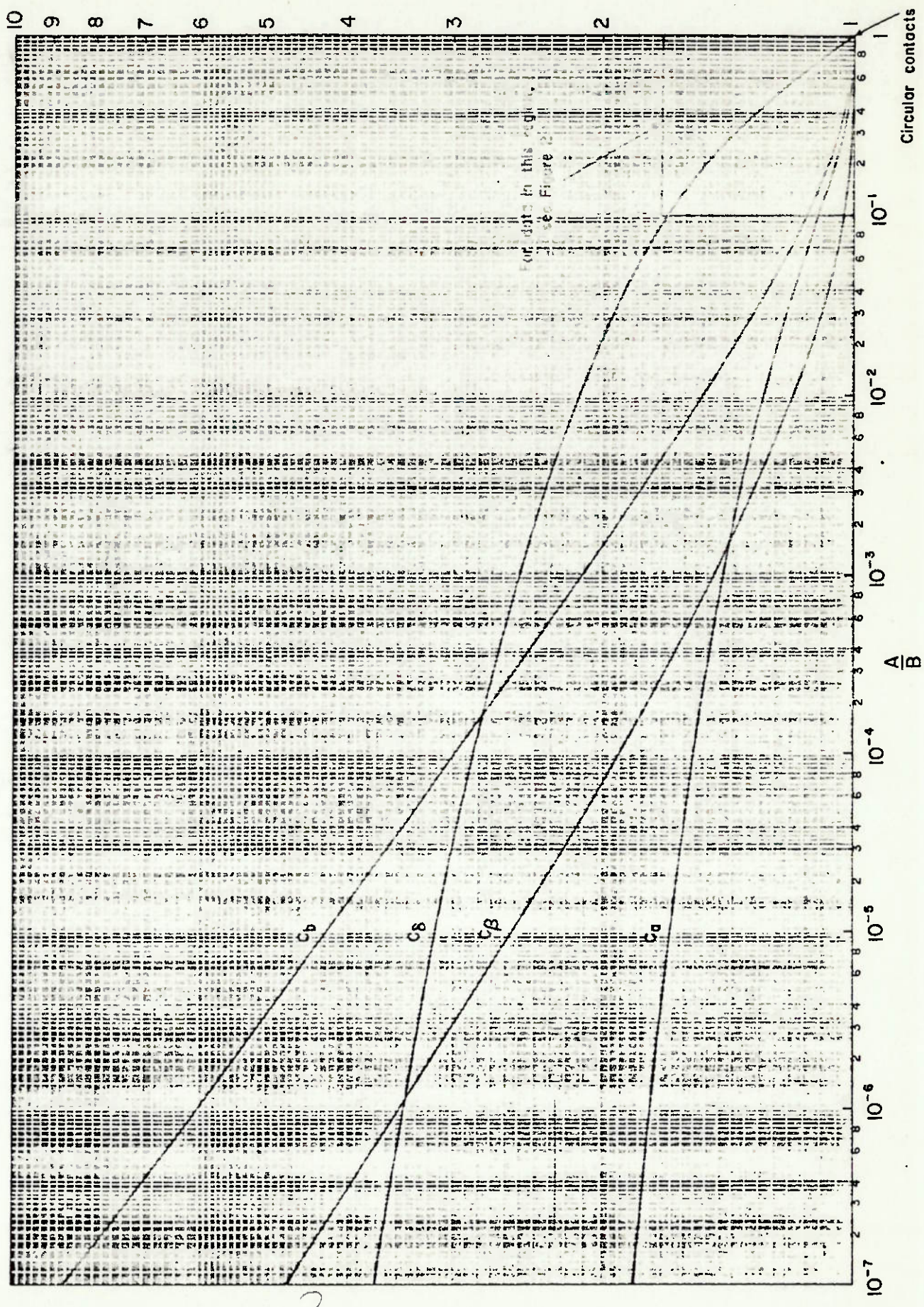


Figura 1 - Coeficientes $C_a, C_b, C_\beta, C_\delta$ em função de A/B

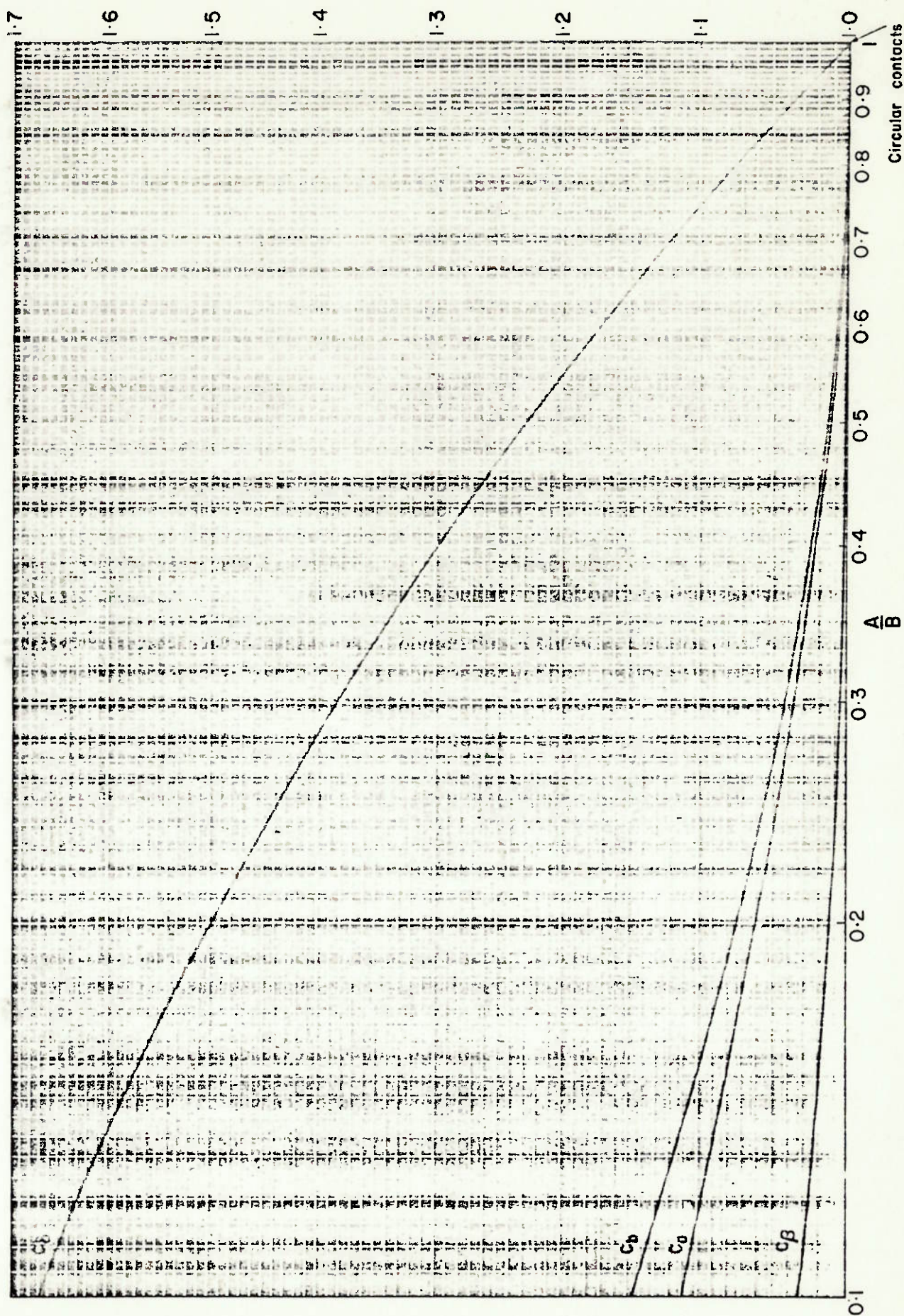


Figura 2 - Detalhe da Fig. 1

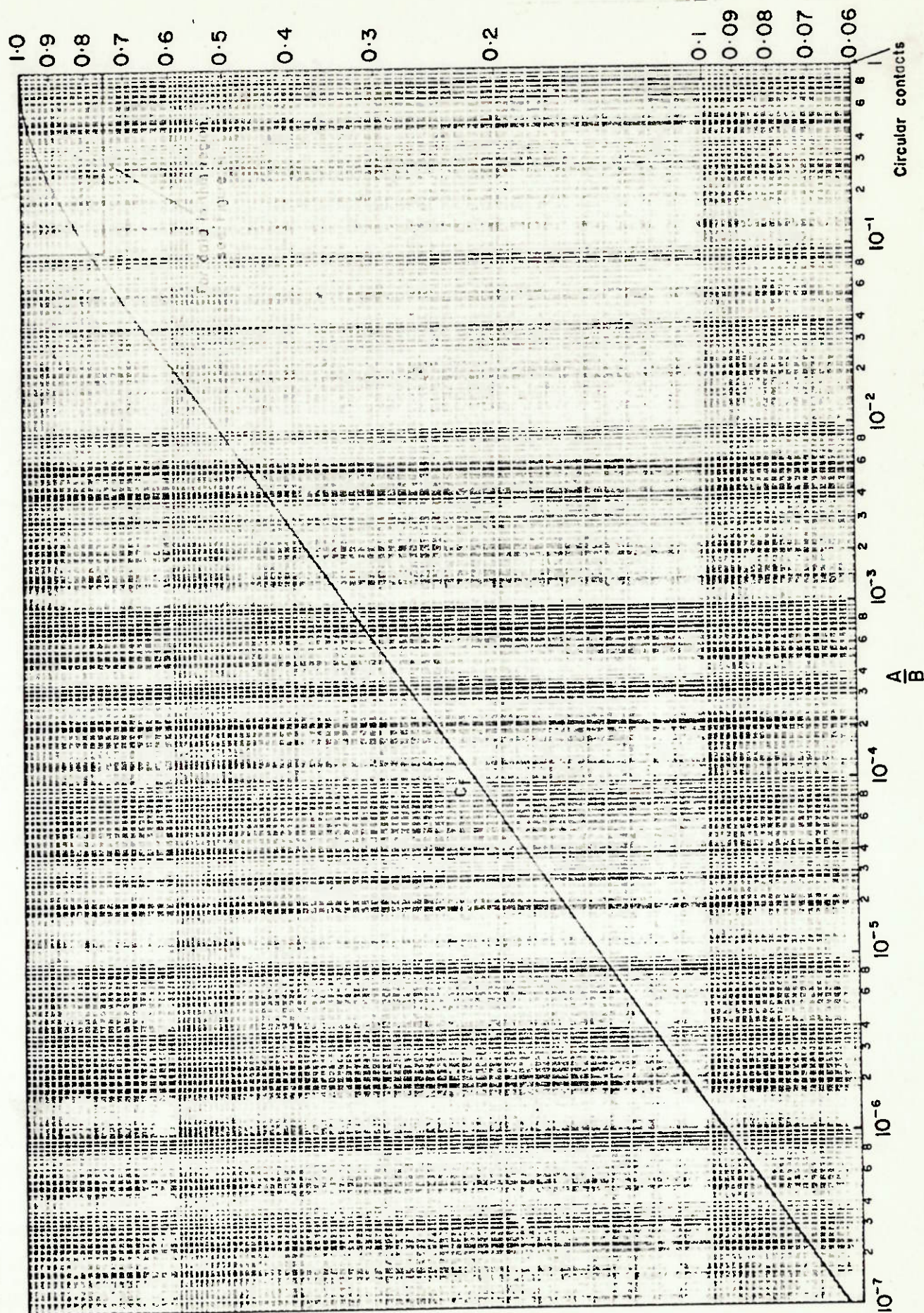


Figura 3 - Coeficiente C_f em função de A/B

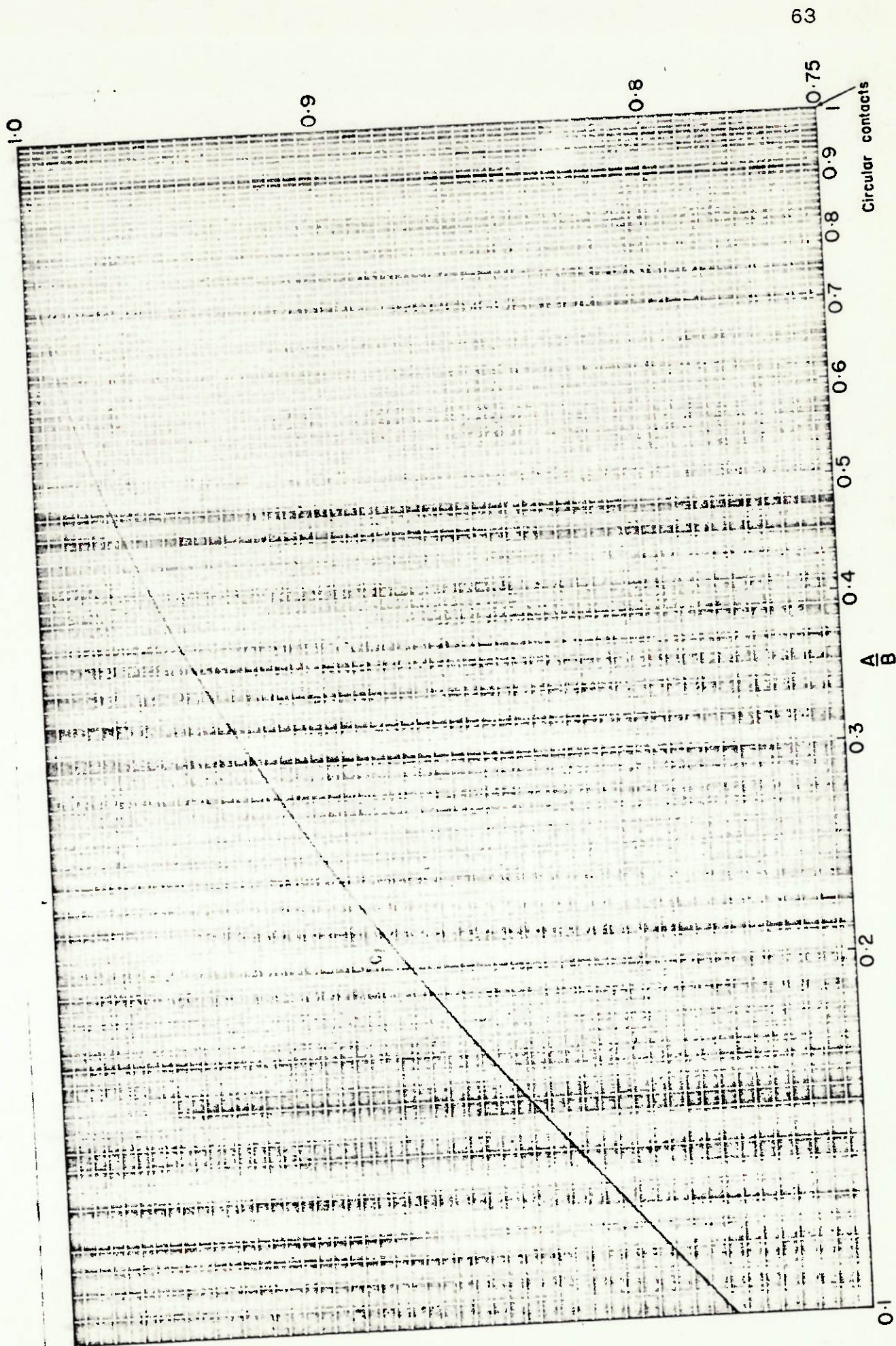


Figura 4. Coeficiente C_f em função de A/B

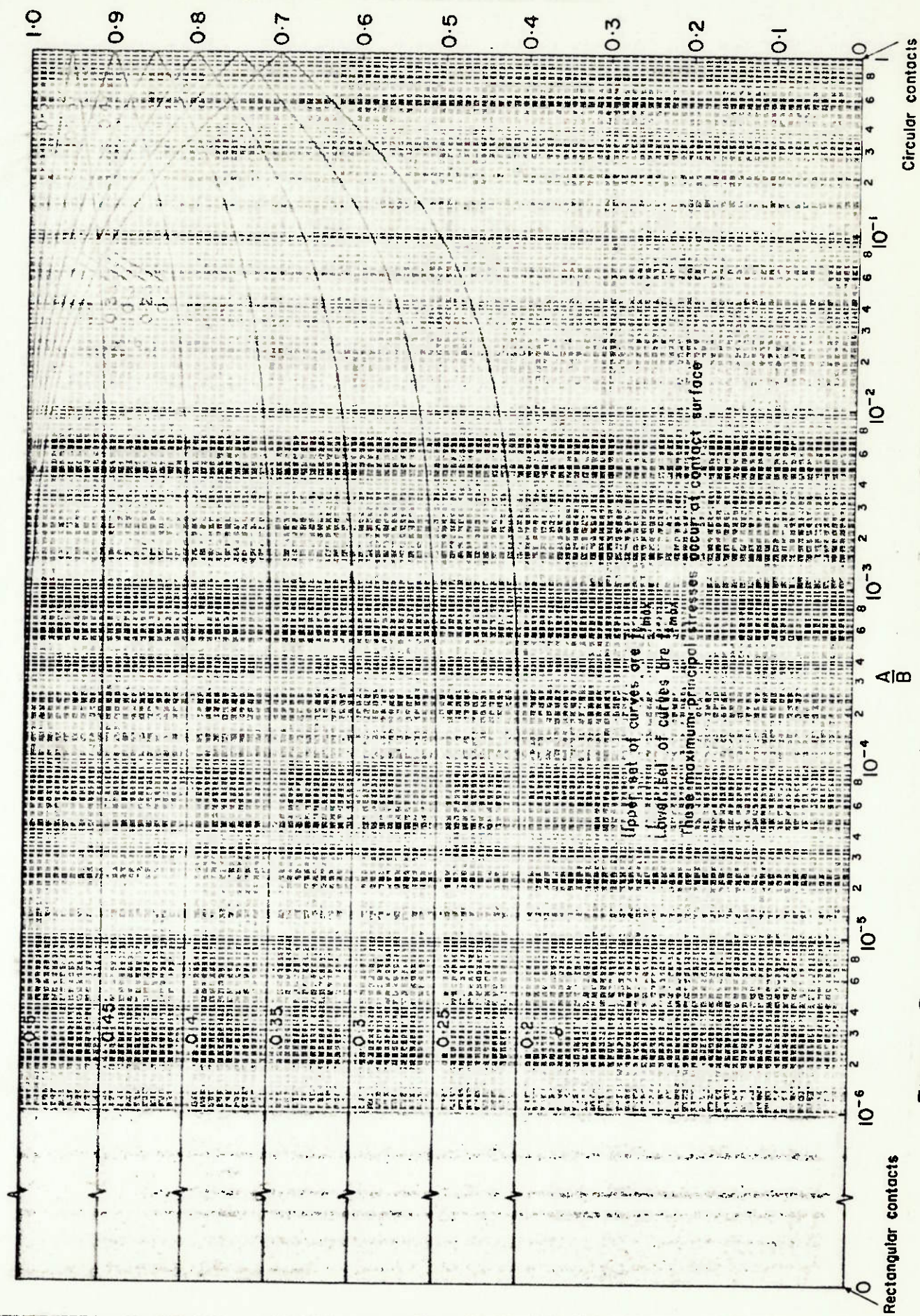


Figura 5 - Tensão no centro do contato

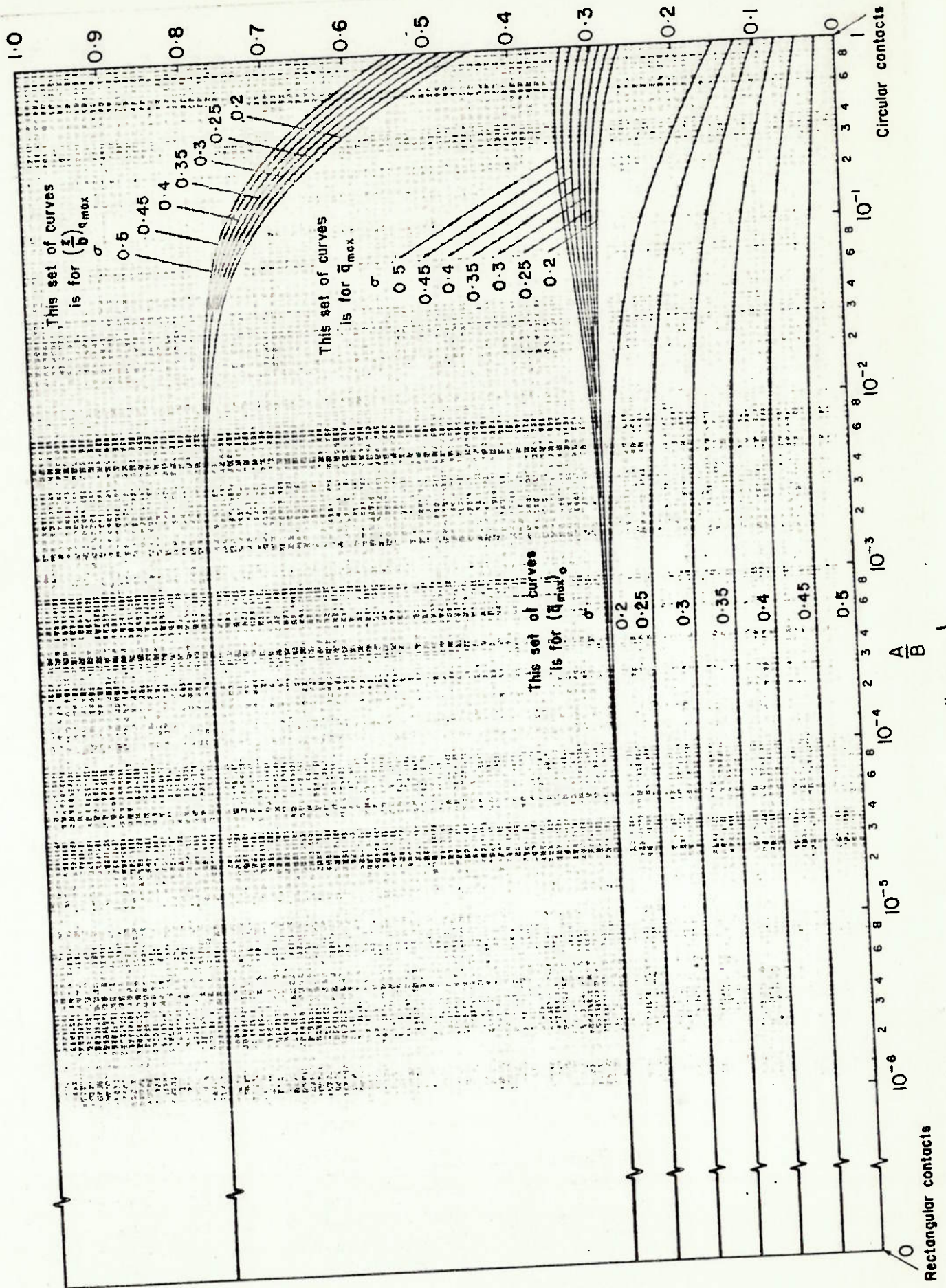


Figura 6 - Tensão de cisalhamento.

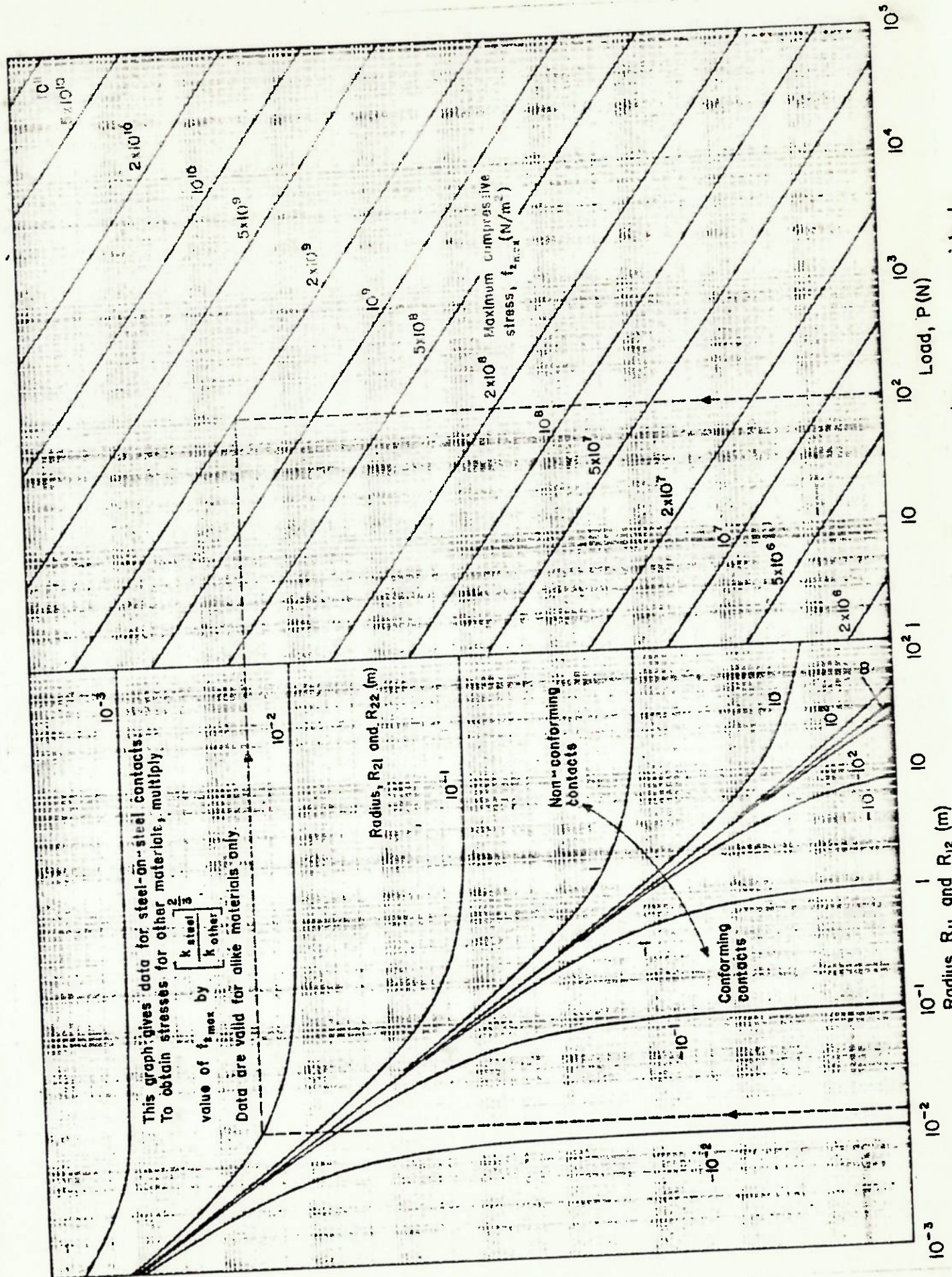


Figura 7. Contato Circular (esfera contra esfera, ou placa ou cavidade).

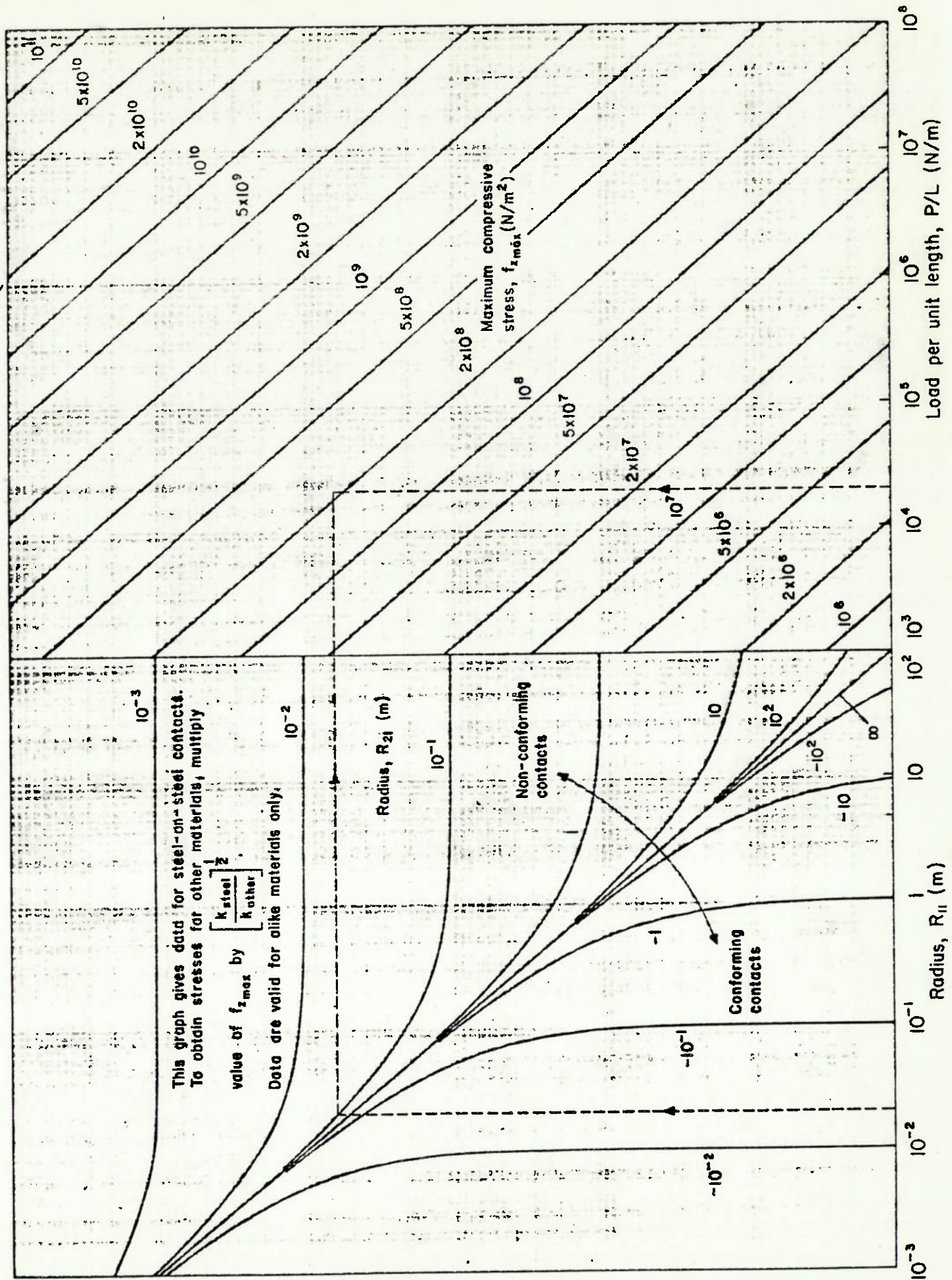
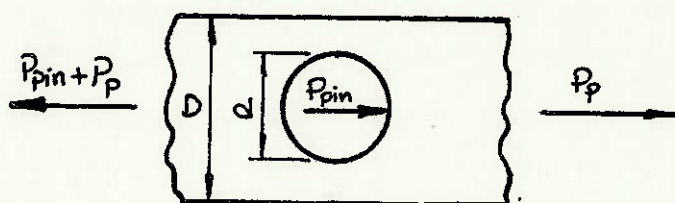


Figura 8 - Contato Retangular (cilindro contra outro cilindro, ou placa, ou ranhura.

4. MÁXIMA TENSÃO DE CISALHAMENTO (ESDU - 66011)

Para pinos colocados em furos sem interferência temos:



onde:

$$f_{ref} = \frac{P_{pin} + \alpha P_p}{(D - d) t}$$

$$P_{pin} = 227.500 \text{ kgf}$$

$$D = 292 \text{ mm}$$

$$d = 140 \text{ mm}$$

$$t = 130 \text{ mm}$$

$$P_p = 0$$

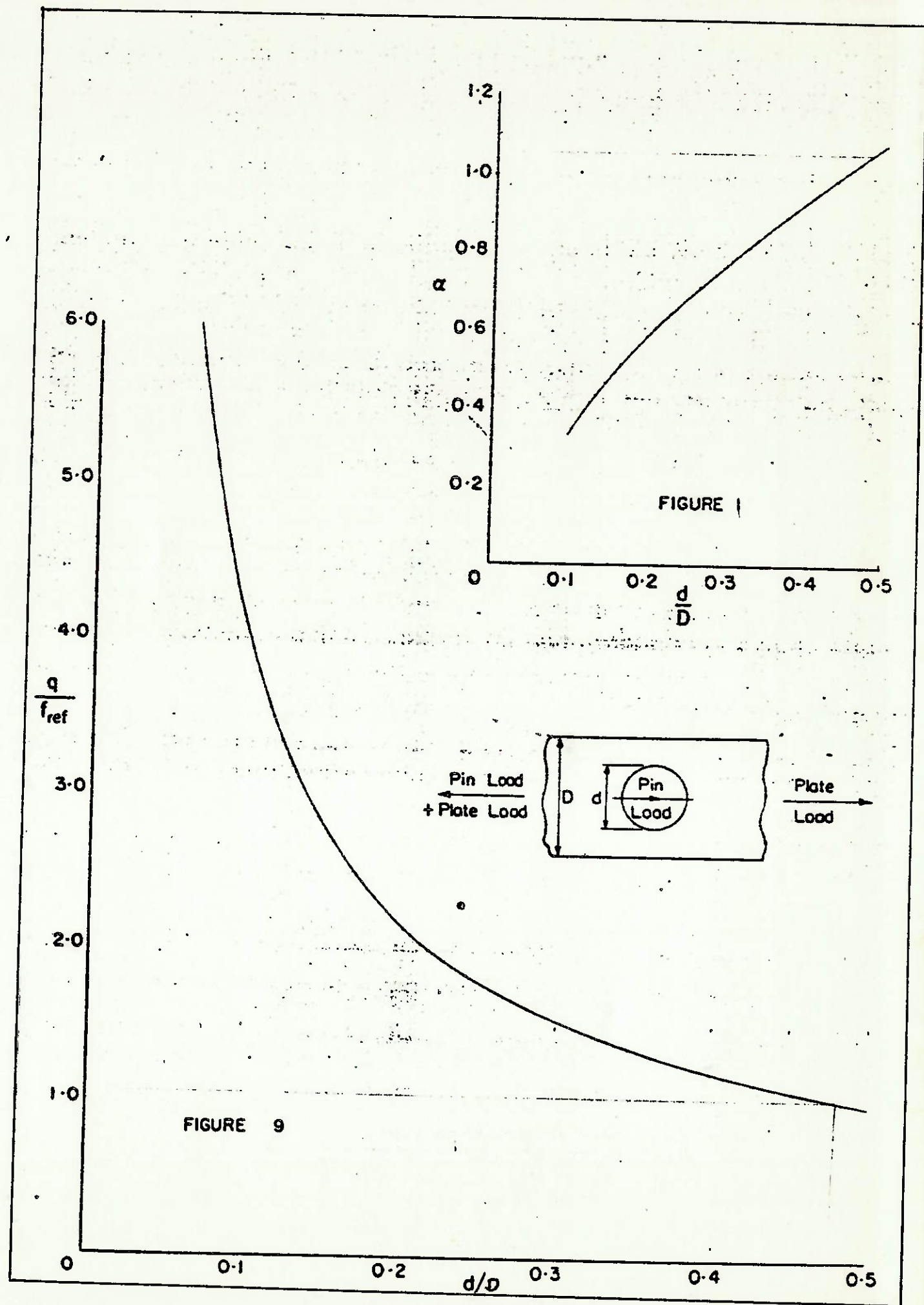
$$\text{com } \frac{d}{D} = 0,48$$

Da figura 9

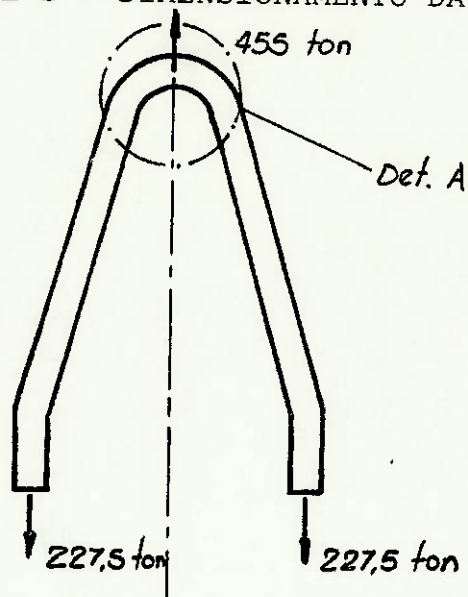
$$\frac{q}{f_{ref}} = 1,05$$

$$f_{ref} = \frac{227\ 500}{(292-140)130} = 11,51 \text{ kgf/mm}^2$$

$$\text{então: } q = 11,51 \cdot 1,05 = 12,09 \text{ kgf/mm}^2$$

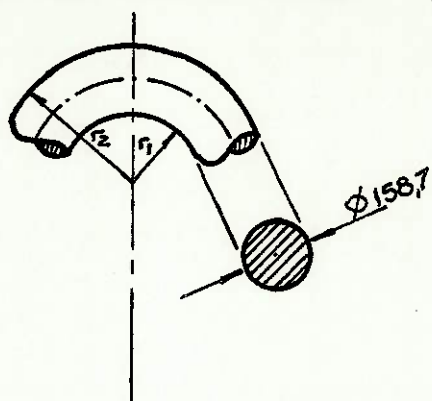


PARTE D - DIMENSIONAMENTO DA ALÇA



Obs: O cálculo do olhal já foi considerado anteriormente. Resta verificar a região da dobra da alça.

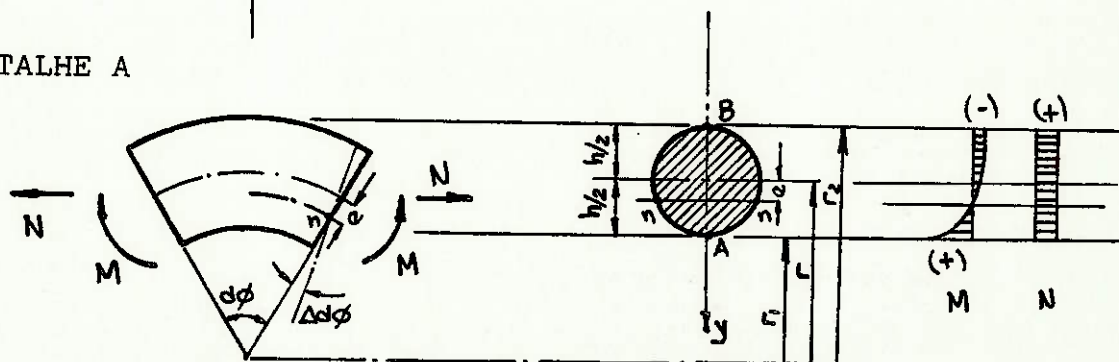
1. TEORIA DAS BARRAS CURVAS (Ref.4)



$$r_1 = 114,3 \text{ mm}$$

$$r_2 = 273 \text{ mm}$$

DETALHE A



NOMENCLATURA:

n-n - linha neutra

- e - distância entre a linha neutra e a linha de centro da seção
 $d\phi$ - ângulos que duas seções transversais da barra, próximas uma da outra, formam entre si, antes da flexão
 $\Delta d\phi$ - ângulo de rotação de uma seção transversal em torno do eixo neutro , devido ao momento M
 r_1 - raio interno
 r_2 - raio externo
 r - raio do centróide da seção

HIPÓTESES:

- . A linha de centro é uma curva plana
- . A barra é submetida a esforços contidos neste plano
- . A barra é de seção circular constante
- . As seções transversais da barra, originariamente planas e normais à linha de centro da barra, permanecem assim depois de uma flexão.

Alongamento específico

$$\epsilon = \frac{(y-e) \Delta d\phi}{(r-y) d\phi} \quad (1)$$

$$\sigma_x = E\epsilon = E \frac{(y-e) \Delta d\phi}{(r-y) d\phi} \quad (2)$$

A distribuição de tensões não é linear (como no caso das barras retas) mas segue uma lei hiperbólica. Da condição de que a soma das forças normais distribuídas sobre a seção transversal é zero, pode-se concluir que o eixo neutro é deslocado do CG da seção transversal para o centro de curvatura da barra.

Aplicando-se 2 equações da estática:

1º) Somatória das forças normais distribuídas numa seção transversal é igual a zero.

$$\int_A \sigma dA = E \frac{\Delta \phi}{\phi} \int_A \frac{(y-e)}{r-y} dA = 0 \quad (3)$$

2º) Momento das forças normais seja igual a M

$$\int_A \sigma y dA = E \frac{\Delta \phi}{\phi} \int_A \frac{(y-e)}{r-y} y dA = M \quad (4)$$

$$\text{De (3)} \rightarrow \int \frac{y}{r-y} dA - e \int \frac{dA}{r-y} = 0 \quad (5)$$

Tomando-se: $\int \frac{y}{r-y} dA = mA$ = área modificada
(é função da forma da seção transversal).

$$\begin{aligned} \int \frac{dA}{r-y} &= \int_A \frac{(y+r-y)}{r(r-y)} dA = \int_A \frac{y dA}{r(r-y)} + \int_A \frac{dA}{r} = \frac{mA}{r} + \frac{A}{r} = \\ &= (m+1) \frac{A}{r} \quad (6) \end{aligned}$$

$$\text{Em (5)} \quad mA - (m+1) \frac{Ae}{r} = 0$$

$$e = r \frac{m}{m+1} \quad (6) \quad \text{ou} \quad m = \frac{e}{r-e} \quad (7)$$

$$\text{De (4)} \rightarrow \int_A \frac{y^2 dA}{r-y} = - \int_A \left(y - \frac{ry}{r-y} \right) dA = - \int_A y dA + r \int_A \frac{y dA}{r-y} = mrA$$

$$\frac{E \Delta \phi}{\phi} (mrA - meA) = M \rightarrow \frac{E \Delta \phi}{\phi} = \frac{M}{m(r-e)A} = \frac{M}{eA}$$

1.1- Tensão Devido à Flexão.

$$\sigma = \frac{M(y-e)}{m(r-e)A(r-y)} = \frac{M(y-e)}{Ae(r-y)}$$

Nos pontos A e B

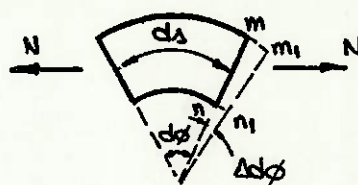
$$y(A) = h/2 \quad ; \quad y(B) = -h/2$$

$$\sigma_A = \frac{M(h/2 - e)}{Ae r_1} \quad ; \quad \sigma_B = \frac{-M(h/2 + e)}{Ae r_2}$$

A variação $d\phi$ é obtida por:

$$\Delta d\phi = \frac{M d\phi}{eAE} = \frac{M ds}{erAE}$$

$$\frac{\Delta d\phi}{ds} = \frac{M}{erAE} = \frac{M(m+1)}{mr^2AE}$$



1.2- Tensão Devido à Força Normal.

$$\sigma = \frac{N}{A}$$

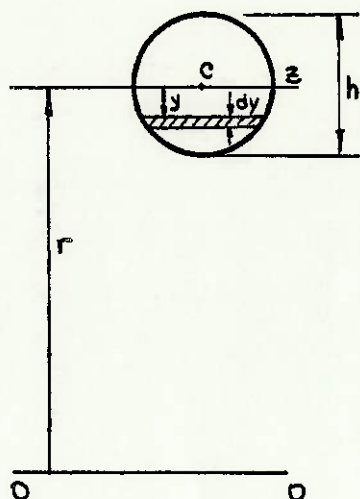
$$r \frac{\Delta d\phi}{ds} = \frac{N}{A}$$

$$\sigma = E\varepsilon$$

$$\Delta d\phi = \frac{N}{A} \frac{ds}{E}$$

Combinando as tensões de flexão, produzidas pelo conjugado M mais a força normal N , ve:

$$\sigma = \frac{M(y-e)}{Ae(r-y)} + \frac{N}{A} \quad (8)$$

1.3- Cálculo de $\underline{m}$ e $\underline{e}$ para seção Circular

$$mA = \int_A \frac{y}{r-y} dA = 2\pi r \left(r - \sqrt{r^2 - \frac{h^2}{4}} \right) - A$$

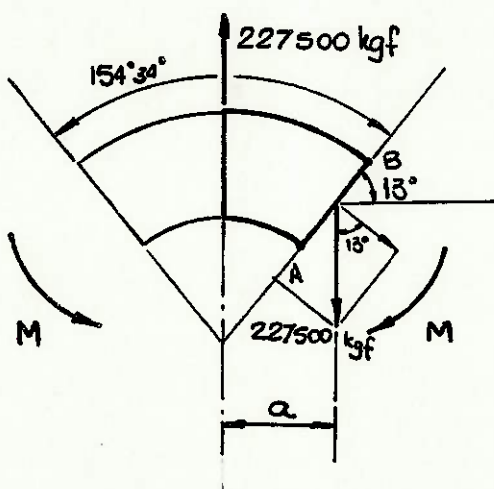
$$m = \frac{1}{4} \left(\frac{h}{2r} \right)^2 + \frac{1}{8} \left(\frac{h}{2r} \right)^4 + \frac{5}{64} \left(\frac{h}{2r} \right)^6 + \dots$$

Para o alça:

$$\left. \begin{array}{l} h = 158,7 \text{ mm} \\ r = 193,65 \text{ mm} \end{array} \right\} \left(\frac{h}{2r} \right) = 0,4097598$$

$$m = 0,045525$$

$$e = r \cdot \frac{m}{m+1} = 3,4320472$$



o ângulo de 13° entre a direção da força de 227500 kgf e a normal da seção foi obtida através do desenho da peça.

$$a = r \cos 13^\circ = 193,65 \cdot \cos 13^\circ$$

$$M = 227.500 \cdot 193,65 \cos 13^\circ \quad (\text{kgf mm})$$

$$N = 227.500 \cos 13^\circ$$

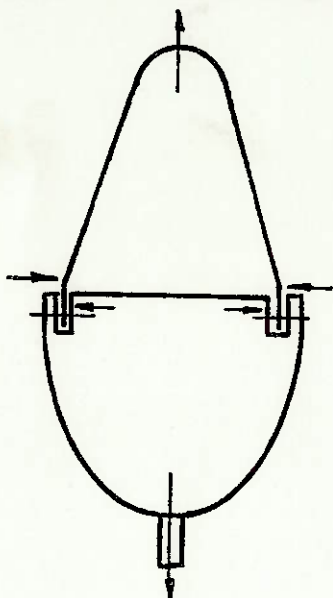
$$\sigma_A = - \frac{M (h/2 - e)}{A \cdot e \cdot r_1} + \frac{N}{A} = -159,7 + 11,2 = -148 \text{ kgf/mm}^2$$

$$\sigma_B = \frac{M (h/2 + e)}{A \cdot e \cdot r_2} + \frac{N}{A} = 82,8 + 11,2 = 94 \text{ kgf/mm}^2$$

1.4- Conclusão.

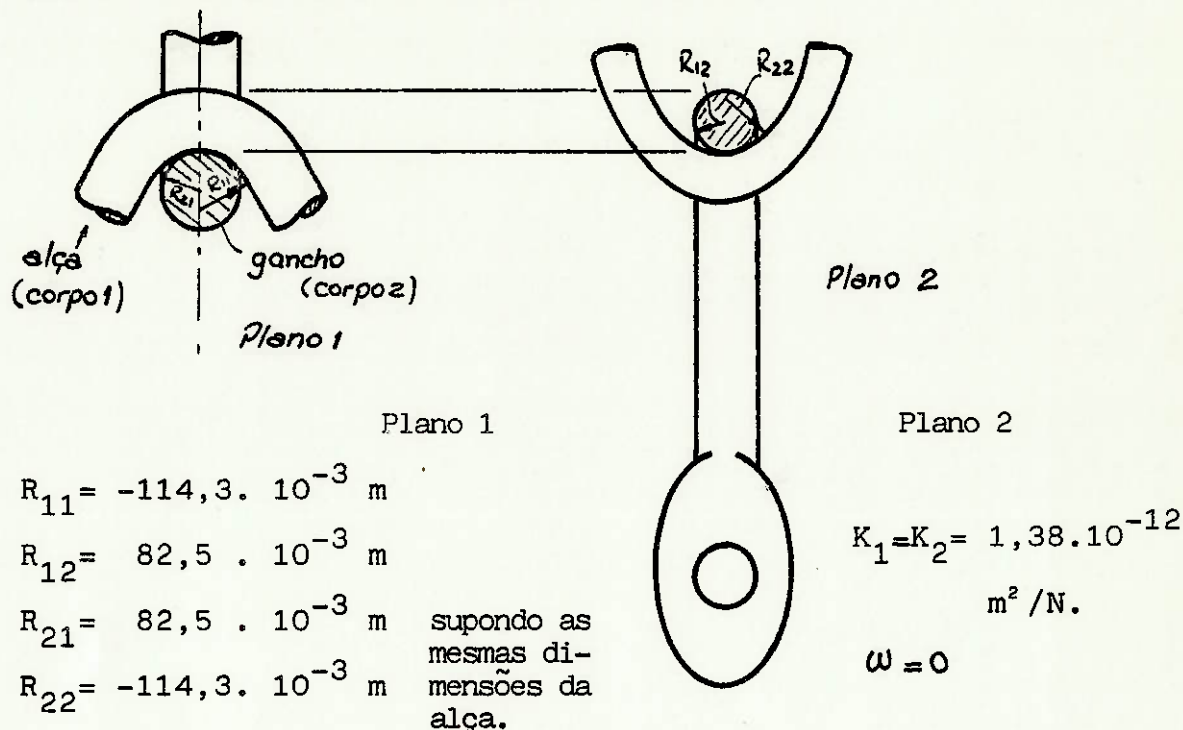
Com esses resultados, vemos que a tensão de escoamento do material da peça ($\sigma_{esc} \approx 64 \text{ kgf/mm}^2$) é ultrapassada!

A conclusão a que se chega é que o modelo utilizado não condiz com a realidade. Uma forte razão para isso é a de que apenas consideramos os esforços ativos agindo na alça. Na verdade, existe o esforço reativo da carcaça do "SWIVEL" que impede o dobramento da alça (veja Fig. A.1).



Assim, passaremos a verificar o esmagamento da parte superior da alça, utilizando-se da teoria das tensões de contato, enunciado anteriormente.

2- TEORIA DAS TENSÕES DE CONTATO (Ref.6)



$$(1) \rightarrow A = \frac{1}{2} \left(\frac{1}{R_{12}} + \frac{1}{R_{22}} \right) = \frac{1}{2} \left\{ \frac{1}{82,5 \cdot 10^{-3}} + \frac{1}{-114,3 \cdot 10^{-3}} \right\} = 1,6862$$

$$A = B = 1,6862 \text{ m}^{-1}$$

$$\left(\frac{A}{B} \right) = 1$$

$$(13) \rightarrow W = \left[\frac{3 P \pi}{4} (k_1 + k_2) (A+B)^2 \right]^{1/3} =$$

$$= \left[\frac{3 \cdot 455000 \pi}{4 \cdot 0,102} (2 \cdot 1,38 \cdot 10^{-12}) (2 \cdot 1,6862)^2 \right]^{1/3} = 0,0686$$

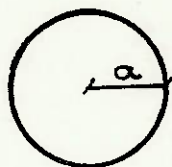
$$(9) \rightarrow a = \frac{C_a W}{(A+B)} \left(\frac{A}{B} \right)^{-1/3} = \frac{1 \cdot 0,06862}{2 \cdot 1,6862} = 0,0203 \text{ m}$$

$$(10) \rightarrow b = \frac{C_b W}{(A+B)} \left(\frac{A}{B} \right)^{-1/3} = 0,0203 \text{ m}$$

onde $C_a = C_b = 1$ (Figs. 1 e 2)

ou por (3)

$$a = b = \left\{ \frac{3 P \pi}{4} (k_1 + k_2) \left[\frac{R_{11} \cdot R_{21}}{R_{11} + R_{21}} \right] \right\}^{1/3} = 0,0203 \text{ m}$$



Contato circular

Pressão máxima: (16) $\rightarrow p_0 = \frac{1,5 P}{\pi a^2} = \frac{1,5 \cdot 455000}{\pi (0,0203)^2} \cdot \frac{1}{0,102} =$

$$= 5\,035\,769\,164 \frac{\text{N}}{\text{m}^2} = \underline{\underline{513,6 \text{ kgf/mm}^2}}$$

ou (17) $\rightarrow f_{z_{\text{máx}}} = - \left\{ \frac{6 P}{\pi^5 (k_1 + k_2)^2 \left[\frac{R_{11} + R_{21}}{R_{11} \cdot R_{21}} \right]^2} \right\}^{1/3} = \underline{\underline{513,6 \frac{\text{kgf}}{\text{mm}^2}}}$

Logo, esta tensão ultrapassa o $\sigma_{\text{rup}} \approx 64 \text{ kgf/mm}^2$

Verificamos a tensão de esmagamento para um gancho maior:

$$R_{21} = 112 \cdot 10^{-3} \text{ m}$$

$$R_{22} = -120 \cdot 10^{-3} \text{ m}$$

$$(1) \left\{ \begin{aligned} A &= \frac{1}{2} \left(\frac{1}{82,5 \cdot 10^{-3}} + \frac{1}{-120 \cdot 10^{-3}} \right) = 1,8939 \\ B &= \frac{1}{2} \left(\frac{1}{-114,3 \cdot 10^{-3}} + \frac{1}{112 \cdot 10^{-3}} \right) = 0,0898 \end{aligned} \right.$$

para mantermos a relação B A , inverteremos os planos, assim:

$$R_{11} = 82,5 \cdot 10^{-3} \text{ m}$$

$$R_{21} = -120 \cdot 10^{-3} \text{ m}$$

$$R_{12} = -114,3 \cdot 10^{-3} \text{ m}$$

$$R_{22} = 112 \cdot 10^{-3} \text{ m}$$

$$\left. \begin{array}{l} A = 0,0898 \\ B = 1,8939 \end{array} \right\} \left(\frac{A}{B} \right) = 0,0474 \rightarrow \left\{ \begin{array}{l} C_a = 1,17 \\ C_b = 1,24 \end{array} \right. \quad (\text{Fig. 1})$$

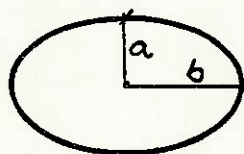
$$(13) \rightarrow W = \left[\frac{3 P R}{4} (k_1 + k_2) (A+B)^2 \right]^{1/3} =$$

$$= \left[\frac{3 \cdot 455000 \cdot \pi}{4 \cdot 0,102} (2 \cdot 1,38 \cdot 10^{12}) (1,8939 + 0,0898)^2 \right]^{1/3}$$

$$W = 0,0485$$

$$(9) \rightarrow a = \frac{C_a W}{(A+B)} \left(\frac{A}{B} \right)^{-1/3} = \frac{1,17 \cdot 0,0485}{(0,0898 + 1,8939)} (0,0474)^{-1/3} = 0,0790 \text{ m}$$

$$(10) \rightarrow b = \frac{C_b W}{(A+B)} \left(\frac{A}{B} \right)^{-1/3} = \frac{1,24 \cdot 0,0485}{(0,0898 + 1,8939)} (0,0474)^{-1/3} = 0,0838 \text{ m}$$



Contato elíptico.

$$\text{pressão máxima: } (22) \rightarrow P_0 = \frac{1,5 P}{\pi a b} = \frac{1,5 \cdot 455000}{\pi \cdot 0,0790 \cdot 0,0838} =$$

$$= 32\,803\,572 \text{ kgf/m}^2 = \underline{\underline{32,8 \text{ kgf/mm}^2}}$$

Com uma tensão de compressão de $32,8 \text{ kgf/mm}^2$ teremos um coeficiente de segurança.

$$\beta = \frac{\sigma_e}{\sigma} = \frac{64}{32,8} = 1,95 \quad \text{sobre a tensão de escoamento para essas dimensões.}$$

PARTE E - APLICAÇÃO DO MÉTODO DOS ELEMENTOS FINITOS AO PROJETO;

1. DISCRETIZAÇÃO.

A discretização foi feita apenas na região do olhal. E aproveitando-se da simetria existente, a discretização recaiu se na metade do olhal.

Como o olhal se apresenta com uma espessura constante (130 mm), e a carga aí aplicada pode ser considerada inalterável ao longo dessa espessura, concluímos que a aplicação de elementos do estado plano de tensões seria o mais adequado e que traria resultados compatíveis.

Na região da alça aonde na peça real a seção é circular, no modelo a seção é retangular. Os resultados dessa região não serão levados em conta a título de dimensionamento e sim a título de comparação com outros critérios de cálculo.

Devido a sua forma geométrica, aproximadamente circular, procuramos aproveitar a vantagem que o programa NAVSAP - nos oferece, que é a geração de elementos através de coordenadas cilíndricas. Assim, para cada raio, fizemos gerar elementos de 0° a 180° em intervalos de 10° .

Na região da alça colocamos elementos retangulares - (também gerados) e na região de transição, tentamos adaptar os elementos através de triângulos.

Com a discretização, totalizou-se 163 nós mais o nó 164 que é o centro dos eixos X,Y e Z. Formou-se 141 elementos - do estado plano de tensões.

Quanto às condições de apoio, restringimos os nós pertencentes à linha de simetria do olhal a se deslocarem na direção do eixo X (global) e livre para se deslocarem na direção do eixo Z (global). Como é estado plano de tensões, todos os elementos são restritos a se deslocarem na direção do eixo Y(global).

Os nós pertencentes à fronteira da parte superior do modelo, estão restritos na direção Z. e livres na direção X.

2. CARREGAMENTO.

2.1- Carga Concentrada.

Como o primeiro contato entre o pino e o furo do olhal é um ponto, fizemos então o carregamento concentrado neste ponto. Assim, aplicamos uma carga de 227.500 kgf na direção de (-Z) e no nó 1. (veja desenho 2).

2.2- Carga Distribuída.

Lançando mão da teoria das tensões de contato, visto anteriormente, chegamos à área de contato em que o pino e o furo do olhal perfazem entre si, bem como a distribuição das pressões (veja Gráfico I).

Como a distribuição de pressão segue a curva de uma elipse e não é possível transportar essa distribuição de pressões para o carregamento do programa NAVSAP, procuramos obter uma pressão média para cada trecho dos elementos.

Assim, o elemento 1 foi submetido a uma pressão constante de 23,4 kgf/mm², o elemento 2 de 21,6 kgf/mm², o elemento 3 de 17,3 kgf/mm² e o elemento 4 de 9,83 kgf/mm² (veja desenho 3).

3. RESULTADOS.

3.1- Carga Admissível.

Para o material do olhal, temos:

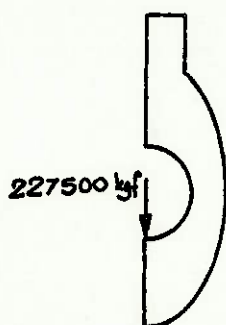
$$\sigma_e = 64 \text{ kgf/mm}^2$$

$$\sigma_{rup} = 82,5 \text{ kgf/mm}^2$$

Usando-se um fator de segurança $\gamma = 2,3$ que está próximo do recomendado pela API para equipamentos de carga teremos:

$$\bar{\sigma}_{admissível} = 28 \text{ kgf/mm}^2$$

3.2- Carga Concentrada.



Na região abaixo da carga concentrada, nota-se a tensão de esmagamento ultrapassando a tensão admissível.

O mesmo acontece na região do intradorso, só que agora o efeito é de tração. (veja esquema E.1).

Analisando-se os elementos 9 e 10 temos:

.elemento 10 (Centro)	$\left\{ \begin{array}{l} T_{máx} = 30,4 \text{ kgf/mm}^2 \\ T_{mín} = 2,1 \text{ kgf/mm}^2 \\ \beta = -87,92^\circ \end{array} \right.$	$\tau_{máx} = \frac{T_{máx} - T_{mín}}{2}$ $= 14,2 \text{ kgf/mm}^2$

$$\begin{array}{l}
 \text{. elemento 9} \\
 \text{(Centro)}
 \end{array}
 \left\{
 \begin{array}{l}
 T_{\text{máx}} = 31,6 \text{ kgf/mm}^2 \\
 T_{\text{min}} = 2,3 \text{ kgf/mm}^2 \\
 \beta = -84,70^\circ
 \end{array}
 \right.
 \quad
 \tau_{\text{máx}} = 14,7 \text{ kgf/mm}^2$$

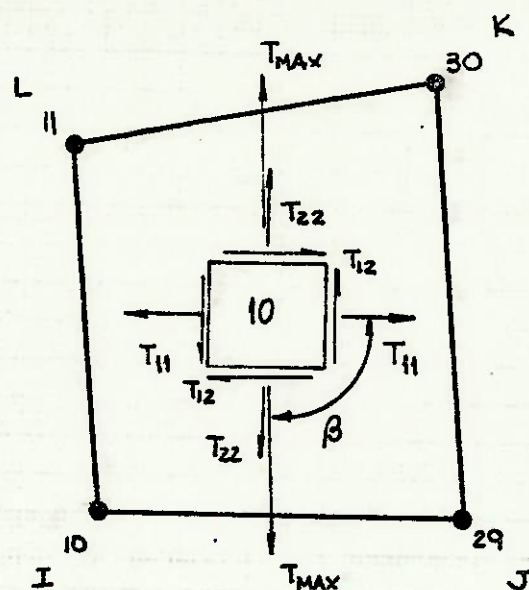
3.3- Carga Distribuída.



Com este escorregamento, que é muito mais compatível com a realidade do que o anterior, notamos que os elementos no introdorso ainda ultrapassam ainda que por pequena diferença o limite admissível, mas muito aquém do limite de esocamento. (veja esquema E-2). (Veja Desenho 4).

$$\begin{array}{l}
 \text{. elemento 10} \\
 \text{(Centro)}
 \end{array}
 \left\{
 \begin{array}{l}
 T_{\text{máx}} = 28,4 \text{ kgf/mm}^2 \\
 T_{\text{min}} = 2,0 \text{ kgf/mm}^2 \\
 \beta = -87,42^\circ
 \end{array}
 \right.
 \quad
 \tau_{\text{máx}} = 13,2 \text{ kgf/mm}^2$$

$$\begin{array}{l}
 \text{. elemento 9} \\
 \text{(Centro)}
 \end{array}
 \left\{
 \begin{array}{l}
 T_{\text{máx}} = 29,1 \text{ kgf/mm}^2 \\
 T_{\text{min}} = 2,1 \text{ kgf/mm}^2 \\
 \beta = -84,25^\circ
 \end{array}
 \right.
 \quad
 \tau_{\text{máx}} = 13,5 \text{ kgf/mm}^2$$



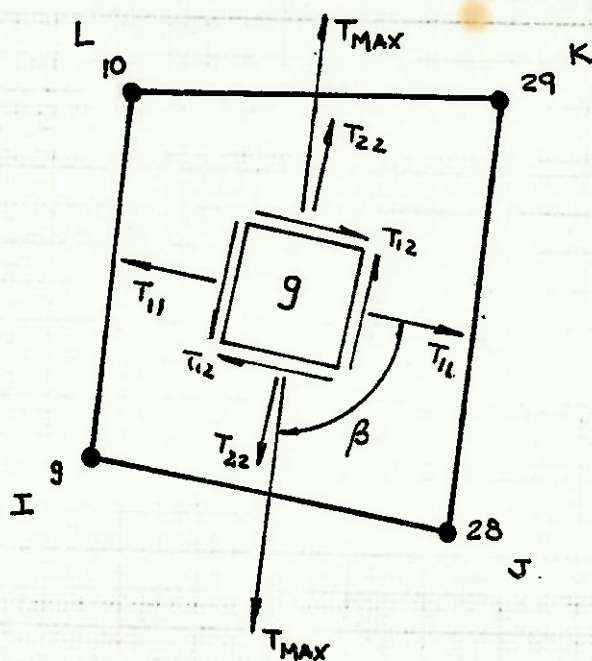
CARGA CONCENTRADA

$$T_{11} = 21,8$$

$$T_{22} = 30,4$$

$$T_{MAX} = 30,4$$

$$\beta = -87,92^\circ$$



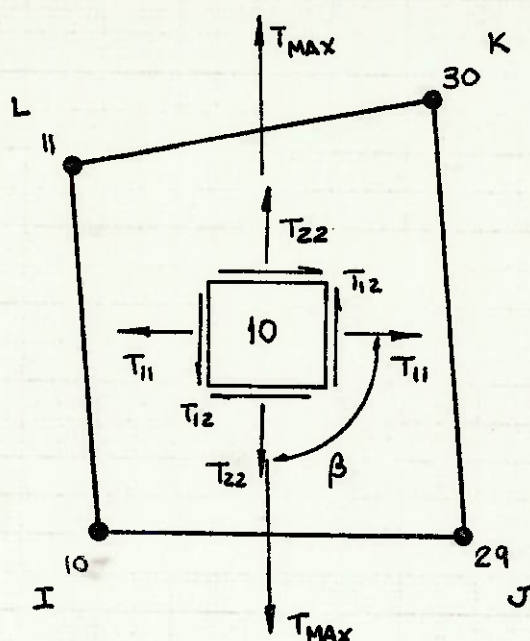
$$T_{11} = 25,7$$

$$T_{22} = 31,4$$

$$T_{MAX} = 31,6$$

$$\beta = -84,70^\circ$$

Esquema E.1



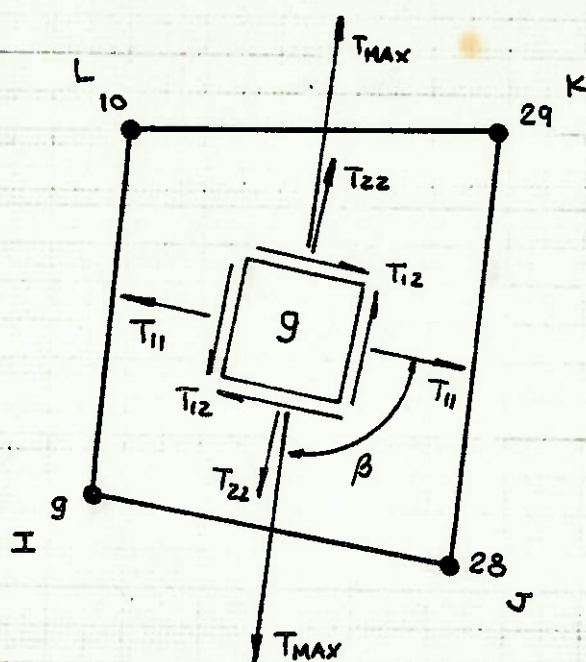
CARGA DISTRIBUÍDA

$$T_{11} = 20,7$$

$$T_{22} = 28,3$$

$$T_{MAX} = 28,4$$

$$\beta = -87,42^\circ$$



$$T_{11} = 24,1$$

$$T_{22} = 28,8$$

$$T_{MAX} = 29,1$$

$$\beta = -84,25^\circ$$

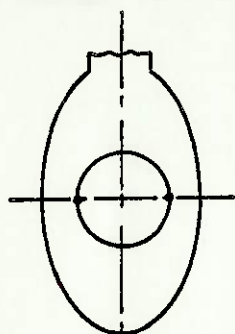
Esquema E.2

PARTE F - CONCLUSÕES

- 1) Com relação à região do intradorso, tanto o carregamento concentrado quanto o distribuído, apresentam resultados aproximadamente idênticos com uma diferença em torno de 7% ($\approx 30 \text{ kgf/mm}^2$).

O mesmo acontece com relação à tensão de cisalhamento.

2)



Na seção do intradorso, a distribuição das tensões de tração mostra um pico na borda interna decrescendo em direção à borda externa (como era de se esperar).

- 3) Os resultados demonstram que a tensão máxima de cisalhamento ocorrem a 45° em relação a direção de tensão máxima.

- 4) Comparando os resultados:

a) Tração na haste

- . Cálculo por tração pura $\sigma_{tr} = 10,6 \text{ kgf/mm}^2$
- . Cálculo pelo método dos elementos finitos (carga distribuída) $\sigma_{tr_{m\acute{a}x}} = 11,5 \text{ kgf/mm}^2$

b) Esmagamento na borda interna do olhal

- . cálculo por esmagamento simples $\sigma_{esm} = 12,5 \text{ kgf/mm}^2$
- . cálculo por tensão de contato (carga distribuída) $\sigma_{esm_{m\acute{a}x}} = 23,8 \text{ kgf/mm}^2$
- . cálculo pelo método dos elementos finitos (carga distribuída) $\sigma_{esm_{m\acute{a}x}} = 22,2 \text{ kgf/mm}^2$

c) Cisalhamento na seção do intradorso.

- . cálculo da ESDU : $\sigma_{\text{máx}} = 12,09 \text{ kgf/mm}^2$
- . cálculo pelo método dos elementos finitos(carga distribuída) $\sigma_{\text{máx}} = 13,47 \text{ kgf/mm}^2$

d) Tração na seção do intradorso

- . cálculo por tração simples : $\sigma_{\text{tr}} = 11,51 \text{ kgf/mm}^2$
- . cálculo pela teoria das barras curvas : $\sigma_{\text{tr}} = 24,2 \text{ kgf/mm}^2$
- . cálculo pela fórmula de Lamé: $\sigma_{\text{tr}} = 19,96 \text{ kgf/mm}^2$
- . cálculo da sumitomo : $\sigma_{\text{tr}} = 60,7 \text{ kgf/mm}^2$
- . cálculo pelo método dos elementos finitos(carga concentrada) : $\sigma_{\text{tr}} = 31,6 \text{ kgf/mm}^2$
- . cálculo pelo método dos elementos finitos(carga distribuída) $\sigma_{\text{tr}} = 29,08 \text{ kgf/mm}^2$

OBS.: - Por esses resultados nota-se que o cálculo na haste por tração simples, o cálculo de esmagamento pelo critério das tensões de contato possuem resultados aproximados com os do método dos elementos finitos. Ou seja, para essas regiões, podemos usar os métodos mais comuns que os resultados serão compatíveis com a realidade.

O mesmo não se diz à região do intradorso, onde os vários critérios trazem resultados bem diferentes, - principalmente o cálculo feito pela SUMITOMO onde estaria o olhal com tensões próximas ao do escoamento.

Enquanto que o cálculo por tração simples, traz uma tensão média, o método dos elementos finitos traz - uma distribuição das tensões ao longo da seção, onde podemos localizar o ponto de máxima tensão.

Para melhores resultados, poderíamos subdividir mais ainda esta região, e assim obtermos resultados mais apurados para o ponto crítico.

Outra observação que se faz, é que para a região do - intradorso, tanto o carregamento de carga concentrada quanto o de carga distribuída, produzem resultados nesta região crítica, aproximadamente iguais.

- 5) Numa análise geral, podemos concluir que num dimensionamento de um componente onde desconhecemos as regiões críticas ou mesmo que conheçamos e quiséssemos saber as tensões existentes o método dos elementos finitos se põe em bora sendo trabalhoso e de custo alto, como o mais adequado instrumento de análise.

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- 13- Norma AISE nº 7.

ANEXOS

- LISTAGENS
- DESENHOS

LISTAGEM: CARGA CONCENTRADA

```

PPPPPPPP MM MM CCCCCC 55555555 11 555999
PPPPPPPP MM MM CCCCCC 55555555 11 555999
PP PP MM MM CCCC 55 55 555999
PP PP MM MM CC CC 555555 11 55 55
PP PP MM MM CC CC 555555 11 55 55
PPPPPPPP MM MM CC CC 555 555 555999
PPPPPPPP MM MM CC CC 555 555 555999
PP PP MM CCCCCC 555 555 11 555999
PP PP MM CCCCCC 555555 1111 555999

```

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0000 222222 222222 666666 77777777 666666 77777777
000000 22222222 22222222 66666666 77777777 666 666 77777777
00 00 222 222 222 222 666 77 666 77
00 00 222 222 222 222 66 77 66 77
00 00 222 222 222 222 66 666666 77 66 666666 77
00 00 222 222 222 222 66 66 77 66 66 77
00 00 222 222 222222 666 666 77 666 666 77
000000 22222222 22222222 666 666 77 666 666 77
0000 22222222 22222222 666666 77 666666 77

```

JATE: NOV 20, 1955 12:27:29, SYSTEM SERIAL: 1017, B67CJ MCP: SYSTEM/INCP. 33-260.1072, HOSTNAME: F2

WORK FLOW STATEMENTS

```

00000100 BEGIN JOB ULHAL/CHANGE=KAJIHARA/CLASS=17
00000100 MAXPROC=600/MAXTIME=600/MAXLINES=3500;
00000200 RUN CUPSON/PROLCA/CSI/CCODE/NAVSAP;
00000300 *****
00000400 ***** CARLOS YOSHIO KAJIHARA ----- POLI/MECANICA *****
00000500 *****
00000600 *****
00000700 *****
00000800 *****
00000900 *****
00001000 *****
00001100 *****
00001200 *****
00001300 *****
00001400 *****
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```

JOB SUMMARY

```

NOV 20, 1955 12:06:02 BUJ 0563 ULHAL
JOB ENTERED SYSTEM: NOV 20, 1955 11:45:00 FROM NFL 33-260
QUEUE: 1
ORIGINATING LSM: 45 PCS: 3
PRIORITY: 50
USERCODE: PMC5190226787.
CHARACTER: KAJIHARA.
0758 THIS 27 CODE FILE IS TOJ OLD TO BE RUN ON THIS RELEASE.
12:27:17 EOT 0758 CURSUS/PROLCA/CSI/CCODE/NAVSAP.
PROMESSOR LINE: 00:01:00.758 USERCODE: PMC5190226787.CHARGECCODE: KAJIHARA.
1/0 LINE: 00:00:22.336 CAROS READ 115 LINES PRINTED: 1826.
ELAPSED TIME: 00:21:12.193 INITIAL PBITS: 355, OTHER PBITS: 11.
MEM. ALLOC.: 0.000 MEY. CLSIC 0.000 UU

```

12:27:25 EJJ 0563 CLHAL. 0.077 U\$
PROCESSOR TIME: 00:00:00.261 USERCODE: PMC5190226747-CHARGECODE: KAJIHARA.
L/O TIME: 00:00:01.005 INITIAL FBITS: 60.
ELAPSED TIME: 00:21:23.344 MEM. ALLOC.: 0.000 MBY. CLSTC 0.000 UU
(VALOR DE JCB 1) (RESJAN 21 PROCLESSAMENICS)

PROGRAMA NAVSAP

*EXECUTADO PARA: OLHAL DA ALCA DO SHIVEL - ESTADO PLANO DE TENSES - UNID. EM KGF MM

* INFORMACOES PARA CONTROLE GERAL DE PROCESSAMENTO

NUMERO DE PONTOS NUDAIS.....= 164
NUMERO DE TIPOS DE ELEMENTOS.....= 1
NUMERO DE CONDIÇÕES DE CARREGAMENTO...= 1
NUMERO DE FREQUÊNCIAS.....= 0
CODIGO DE ANALISE (NDYN).....= 0
E0-0, ESTAFICA,
E0-1, FREQUÊNCIAS E MODOS,
E0-2, RESPOSTA FORCADA,
E0-3, ESPECTRO DE RESPOSTA,
E0-4, INTERACAO DIFETA
OPCAO DE EXECUCAO (MODEX).....= 0
E0-0, EXECUCAO,
E0-1, VERIFICACAO DE DADOS
NUMERO DE VEIGRES DE
INTERACAO POR SUB-ESPACOS (NAD).....= 0
NUMERO DE EQUACÖES POR BLOCO.....= 0
OPCAO DE ARMAZENAGEM PARA REINICIO...= 0
OPCAO DE ARMAZENAGEM PARA DESENHOS
EM PÓS-PROCESSAMENTO (IGPOS).....= 0

* DADOS DE ENTRADA DOS PONTOS NODAIS

NUMERO DO NO	COORDENADAS DOS NODOS			COORDENADAS DOS NODOS			T
	X	Y	Z	X	Y	Z	
C 18	0	1	0	1	1	180.000	0.000
C 19	0	1	0	1	1	0.000	0.000
C 1	1	1	0	1	1	180.000	0.000
C 19	1	1	0	1	1	0.000	0.000
C 20	0	1	0	1	1	180.000	0.000
C 38	0	1	0	1	1	0.000	0.000
C 20	1	1	0	1	1	180.000	0.000
C 38	1	1	0	1	1	0.000	0.000
C 39	0	1	0	1	1	180.000	0.000
C 39	0	1	0	1	1	0.000	0.000
C 39	1	1	0	1	1	180.000	0.000
C 56	0	1	0	1	1	0.000	0.000
C 76	0	1	0	1	1	180.000	0.000
C 76	1	1	0	1	1	0.000	0.000
C 77	0	1	0	1	1	180.000	0.000
C 95	0	1	0	1	1	0.000	0.000
C 95	1	1	0	1	1	180.000	0.000

NUMERO DO PUNTO	CONDICIONES DE CONTIGUO	X	Y	Z	T
90	0	146.000	0.000	180.000	0.000
114	0	146.000	0.000	0.000	0.000
96	1	146.000	0.000	180.000	0.000
114	1	146.000	0.000	0.000	0.000
114	1	146.000	0.000	0.000	0.000
115	0	162.000	0.000	180.000	0.000
120	0	162.000	0.000	180.000	0.000
115	1	162.000	0.000	180.000	0.000
121	0	162.000	0.000	180.000	0.000
122	0	155.000	0.000	180.000	0.000
123	0	155.000	0.000	180.000	0.000
124	0	155.000	0.000	180.000	0.000
125	0	162.000	0.000	180.000	0.000
126	0	171.000	0.000	180.000	0.000
127	0	177.000	0.000	180.000	0.000
135	0	182.000	0.000	180.000	0.000
136	0	182.000	0.000	180.000	0.000
139	0	171.000	0.000	180.000	0.000
140	1	205.400	0.000	180.000	0.000
141	0	204.000	0.000	180.000	0.000
142	0	195.000	0.000	180.000	0.000
129	0	67.500	0.000	180.000	0.000
134	0	0.000	0.000	180.000	0.000
134	1	0.000	0.000	180.000	0.000
143	0	85.000	0.000	180.000	0.000
144	0	57.500	0.000	180.000	0.000
149	0	0.000	0.000	180.000	0.000
149	1	0.000	0.000	180.000	0.000
150	0	33.500	0.000	180.000	0.000
151	0	67.500	0.000	180.000	0.000
156	0	0.000	0.000	180.000	0.000
156	1	0.000	0.000	180.000	0.000
157	0	33.000	0.000	180.000	0.000
158	0	67.500	0.000	180.000	0.000
153	0	0.000	0.000	180.000	0.000
153	1	0.000	0.000	180.000	0.000
154	1	0.000	0.000	180.000	0.000

DADOS DOS PUNTOS GERADOS

NUMERO DO PUNTO	CONDICIONES DE CONTIGUO	X	Y	Z	T
1	1	-0.000	0.000	-70.250	0.000
2	0	12.199	0.000	-09.183	0.000
3	0	24.027	0.000	-66.013	0.000
4	0	35.125	0.000	-60.836	0.000
5	0	45.150	0.000	-53.815	0.000
6	0	53.015	0.000	-45.156	0.000
7	0	60.836	0.000	-35.125	0.000
8	0	66.013	0.000	-24.027	0.000
9	0	69.183	0.000	-12.199	0.000
10	0	70.250	0.000	0.000	0.000
11	0	59.183	0.000	12.199	0.000
12	0	66.013	0.000	24.027	0.000

13	0	1	0	0	60.835	0.000	35.125	C.000
14	0	1	0	0	53.815	0.000	45.156	0.000
15	0	1	0	0	45.156	0.000	53.815	0.000
16	0	1	0	0	35.125	0.000	60.835	0.000
17	0	1	0	0	24.027	0.000	66.013	0.000
18	0	1	0	0	12.199	0.000	82.183	0.000
19	1	1	0	0	0.000	0.000	70.250	0.000
20	1	1	0	0	-0.000	0.000	-83.000	0.000
21	0	1	0	0	14.413	0.000	-81.739	0.000
22	0	1	0	0	28.565	0.000	-77.594	0.000
23	0	1	0	0	41.200	0.000	-71.880	0.000
24	0	1	0	0	53.351	0.000	-63.582	0.000
25	0	1	0	0	63.582	0.000	-53.351	0.000
26	0	1	0	0	71.880	0.000	-41.200	0.000
27	0	1	0	0	77.594	0.000	-28.565	0.000
28	0	1	0	0	81.739	0.000	-14.413	0.000
29	0	1	0	0	83.000	0.000	0.000	0.000
30	0	1	0	0	91.739	0.000	14.413	0.000
31	0	1	0	0	77.594	0.000	28.565	0.000
32	0	1	0	0	71.880	0.000	41.200	0.000
33	0	1	0	0	63.582	0.000	53.351	0.000
34	0	1	0	0	53.351	0.000	63.582	0.000
35	0	1	0	0	41.200	0.000	71.880	0.000
36	0	1	0	0	28.565	0.000	77.594	0.000
37	0	1	0	0	14.413	0.000	81.739	0.000
38	1	1	0	0	0.000	0.000	83.000	0.000
39	1	1	0	0	-0.000	0.000	-97.000	0.000
40	0	1	0	0	16.844	0.000	-95.526	0.000
41	0	1	0	0	33.176	0.000	-91.150	0.000
42	0	1	0	0	48.500	0.000	-84.604	0.000
43	0	1	0	0	62.250	0.000	-74.306	0.000
44	0	1	0	0	74.306	0.000	-62.250	0.000
45	0	1	0	0	84.604	0.000	-48.500	0.000
46	0	1	0	0	91.150	0.000	-33.176	0.000
47	0	1	0	0	95.526	0.000	-16.844	0.000
48	0	1	0	0	97.000	0.000	0.000	0.000
49	0	1	0	0	95.526	0.000	16.844	0.000
50	0	1	0	0	91.150	0.000	33.176	0.000
51	0	1	0	0	84.604	0.000	48.500	0.000
52	0	1	0	0	74.306	0.000	62.250	0.000
53	0	1	0	0	62.250	0.000	74.306	0.000
54	0	1	0	0	48.500	0.000	84.604	0.000
55	0	1	0	0	33.176	0.000	91.150	0.000
56	0	1	0	0	16.844	0.000	95.526	0.000
57	1	1	0	0	0.000	0.000	97.000	0.000
58	1	1	0	0	-0.000	0.000	-112.500	0.000
59	0	1	0	0	19.230	0.000	-110.791	0.000
60	0	1	0	0	36.477	0.000	-105.715	0.000
61	0	1	0	0	50.250	0.000	-97.428	0.000
62	0	1	0	0	72.314	0.000	-86.180	0.000
63	0	1	0	0	86.180	0.000	-72.314	0.000
64	0	1	0	0	97.428	0.000	-56.250	0.000
65	0	1	0	0	105.715	0.000	-36.477	0.000
66	0	1	0	0	110.791	0.000	-19.230	0.000
67	0	1	0	0	112.500	0.000	0.000	0.000
68	0	1	0	0	110.791	0.000	19.230	0.000
69	0	1	0	0	105.715	0.000	36.477	0.000
70	0	1	0	0	97.428	0.000	56.250	0.000
71	0	1	0	0	86.180	0.000	72.314	0.000
72	0	1	0	0	72.314	0.000	86.180	0.000

73	0	1	0	0	1	1	1	1	1	56.250	0.000	97.428	0.000
74	0	1	1	1	1	1	1	1	1	38.477	0.000	105.715	0.000
75	0	1	1	1	1	1	1	1	1	19.535	0.000	110.791	0.000
76	1	1	1	1	1	1	1	1	1	0.000	0.000	112.500	0.000
77	1	1	1	1	1	1	1	1	1	-0.000	0.000	-129.000	0.000
78	0	1	1	1	1	1	1	1	1	22.401	0.000	-127.040	0.000
79	0	1	1	1	1	1	1	1	1	44.121	0.000	-121.220	0.000
80	0	1	1	1	1	1	1	1	1	64.500	0.000	-111.717	0.000
81	0	1	1	1	1	1	1	1	1	82.920	0.000	-50.420	0.000
82	0	1	1	1	1	1	1	1	1	98.420	0.000	-82.920	0.000
83	0	1	1	1	1	1	1	1	1	111.717	0.000	-54.500	0.000
84	0	1	1	1	1	1	1	1	1	121.220	0.000	-44.121	0.000
85	0	1	1	1	1	1	1	1	1	127.040	0.000	-22.401	0.000
86	0	1	1	1	1	1	1	1	1	129.000	0.000	0.000	0.000
87	0	1	1	1	1	1	1	1	1	127.040	0.000	22.401	0.000
88	0	1	1	1	1	1	1	1	1	121.220	0.000	44.121	0.000
89	0	1	1	1	1	1	1	1	1	111.717	0.000	64.500	0.000
90	0	1	1	1	1	1	1	1	1	98.420	0.000	82.920	0.000
91	0	1	1	1	1	1	1	1	1	82.920	0.000	50.420	0.000
92	0	1	1	1	1	1	1	1	1	64.500	0.000	111.717	0.000
93	0	1	1	1	1	1	1	1	1	44.121	0.000	121.220	0.000
94	0	1	1	1	1	1	1	1	1	22.401	0.000	127.040	0.000
95	1	1	1	1	1	1	1	1	1	0.000	0.000	129.000	0.000
96	1	1	1	1	1	1	1	1	1	-0.000	0.000	-146.000	0.000
97	0	1	1	1	1	1	1	1	1	25.553	0.000	-143.782	0.000
98	0	1	1	1	1	1	1	1	1	49.935	0.000	-137.195	0.000
99	0	1	1	1	1	1	1	1	1	73.000	0.000	-126.440	0.000
100	0	1	1	1	1	1	1	1	1	93.347	0.000	-111.842	0.000
101	0	1	1	1	1	1	1	1	1	111.842	0.000	-93.347	0.000
102	0	1	1	1	1	1	1	1	1	126.440	0.000	-73.000	0.000
103	0	1	1	1	1	1	1	1	1	137.195	0.000	-49.935	0.000
104	0	1	1	1	1	1	1	1	1	143.782	0.000	-25.553	0.000
105	0	1	1	1	1	1	1	1	1	146.000	0.000	0.000	0.000
106	0	1	1	1	1	1	1	1	1	143.782	0.000	25.553	0.000
107	0	1	1	1	1	1	1	1	1	137.195	0.000	49.935	0.000
108	0	1	1	1	1	1	1	1	1	126.440	0.000	73.000	0.000
109	0	1	1	1	1	1	1	1	1	111.842	0.000	93.347	0.000
110	0	1	1	1	1	1	1	1	1	93.347	0.000	111.842	0.000
111	0	1	1	1	1	1	1	1	1	73.000	0.000	126.440	0.000
112	0	1	1	1	1	1	1	1	1	49.935	0.000	137.195	0.000
113	0	1	1	1	1	1	1	1	1	25.553	0.000	143.782	0.000
114	1	1	1	1	1	1	1	1	1	0.000	0.000	146.000	0.000
115	1	1	1	1	1	1	1	1	1	-0.000	0.000	-146.000	0.000
116	0	1	1	1	1	1	1	1	1	25.553	0.000	-152.230	0.000
117	0	1	1	1	1	1	1	1	1	55.407	0.000	-140.290	0.000
118	0	1	1	1	1	1	1	1	1	81.000	0.000	-104.122	0.000
119	0	1	1	1	1	1	1	1	1	104.122	0.000	-77.500	0.000
120	0	1	1	1	1	1	1	1	1	124.099	0.000	-51.474	0.000
121	0	1	1	1	1	1	1	1	1	134.234	0.000	51.474	0.000
122	0	1	1	1	1	1	1	1	1	141.424	0.000	77.500	0.000
123	0	1	1	1	1	1	1	1	1	141.424	0.000	104.122	0.000
124	0	1	1	1	1	1	1	1	1	134.234	0.000	110.594	0.000
125	0	1	1	1	1	1	1	1	1	124.099	0.000	144.590	0.000
126	0	1	1	1	1	1	1	1	1	109.917	0.000	168.000	0.000
127	0	1	1	1	1	1	1	1	1	101.523	0.000	188.000	0.000
128	0	1	1	1	1	1	1	1	1	90.000	0.000	168.000	0.000
129	0	1	1	1	1	1	1	1	1	57.500	0.000	168.000	0.000
130	0	1	1	1	1	1	1	1	1	34.000	0.000	168.000	0.000
131	0	1	1	1	1	1	1	1	1	40.500	0.000	168.000	0.000
132	0	1	1	1	1	1	1	1	1	27.000	0.000	168.000	0.000

133	0	1	1	0	1	1	1	13.500	0.000	168.000	C.000
134	1	1	1	0	1	1	1	C.000	0.000	168.000	C.000
135	1	1	1	0	1	1	1	-0.000	0.000	-182.000	C.000
136	0	1	1	0	1	1	1	31.604	0.000	-179.235	C.000
137	0	1	1	0	1	1	1	52.248	0.000	-171.024	C.000
138	0	1	1	0	1	1	1	21.000	0.000	-157.817	C.000
139	0	1	1	0	1	1	1	109.717	0.000	-130.554	C.000
140	1	1	1	0	1	1	1	-0.000	0.000	-200.400	C.000
141	0	1	1	0	1	1	1	35.424	0.000	-200.501	C.000
142	0	1	1	0	1	1	1	66.694	0.000	-183.240	C.000
143	0	1	1	0	1	1	1	23.000	0.000	196.000	C.000
144	0	1	1	0	1	1	1	67.500	0.000	196.000	C.000
145	0	1	1	0	1	1	1	54.600	0.000	196.000	C.000
146	0	1	1	0	1	1	1	48.500	0.000	196.000	C.000
147	0	1	1	0	1	1	1	27.000	0.000	196.000	C.000
148	0	1	1	0	1	1	1	13.500	0.000	196.000	C.000
149	1	1	1	0	1	1	1	0.000	0.000	196.000	C.000
150	0	1	1	0	1	1	1	84.000	0.000	220.000	C.000
151	0	1	1	0	1	1	1	67.500	0.000	220.000	C.000
152	0	1	1	0	1	1	1	54.000	0.000	220.000	C.000
153	0	1	1	0	1	1	1	48.500	0.000	220.000	C.000
154	0	1	1	0	1	1	1	27.000	0.000	220.000	C.000
155	0	1	1	0	1	1	1	13.500	0.000	220.000	C.000
156	1	1	1	0	1	1	1	0.000	0.000	220.000	C.000
157	0	1	1	1	1	1	1	33.333	0.000	240.000	C.000
158	0	1	1	1	1	1	1	57.500	0.000	240.000	C.000
159	0	1	1	1	1	1	1	54.000	0.000	240.000	C.000
160	0	1	1	1	1	1	1	48.500	0.000	240.000	C.000
161	0	1	1	1	1	1	1	27.000	0.000	240.000	C.000
162	0	1	1	1	1	1	1	13.500	0.000	240.000	C.000
163	1	1	1	1	1	1	1	0.000	0.000	240.000	C.000
164	1	1	1	0	1	1	1	6.000	0.000	240.000	C.000

*NUMERUS DAS EQUAQUES

V	X	Y	Z	XX	YY	ZZ
1	0	0	1	0	0	0
2	2	0	3	0	0	0
3	4	0	5	0	0	0
4	6	0	7	0	0	0
5	8	0	9	0	0	0
6	10	0	11	0	0	0
7	12	0	13	0	0	0
8	14	0	15	0	0	0
9	16	0	17	0	0	0
10	18	0	19	0	0	0
11	20	0	21	0	0	0
12	22	0	23	0	0	0
13	24	0	25	0	0	0
14	26	0	27	0	0	0
15	28	0	29	0	0	0
16	30	0	31	0	0	0
17	32	0	33	0	0	0
18	34	0	35	0	0	0
19	0	0	36	0	0	0
20	0	0	37	0	0	0
21	38	0	39	0	0	0
22	40	0	41	0	0	0
23	42	0	43	0	0	0

*ELEMENTOS DE ESTADO PLANO DE TENSÕES

MODOS INCOMPATIVELIS SUPRIMIDOS

NUMERO DE ELEMENTOS...= 141
 NUMERO DE MATERIAIS...= 1
 AQ. MAXIMO DE TEMP. 1
 PUN MATERIAL...= 1
 CODIGO DE ANALISE...= 2
 CODIGO DE INCLUSAO 2
 DE MODOS DE FLEXAO...= 1
 EG.O, INCLUI
 OF.O, SUPRIME

NUMERO DO MATERIAL...= 1
 NUMERO DE TEMPERATURAS...= 1
 PESO ESPECIFICO...= 0.
 MASSA ESPECIFICA...= 0.
 ANGULO BETA...= 0.000
 TENSAO ADMISSIVEL...= -2800E+02

TEMPERATURA E(CN) E(CS) E(CT) N(CHS) N(CAT) N(IST) G(CNS) ALFA(CN) ALFA(CS) ALFA(CT)
 0.0) -2100E+05 -2100E+05 -2100E+05 0.2800 0.2800 0.2800 -8203E+04 0. 0. 0.

MULTIPLICACOES DE CARGAS NAO MODAIS

CASO	TEMPERATURA	PRESSAL	GRAVID.-X	GRAVID.-Y	GRAVID.-Z
A	0.000	0.000	0.000	0.000	0.000
B	0.000	0.000	0.000	0.000	0.000
C	0.000	0.000	0.000	0.000	0.000
D	0.000	0.000	0.000	0.000	0.000

ELEMENTO NUMERO	I	J	K	L	MATL TIPO	TEMPERATURA DE REF.	PRESSAO LM I-J	OPCAO TENS.	KG	ESPESURA
1	1	20	21	2	1	0.000	0.	20	1	130.0000
2	2	21	22	3	1	0.000	0.	20	1	130.0000
3	3	22	23	4	1	0.000	0.	20	1	130.0000
4	4	23	24	5	1	0.000	0.	20	1	130.0000
5	5	24	25	6	1	0.000	0.	20	1	130.0000
6	6	25	26	7	1	0.000	0.	20	1	130.0000
7	7	26	27	8	1	0.000	0.	20	1	130.0000
8	8	27	28	9	1	0.000	0.	20	1	130.0000
9	9	28	29	10	1	0.000	0.	20	1	130.0000
10	10	29	30	11	1	0.000	0.	20	1	130.0000
11	11	30	31	12	1	0.000	0.	20	1	130.0000
12	12	31	32	13	1	0.000	0.	20	1	130.0000
13	13	32	33	14	1	0.000	0.	20	1	130.0000
14	14	33	34	15	1	0.000	0.	20	1	130.0000
15	15	34	35	16	1	0.000	0.	20	1	130.0000
16	16	35	36	17	1	0.000	0.	20	1	130.0000
17	17	36	37	18	1	0.000	0.	20	1	130.0000
18	18	37	38	19	1	0.000	0.	20	1	130.0000
19	19	38	39	20	1	0.000	0.	20	1	130.0000
20	20	39	40	21	1	0.000	0.	20	1	130.0000
21	21	40	41	22	1	0.000	0.	20	1	130.0000
22	22	41	42	23	1	0.000	0.	20	1	130.0000
23	23	42	43	24	1	0.000	0.	20	1	130.0000
24	24	43	44	25	1	0.000	0.	20	1	130.0000
25	25	44	45	26	1	0.000	0.	20	1	130.0000
26	26	45	46	27	1	0.000	0.	20	1	130.0000
27	27	46	47	28	1	0.000	0.	20	1	130.0000
28	28	47	48	29	1	0.000	0.	20	1	130.0000
29	29	48	49	30	1	0.000	0.	20	1	130.0000
30	30	49	50	31	1	0.000	0.	20	1	130.0000
31	31	50	51	32	1	0.000	0.	20	1	130.0000
32	32	51	52	33	1	0.000	0.	20	1	130.0000
33	33	52	53	34	1	0.000	0.	20	1	130.0000
34	34	53	54	35	1	0.000	0.	20	1	130.0000
35	35	54	55	36	1	0.000	0.	20	1	130.0000
36	36	55	56	37	1	0.000	0.	20	1	130.0000
37	37	56	57	38	1	0.000	0.	20	1	130.0000
38	38	57	58	39	1	0.000	0.	20	1	130.0000
39	39	58	59	40	1	0.000	0.	20	1	130.0000
40	40	59	60	41	1	0.000	0.	20	1	130.0000
41	41	60	61	42	1	0.000	0.	20	1	130.0000
42	42	61	62	43	1	0.000	0.	20	1	130.0000
43	43	62	63	44	1	0.000	0.	20	1	130.0000
44	44	63	64	45	1	0.000	0.	20	1	130.0000
45	45	64	65	46	1	0.000	0.	20	1	130.0000
46	46	65	66	47	1	0.000	0.	20	1	130.0000
47	47	66	67	48	1	0.000	0.	20	1	130.0000
48	48	67	68	49	1	0.000	0.	20	1	130.0000
49	49	68	69	50	1	0.000	0.	20	1	130.0000
50	50	69	70	51	1	0.000	0.	20	1	130.0000
51	51	70	71	52	1	0.000	0.	20	1	130.0000
52	52	71	72	53	1	0.000	0.	20	1	130.0000
53	53	72	73	54	1	0.000	0.	20	1	130.0000
54	54	73	74	55	1	0.000	0.	20	1	130.0000
55	55	74	75	56	1	0.000	0.	20	1	130.0000
56	56	75	76	57	1	0.000	0.	20	1	130.0000
57	57	76	77	58	1	0.000	0.	20	1	130.0000
58	58	77	78	59	1	0.000	0.	20	1	130.0000
59	59	78	79	60	1	0.000	0.	20	1	130.0000
60	60	79	80	61	1	0.000	0.	20	1	130.0000
61	61	80	81	62	1	0.000	0.	20	1	130.0000

58	51	80	81	62	1	0.000	0.000	20	1	130.0000
59	62	81	82	63	1	0.000	0.000	20	1	130.0000
60	63	82	83	64	1	0.000	0.000	20	1	130.0000
61	64	83	84	65	1	0.000	0.000	20	1	130.0000
62	65	84	85	66	1	0.000	0.000	20	1	130.0000
63	66	85	86	67	1	0.000	0.000	20	1	130.0000
64	67	86	87	68	1	0.000	0.000	20	1	130.0000
65	68	87	88	69	1	0.000	0.000	20	1	130.0000
66	69	88	89	70	1	0.000	0.000	20	1	130.0000
67	70	89	90	71	1	0.000	0.000	20	1	130.0000
68	71	90	91	72	1	0.000	0.000	20	1	130.0000
69	72	91	92	73	1	0.000	0.000	20	1	130.0000
70	73	92	93	74	1	0.000	0.000	20	1	130.0000
71	74	93	94	75	1	0.000	0.000	20	1	130.0000
72	75	94	95	76	1	0.000	0.000	20	1	130.0000
73	76	95	96	77	1	0.000	0.000	20	1	130.0000
74	77	96	97	78	1	0.000	0.000	20	1	130.0000
75	78	97	98	79	1	0.000	0.000	20	1	130.0000
76	79	98	99	80	1	0.000	0.000	20	1	130.0000
77	80	99	100	81	1	0.000	0.000	20	1	130.0000
78	81	100	101	82	1	0.000	0.000	20	1	130.0000
79	82	101	102	83	1	0.000	0.000	20	1	130.0000
80	83	102	103	84	1	0.000	0.000	20	1	130.0000
81	84	103	104	85	1	0.000	0.000	20	1	130.0000
82	85	104	105	86	1	0.000	0.000	20	1	130.0000
83	86	105	106	87	1	0.000	0.000	20	1	130.0000
84	87	106	107	88	1	0.000	0.000	20	1	130.0000
85	88	107	108	89	1	0.000	0.000	20	1	130.0000
86	89	108	109	90	1	0.000	0.000	20	1	130.0000
87	90	109	110	91	1	0.000	0.000	20	1	130.0000
88	91	110	111	92	1	0.000	0.000	20	1	130.0000
89	92	111	112	93	1	0.000	0.000	20	1	130.0000
90	93	112	113	94	1	0.000	0.000	20	1	130.0000
91	94	113	114	95	1	0.000	0.000	20	1	130.0000
92	95	114	115	96	1	0.000	0.000	20	1	130.0000
93	96	115	116	97	1	0.000	0.000	20	1	130.0000
94	97	116	117	98	1	0.000	0.000	20	1	130.0000
95	98	117	118	99	1	0.000	0.000	20	1	130.0000
96	99	118	119	100	1	0.000	0.000	20	1	130.0000
97	100	119	120	101	1	0.000	0.000	20	1	130.0000
98	101	120	121	102	1	0.000	0.000	20	1	130.0000
99	102	121	122	103	1	0.000	0.000	20	1	130.0000
100	103	122	123	104	1	0.000	0.000	20	1	130.0000
101	104	123	124	105	1	0.000	0.000	20	1	130.0000
102	105	124	125	106	1	0.000	0.000	20	1	130.0000
103	106	125	126	107	1	0.000	0.000	20	1	130.0000
104	107	126	127	108	1	0.000	0.000	20	1	130.0000
105	108	127	128	109	1	0.000	0.000	20	1	130.0000
106	109	128	129	110	1	0.000	0.000	20	1	130.0000
107	110	129	130	111	1	0.000	0.000	20	1	130.0000
108	111	130	131	112	1	0.000	0.000	20	1	130.0000
109	112	131	132	113	1	0.000	0.000	20	1	130.0000
110	113	132	133	114	1	0.000	0.000	20	1	130.0000
111	114	133	134	115	1	0.000	0.000	20	1	130.0000
112	115	134	135	116	1	0.000	0.000	20	1	130.0000
113	116	135	136	117	1	0.000	0.000	20	1	130.0000
114	117	136	137	118	1	0.000	0.000	20	1	130.0000
115	118	137	138	119	1	0.000	0.000	20	1	130.0000
116	119	138	139	120	1	0.000	0.000	20	1	130.0000
117	120	139	140	121	1	0.000	0.000	20	1	130.0000
118	121	140	141	122	1	0.000	0.000	20	1	130.0000
119	122	141	142	123	1	0.000	0.000	20	1	130.0000
120	123	142	143	124	1	0.000	0.000	20	1	130.0000
121	124	143	144	125	1	0.000	0.000	20	1	130.0000
122	125	144	145	126	1	0.000	0.000	20	1	130.0000
123	126	145	146	127	1	0.000	0.000	20	1	130.0000
124	127	146	147	128	1	0.000	0.000	20	1	130.0000
125	128	147	148	129	1	0.000	0.000	20	1	130.0000
126	129	148	149	130	1	0.000	0.000	20	1	130.0000
127	130	149	150	131	1	0.000	0.000	20	1	130.0000
128	131	150	151	132	1	0.000	0.000	20	1	130.0000
129	132	151	152	133	1	0.000	0.000	20	1	130.0000
130	133	152	153	134	1	0.000	0.000	20	1	130.0000
131	134	153	154	135	1	0.000	0.000	20	1	130.0000
132	135	154	155	136	1	0.000	0.000	20	1	130.0000
133	136	155	156	137	1	0.000	0.000	20	1	130.0000
134	137	156	157	138	1	0.000	0.000	20	1	130.0000
135	138	157	158	139	1	0.000	0.000	20	1	130.0000
136	139	158	159	140	1	0.000	0.000	20	1	130.0000
137	140	159	160	141	1	0.000	0.000	20	1	130.0000
138	141	160	161	142	1	0.000	0.000	20	1	130.0000
139	142	161	162	143	1	0.000	0.000	20	1	130.0000
140	143	162	163	144	1	0.000	0.000	20	1	130.0000
141	144	163	164	145	1	0.000	0.000	20	1	130.0000
142	145	164	165	146	1	0.000	0.000	20	1	130.0000
143	146	165	166	147	1	0.000	0.000	20	1	130.0000
144	147	166	167	148	1	0.000	0.000	20	1	130.0000
145	148	167	168	149	1	0.000	0.000	20	1	130.0000
146	149	168	169	150	1	0.000	0.000	20	1	130.0000
147	150	169	170	151	1	0.000	0.000	20	1	130.0000
148	151	170	171	152	1	0.000	0.000	20	1	130.0000
149	152	171	172	153	1	0.000	0.000	20	1	130.0000
150	153	172	173	154	1	0.000	0.000	20	1	130.0000
151	154	173	174	155	1	0.000	0.000	20	1	130.0000
152	155	174	175	156	1	0.000	0.000	20	1	130.0000
153	156	175	176	157	1	0.000	0.000	20	1	130.0000
154	157	176	177	158	1	0.000	0.000	20	1	130.0000
155	158	177	178	159	1	0.000	0.000	20	1	130.0000
156	159	178	179	160	1	0.000	0.000	20	1	130.0000
157	160	179	180	161	1	0.000	0.000	20	1	130.0000
158	161	180	181	162	1	0.000	0.000	20	1	130.0000
159	162	181	182	163	1	0.000	0.000	20	1	130.0000
160	163	182	183	164	1	0.000	0.000	20	1	130.0000
161	164	183	184	165	1	0.000	0.000	20	1	130.0000
162	165	184	185	166	1	0.000	0.000	20	1	130.0000
163	166	185	186	167	1	0.000	0.000	20	1	130.0000
164	167	186	187	168	1	0.000	0.000	20	1	130.0000
165	168	187	188	169	1	0.000	0.000	20	1	130.0000
166	169	188	189	170	1	0.000	0.000	20	1	130.0000
167	170	189	190	171	1	0.000	0.000	20	1	130.0000
168	171	190	191	172	1	0.000	0.000	20	1	130.0000
169	172	191	192	173	1	0.000	0.000	20	1	130.0000
170	173	192	193	174	1	0.000	0.000	20	1	130.0000
171	174	193	194	175	1	0.000	0.000	20	1	130.0000
172	175	194	195	176	1	0.000	0.000	20	1	130.0000
173	176	195	196	177	1	0.000	0.000	20	1	130.0000
174	177	196	197	178	1	0.000	0.000	20	1	130.0000
175	178	197	198	179	1	0.000	0.000	20	1	130.0000
176	179	198	199	180	1	0.000	0.000	20	1	130.0000
177	180	199	200	181	1	0.000	0.000	20	1	130.0000
178	181	200	201	182	1	0.000	0.000	20	1	130.0000
179	182	201	202	183	1	0.000	0.000	20	1	130.0000
180	183	202	203	184	1	0.000	0.000	20	1	130.0000
181	184	203	204	185	1	0.000	0.000	20	1	130.0000
182	185	204	205	186	1	0.000	0.000	20	1	130.0000
183	186	205	206	187	1	0.000	0.000	20	1	130.0000
184	187	206	207	188	1	0.000	0.000	20	1	130.0000
185	188	207	208	189	1	0.000	0.000	20	1	130.0000
186	189	208	209	190	1	0.000	0.000	20	1	130.0000
187	190	209	210	191	1	0.000	0.000	20	1	130.0000

118	112	130	131	1	0.000	0.	16	1	130.0000
119	112	131	113	1	0.000	0.	16	1	130.0000
120	113	131	132	1	0.000	0.	16	1	130.0000
121	113	132	133	1	0.000	0.	16	1	130.0000
122	113	133	114	1	0.000	0.	16	1	130.0000
123	114	133	134	1	0.000	0.	16	1	130.0000
124	123	143	144	1	0.000	0.	20	1	130.0000
125	123	144	145	1	0.000	0.	20	1	130.0000
126	123	145	146	1	0.000	0.	20	1	130.0000
127	131	146	147	1	0.000	0.	20	1	130.0000
128	132	147	148	1	0.000	0.	20	1	130.0000
129	133	148	149	1	0.000	0.	20	1	130.0000
130	143	150	151	1	0.000	0.	20	1	130.0000
131	144	151	152	1	0.000	0.	20	1	130.0000
132	145	152	153	1	0.000	0.	20	1	130.0000
133	145	153	154	1	0.000	0.	20	1	130.0000
134	147	154	155	1	0.000	0.	20	1	130.0000
135	145	155	156	1	0.000	0.	20	1	130.0000
136	150	157	158	1	0.000	0.	20	1	130.0000
137	151	158	159	1	0.000	0.	20	1	130.0000
138	152	159	160	1	0.000	0.	20	1	130.0000
139	153	160	161	1	0.000	0.	20	1	130.0000
140	154	161	162	1	0.000	0.	20	1	130.0000
141	155	162	163	1	0.000	0.	20	1	130.0000

* PARAMETROS DO SISTEMA DE EQUACOES

NUMERO TOTAL DE EQUACOES.....	301
LARGURA DE BANDA.....	42
NUMERO DE EQUACOES POR BLOCO..	301
NUMERO DE BLOCOS.....	1

*CARGAS (ESTATICAS) OU MASSAS (DINAMICAS) MODAIS

VOZ	CRG1J	DIR. X	DIR. Y	DIR. Z	DIR. X	DIR. Y	DIR. Z
NUMERO	NUMERO	FORÇA	FORÇA	FORÇA	FORÇA	FORÇA	FORÇA
1	1	0.	0.	-11375E+06	0.	0.	0.

CONDICAO MULTIPLICADORES DE CARGAS NAO MODAIS

DE	CRG10.	A	B	C	D
1	1.000E+00	0.	0.	0.	0.

• DESLOCAMENTOS E ROTACÕES DOS NÓS •

NÚMERO DO NÓ	CÓDIGO ORIGEM	TRANSLACAO EM X	TRANSLACAO EM Y	TRANSLACAO EM Z	ROTACAO EM X	ROTACAO EM Y	ROTACAO EM Z
164	1	0.	0.	0.	0.	0.	0.
165	1	0.	0.	0.	0.	0.	0.
166	1	-82590E-03	0.	0.	0.	0.	0.
167	1	-13639E-02	0.	0.	0.	0.	0.
168	1	-13872E-02	0.	0.	0.	0.	0.
169	1	-54024E-03	0.	0.	0.	0.	0.
170	1	-93553E-03	0.	0.	0.	0.	0.
171	1	-32435E-02	0.	0.	0.	0.	0.
172	1	0.	0.	-70891E-02	0.	0.	0.
173	1	-97321E-03	0.	-73392E-02	0.	0.	0.
174	1	-17628E-02	0.	-80520E-02	0.	0.	0.
175	1	-19746E-02	0.	-92195E-02	0.	0.	0.
176	1	-13351E-02	0.	-10547E-01	0.	0.	0.
177	1	-19548E-03	0.	-11796E-01	0.	0.	0.
178	1	-21909E-02	0.	-11337E-01	0.	0.	0.
179	1	0.	0.	-14732E-01	0.	0.	0.
180	1	-13343E-02	0.	-13288E-01	0.	0.	0.
181	1	-25331E-02	0.	-16330E-01	0.	0.	0.
182	1	-33758E-02	0.	-13325E-01	0.	0.	0.
183	1	-38625E-02	0.	-2254E-01	0.	0.	0.
184	1	-36250E-02	0.	-25392E-01	0.	0.	0.
185	1	-11657E-02	0.	-27139E-01	0.	0.	0.
186	1	-20073E-01	0.	-28941E+00	0.	0.	0.
187	1	-17307E-01	0.	-30734E+00	0.	0.	0.
188	1	0.	0.	-31534E+00	0.	0.	0.
189	1	-10810E-01	0.	-21267E+00	0.	0.	0.
190	1	-27260E-01	0.	-23769E+00	0.	0.	0.
191	1	-24613E-01	0.	-23170E+00	0.	0.	0.
192	1	-14728E-01	0.	-31351E+00	0.	0.	0.
193	1	0.	0.	-32118E+00	0.	0.	0.
194	1	-0.	0.	-21832E-01	0.	0.	0.
195	1	-14404E-02	0.	-22774E-01	0.	0.	0.
196	1	-26433E-02	0.	-25231E-01	0.	0.	0.
197	1	-33392E-02	0.	-25333E-01	0.	0.	0.
198	1	-43644E-02	0.	-34301E-01	0.	0.	0.
199	1	-43355E-02	0.	-41375E-01	0.	0.	0.
200	1	-45785E-02	0.	-53575E-01	0.	0.	0.
201	1	-11804E-02	0.	-85937E-01	0.	0.	0.
202	1	-64121E-02	0.	-16537E+00	0.	0.	0.
203	1	-26511E-01	0.	-13378E+00	0.	0.	0.
204	1	-54461E-01	0.	-16298E+00	0.	0.	0.
205	1	-83227E-01	0.	-17437E+00	0.	0.	0.
206	1	-27556E-01	0.	-13307E+00	0.	0.	0.
207	1	-55650E-01	0.	-16577E+00	0.	0.	0.
208	1	-19831E-01	0.	-18737E+00	0.	0.	0.
209	1	-33930E-02	0.	-24315E+00	0.	0.	0.
210	1	-16757E-01	0.	-26438E+00	0.	0.	0.
211	1	-1243E-01	0.	-29736E+00	0.	0.	0.
212	1	-12309E-01	0.	-31942E+00	0.	0.	0.
213	1	0.	0.	-32746E+00	0.	0.	0.
214	1	0.	0.	-25578E-01	0.	0.	0.
215	1	-11709E-02	0.	-30212E-01	0.	0.	0.
216	1	-19709E-04	0.	-44071E-01	0.	0.	0.
217	1	-51535E-02	0.	-66761E-01	0.	0.	0.
218	1	-10732E-01	0.	-93919E-01	0.	0.	0.

109	1	-34972E-01	0.	-12312E+00	0.	C.	0.
108	1	-53997E-01	0.	-15443E+00	0.	C.	0.
107	1	-84654E-01	0.	-17099E+00	0.	C.	0.
106	1	-10575E+00	0.	-17513E+00	0.	C.	0.
105	1	-11502E+00	0.	-16958E+00	0.	C.	0.
104	1	-10921E+00	0.	-18243E+00	0.	C.	0.
103	1	-89109E-01	0.	-16301E+00	0.	C.	0.
102	1	-61241E-01	0.	-17550E+00	0.	C.	0.
101	1	-32109E-01	0.	-24241E+00	0.	C.	0.
100	1	-75774E-02	0.	-23556E+00	0.	C.	0.
99	1	-63702E-02	0.	-27122E+00	0.	C.	0.
98	1	-14234E-01	0.	-36315E+00	0.	C.	0.
97	1	-10295E-01	0.	-34615E+00	0.	C.	0.
96	1	0.	0.	-33468E+00	0.	C.	0.
95	1	0.	0.	-27275E-01	0.	C.	0.
94	1	-48550E-03	0.	-32355E-01	0.	C.	0.
93	1	-32576E-02	0.	-49431E-01	0.	C.	0.
92	1	-19547E-01	0.	-6091E-01	0.	C.	0.
91	1	-23770E-01	0.	-8408E-01	0.	C.	0.
90	1	-42743E-01	0.	-11903E+00	0.	C.	0.
89	1	-65771E-01	0.	-1234E+00	0.	C.	0.
88	1	-59110E-01	0.	-13358E+00	0.	C.	0.
87	1	-10743E+00	0.	-18665E+00	0.	C.	0.
86	1	-11509E+00	0.	-10838E+00	0.	C.	0.
85	1	-11103E+00	0.	-17022E+00	0.	C.	0.
84	1	-94455E-01	0.	-17552E+00	0.	C.	0.
83	1	-70164E-01	0.	-19129E+00	0.	C.	0.
82	1	-43412E-01	0.	-21490E+00	0.	C.	0.
81	1	-19031E-01	0.	-24507E+00	0.	C.	0.
80	1	-71845E-03	0.	-27838E+00	0.	C.	0.
79	1	-87793E-02	0.	-31062E+00	0.	C.	0.
78	1	-81465E-02	0.	-33560E+00	0.	C.	0.
77	1	0.	0.	-34530E+00	0.	C.	0.
76	1	0.	0.	-29334E-01	0.	C.	0.
75	1	-25077E-02	0.	-33347E-01	0.	C.	0.
74	1	-72857E-02	0.	-45700E-01	0.	C.	0.
73	1	-16234E-01	0.	-6458E-01	0.	C.	0.
72	1	-30333E-01	0.	-87990E-01	0.	C.	0.
71	1	-49282E-01	0.	-11206E+00	0.	C.	0.
70	1	-70364E-01	0.	-13371E+00	0.	C.	0.
69	1	-92692E-01	0.	-15038E+00	0.	C.	0.
68	1	-10827E+00	0.	-18157E+00	0.	C.	0.
67	1	-11502E+00	0.	-16396E+00	0.	C.	0.
66	1	-11213E+00	0.	-17358E+00	0.	C.	0.
65	1	-96402E-01	0.	-16638E+00	0.	C.	0.
64	1	-77644E-01	0.	-20297E+00	0.	C.	0.
63	1	-36601E-01	0.	-22348E+00	0.	C.	0.
62	1	-30336E-01	0.	-25373E+00	0.	C.	0.
61	1	-10453E-01	0.	-28372E+00	0.	C.	0.
60	1	-29134E-02	0.	-31723E+00	0.	C.	0.
59	1	-62177E-02	0.	-34907E+00	0.	C.	0.
58	1	0.	0.	-36927E+00	0.	C.	0.
57	1	0.	0.	-36172E-01	0.	C.	0.
56	1	-50931E-02	0.	-34065E-01	0.	C.	0.
55	1	-12100E-01	0.	-45095E-01	0.	C.	0.
54	1	-2545E-01	0.	-6191E-01	0.	C.	0.
53	1	-37131E-01	0.	-8320E-01	0.	C.	0.
52	1	-55337E-01	0.	-10545E+00	0.	C.	0.
51	1	-75391E-01	0.	-12628E+00	0.	C.	0.
50	1	-74267E-01	0.	-14337E+00	0.	C.	0.

49	1	-10851E+00	0.	-15783L+00	0.	0.
48	1	-11513E+00	0.	-16937E+00	0.	0.
47	1	-11285E+00	0.	-16983E+00	0.	0.
46	1	-10159E+00	0.	-19477E+00	0.	0.
45	1	-8421E-01	0.	-21295E+00	0.	0.
44	1	-6362E-01	0.	-23539E+00	0.	0.
43	1	-4254E-01	0.	-26304E+00	0.	0.
42	1	-2779E-01	0.	-29336E+00	0.	0.
41	1	-4377E-02	0.	-32905E+00	0.	0.
40	1	-4123E-02	0.	-36403E+00	0.	0.
39	1	0.	0.	-3200E+00	0.	0.
38	1	-8617E-02	0.	-31966E-01	0.	0.
37	1	-1050E-01	0.	-34307E-01	0.	0.
36	1	-3063E-01	0.	-43601E-01	0.	0.
35	1	-4540E-01	0.	-53315E-01	0.	0.
34	1	-5232E-01	0.	-76726E-01	0.	0.
33	1	-7952E-01	0.	-97719E-01	0.	0.
32	1	-9601E-01	0.	-11731E+00	0.	0.
31	1	-1779E+00	0.	-15625E+00	0.	0.
30	1	-1137E+00	0.	-15342E+00	0.	0.
29	1	-1127E+00	0.	-16945E+00	0.	0.
28	1	-1330E+00	0.	-19570E+00	0.	0.
27	1	-9295E-01	0.	-20369E+00	0.	0.
26	1	-5671E-01	0.	-22444E+00	0.	0.
25	1	-3946E-01	0.	-24919E+00	0.	0.
24	1	-2739E-01	0.	-27453E+00	0.	0.
23	1	-6017E-03	0.	-30333E+00	0.	0.
22	1	0.	0.	-3514E+00	0.	0.
21	1	0.	0.	-3532E+00	0.	0.
20	1	0.	0.	-4134E+00	0.	0.
19	1	0.	0.	-3659E-01	0.	0.
18	1	-1415E-01	0.	-33799E-01	0.	0.
17	1	-2852E-01	0.	-42158E-01	0.	0.
16	1	-4320E-01	0.	-52824E-01	0.	0.
15	1	-5694E-01	0.	-64955E-01	0.	0.
14	1	-7256E-01	0.	-83476E-01	0.	0.
13	1	-8553E-01	0.	-10276E+00	0.	0.
12	1	-9720E-01	0.	-12368E+00	0.	0.
11	1	-1533E+00	0.	-14371E+00	0.	0.
10	1	-1094E+00	0.	-1852E+00	0.	0.
9	1	-1089E+00	0.	-19198E+00	0.	0.
8	1	-1043E+00	0.	-21599E+00	0.	0.
7	1	-9610E-01	0.	-24745E+00	0.	0.
6	1	-8560E-01	0.	-26524E+00	0.	0.
5	1	-7394E-01	0.	-29743E+00	0.	0.
4	1	-6194E-01	0.	-31646E+00	0.	0.
3	1	-4962E-01	0.	-34651E+00	0.	0.
2	1	-3549E-01	0.	-36144E+00	0.	0.
1	1	0.	0.	-49241E+00	0.	0.

ELEMENTO (1)									
CRGTO. LUC	I11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	-0.3379E+02	-0.4248E+02	0.	-35107E+02	-1.6273E+02	-89554E+02	-53.29	82.82	
1 L-I	-0.7490E+02	-0.5744E+02	0.	-62404E+02	-85402E+01	-13430E+03	-47.69	130.06	
1 J-K	-0.2593E+02	-0.1864E+02	0.	-76636E+01	-11698E+02	-63529E+02	-61.57	58.92	
1 I-J	-0.5609E+02	-0.1605E+03	0.	-50055E+02	-41584E+02	-16589E+03	26.82	145.50	
1 K-L	-0.1018E+02	-0.5965E+01	0.	-24322E+02	-23533E+02	-27805E+02	54.16	41.55	
***** TENSÃO ADMISSIVEL ULTRAFASADA *****									
ELEMENTO (2)									
CRGTO. LUC	I11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	0.17449E+01	-0.12047E+02	0.	-45894E+01	-31233E+01	-13435E+02	-16.83	15.24	
1 L-I	-0.16357E+01	-0.75333E+01	0.	-46632E+01	-34287E+01	-89253E+01	-20.69	11.05	
1 J-K	-0.5821E-01	-0.18329E+02	0.	-70984E+01	-28712E+01	-17259E+02	-22.43	18.16	
1 I-J	-0.10372E+02	-0.50576E+01	0.	-30302E+01	-63527E+01	-11112E+02	79.82	15.35	
1 K-L	-0.11055E+02	-0.40264E+01	0.	-76619E+01	-33557E+01	-10245E+02	56.09	16.42	
***** TENSÃO ADMISSIVEL ULTRAFASADA *****									
ELEMENTO (3)									
CRGTO. LUC	I11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	-0.6107E+00	-0.18226E+01	0.	-30211E+01	-20346E+01	-41163E+01	-35.56	5.43	
1 L-I	-0.0083E-01	-0.26750E+01	0.	-36561E+01	-52552E+01	-23156E+01	5.45	6.87	
1 J-K	-0.10875E+01	-0.42751E+01	0.	-25834E+01	-23879E+01	-59296E+01	-32.59	5.82	
1 I-J	-0.18405E+01	-0.23655E+01	0.	-18366E+01	-19805E+01	-38645E+01	41.90	3.79	
1 K-L	-0.11791E+01	-0.20626E+00	0.	-44239E+01	-43817E+01	-44701E+01	43.55	7.67	
***** TENSÃO ADMISSIVEL ULTRAFASADA *****									
ELEMENTO (4)									
CRGTO. LUC	I11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	0.14430E+01	-0.55521E+01	0.	-34835E+01	-75425E+01	-54461E+01	-60.26	7.83	
1 L-I	0.17354E+01	-0.20928E+01	0.	-30302E+01	-10283E+02	-66126E+01	-70.49	5.57	
1 J-K	0.14132E+00	-0.35160E+01	0.	-31112E+01	-53879E+01	-17116E+01	-59.24	8.40	
1 I-J	-0.77134E+01	-0.13768E+01	0.	-24222E+01	-68445E+01	-30372E+01	23.89	6.70	
1 K-L	-0.7720E+01	-0.73450E-01	0.	-36178E+01	-83531E+01	-15057E+01	23.61	5.20	
***** TENSÃO ADMISSIVEL ULTRAFASADA *****									
ELEMENTO (5)									
CRGTO. LUC	I11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	0.19501E+01	-0.12247E+02	0.	-42527E+01	-13802E+02	-39528E+01	-76.09	13.61	
1 L-I	-0.24291E+01	-0.17008E+02	0.	-33440E+01	-17733E+02	-18988E+01	-77.68	16.55	
1 J-K	0.12792E+00	-0.94844E+01	0.	-33245E+01	-1031E+02	-76885E+01	-71.98	10.54	
1 I-J	-0.12480E+02	-0.16753E+01	0.	-28551E+01	-13212E+02	-94865E+01	14.09	12.76	
1 K-L	-0.13859E+02	-0.57384E+00	0.	-36739E+01	-14620E+02	-38706E+01	14.66	14.82	
***** TENSÃO ADMISSIVEL ULTRAFASADA *****									
ELEMENTO (6)									
CRGTO. LUC	I11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	-0.24477E+01	-0.18920E+02	0.	-48025E+01	-20218E+02	-11459E+01	-74.89	19.67	
1 L-I	0.33682E+01	-0.25441E+02	0.	-32759E+01	-25918E+02	-23892E+01	-81.73	24.60	
1 J-K	-0.6159E+00	-0.14710E+02	0.	-33157E+01	-15439E+02	-36756E+01	-77.60	15.63	
1 I-J	-0.19255E+02	-0.21491E+01	0.	-26128E+01	-15735E+02	-18952E+01	5.09	16.94	
1 K-L	-0.20402E+02	-0.90601E+00	0.	-36751E+01	-21073E+02	-22902E+01	10.34	20.96	
***** TENSÃO ADMISSIVEL ULTRAFASADA *****									
ELEMENTO (7)									
CRGTO. LUC	I11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	-0.24477E+01	-0.18920E+02	0.	-48025E+01	-20218E+02	-11459E+01	-74.89	19.67	
1 L-I	0.33682E+01	-0.25441E+02	0.	-32759E+01	-25918E+02	-23892E+01	-81.73	24.60	
1 J-K	-0.6159E+00	-0.14710E+02	0.	-33157E+01	-15439E+02	-36756E+01	-77.60	15.63	
1 I-J	-0.19255E+02	-0.21491E+01	0.	-26128E+01	-15735E+02	-18952E+01	5.09	16.94	
1 K-L	-0.20402E+02	-0.90601E+00	0.	-36751E+01	-21073E+02	-22902E+01	10.34	20.96	

ELEMENTO (14)	CRGTO. LUC	111	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
	1 CEN	-31887E+00	.12439E+02	0.	.33248E+01	.1295E+02	-.53814E+00	75.59	12.57
	1 L-I	-14373E+02	.14373E+02	0.	-.4333E+01	.15719E+02	-.37811E+00	72.80	15.53
	1 J-K	-5724E+00	.95612E+01	0.	-.4333E+01	-.1352E+01	-.1352E+01	68.32	15.02
	1 I-J	-12592E+02	-.15284E+00	0.	-.42249E+01	.1295E+02	-.11464E+01	-17.03	14.50
ELEMENTO (15)	CRGTO. LUC	111	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
	1 CEN	-31123E+00	.40726E+01	0.	.39515E+01	.6394E+01	-.2636E+01	55.51	8.05
	1 L-I	-33024E+00	.30743E+01	0.	.42726E+01	.6169E+01	-.27651E+01	53.90	7.56
	1 J-K	-3742E+00	.35869E+01	0.	.42717E+01	.6578E+01	-.25151E+01	55.02	6.13
	1 I-J	-40562E+01	-.27312E+00	0.	-.43964E+01	.6108E+01	-.25457E+01	-30.29	7.50
ELEMENTO (16)	CRGTO. LUC	111	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
	1 CEN	-83923E+00	.13228E+01	0.	.4054E+01	.15787E+01	-.664E+01	34.86	7.83
	1 L-I	-93902E+00	-.73641E+01	0.	.37304E+01	.7495E+00	-.9076E+01	24.63	5.48
	1 J-K	-31726E+00	-.20917E+01	0.	.37153E+01	.31542E+01	-.4728E+01	35.34	6.87
	1 I-J	-39935E+01	-.55169E+00	0.	-.30734E+01	.11727E+01	-.58201E+01	-55.29	6.49
ELEMENTO (17)	CRGTO. LUC	111	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
	1 CEN	-12274E+01	-.10413E+02	0.	.36779E+01	-.6377E+01	-.11704E+02	15.34	11.74
	1 L-I	-.2027E+01	-.15869E+02	0.	.28162E+01	-.14694E+01	-.1644E+02	11.14	15.75
	1 J-K	-4998E+00	-.86448E+01	0.	.23166E+01	.14544E+01	-.77993E+01	18.73	8.62
	1 I-J	-10595E+02	-.90152E+00	0.	-.20035E+01	-.5545E+00	-.11094E+02	-76.85	10.15
ELEMENTO (18)	CRGTO. LUC	111	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
	1 CEN	-14875E+01	-.15097E+02	0.	.29880E+01	-.8367E+01	-.15713E+02	11.74	15.31
	1 L-I	-27686E+01	-.21767E+02	0.	.17492E+01	-.2628E+01	-.21927E+02	5.22	20.74
	1 J-K	-44742E+00	-.10240E+02	0.	.17235E+01	.17986E+01	-.10483E+02	6.97	10.16
	1 I-J	-15435E+02	-.13380E+01	0.	-.8280E+00	-.9505E+00	-.15512E+02	-86.72	15.04
ELEMENTO (19)	CRGTO. LUC	111	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
	1 CEN	-14678E+01	-.17564E+02	0.	.20124E+01	-.12204E+01	-.17835E+02	7.01	17.26
	1 L-I	-31045E+01	-.24757E+02	0.	.56727E+00	-.3183E+01	-.24773E+02	1.56	23.35
	1 J-K	-40425E+00	-.11940E+02	0.	.57731E+00	.4325E+00	-.11967E+02	2.67	12.19
	1 I-J	-18003E+02	-.10359E+01	0.	.35937E+00	-.10359E+01	-.18010E+02	8.79	17.52
ELEMENTO (20)	CRGTO. LUC	111	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
	1 CEN	-18421E+02	-.36061E+00	0.	-.1507E+01	-.73077E+00	-.18343E+02	-85.07	17.99
	1 L-I	-38426E+02	-.73763E+01	0.	-.15007E+02	-.1308E+01	-.44494E+02	-67.99	43.85
	1 J-K	-.41024E+02	-.53265E+01	0.	-.18597E+02	.24780E+01	-.49321E+02	-66.41	51.60
	1 I-J	-.40001E+02	-.43054E+01	0.	-.61607E+01	-.32902E+01	-.41620E+02	-80.62	40.06
ELEMENTO (21)	CRGTO. LUC	111	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
	1 CEN	-13311E+02	-.58169E+02	0.	.18552E+02	-.76915E+01	-.63814E+02	18.15	60.14
	1 J-K	-.2455E+01	-.22734E+02	0.	.97382E+01	.51797E+01	-.2607E+02	18.84	25.40
	1 I-J	-.2455E+01	-.22734E+02	0.	.97382E+01	.51797E+01	-.2607E+02	18.84	25.40
	1 K-L	-.2455E+01	-.22734E+02	0.	.97382E+01	.51797E+01	-.2607E+02	18.84	25.40

CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGLO	T. EQUIV.
1 CEN	-13637E+02	-13477E+02	0.	-15328E+02	-17718E+01	-23825E+02	-45.15	25.81
1 L-I	-19746E+02	-19562E+02	0.	-20509E+02	-13593E+01	-39667E+02	-44.43	40.36
1 J-K	-14205E+02	-35330E+01	0.	-10437E+02	-25979E+01	-20535E+02	-58.75	22.19
1 I-J	-18005E+02	-20664E+02	0.	-19522E+02	-33595E+01	-43731E+02	37.74	42.14
1 K-L	-43414E+01	-27524E+01	0.	-12135E+02	-88170E+01	-15711E+02	46.87	21.36
ELEMENTO (21)								
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGLO	T. EQUIV.
1 CEN	-61515E+01	-47752E+01	0.	-83756E+01	-60558E+01	-11236E+02	-37.02	15.23
1 L-I	-21474E+01	-45513E+01	0.	-96223E+01	-64363E+01	-12931E+02	-41.73	17.09
1 J-K	-15953E+01	-23611E+01	0.	-75128E+01	-31218E+01	-57852E+01	-43.56	13.66
1 I-J	-35905E+01	-32112E+01	0.	-89478E+01	-75545E+01	-13428E+02	45.04	16.26
1 K-L	-10550E+01	-46311E+01	0.	-84169E+01	-76722E+01	-91713E+01	45.57	14.61
ELEMENTO (22)								
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGLO	T. EQUIV.
1 CEN	-22552E+01	-14875E+01	0.	-72514E+01	-91625E+01	-54202E+01	-45.49	12.77
1 L-I	-12871E+01	-38368E+01	0.	-79608E+01	-16330E+02	-55082E+01	-45.55	12.21
1 J-K	-72041E+01	-18344E+01	0.	-66344E+01	-71599E+01	-53513E+01	-47.39	11.57
1 I-J	-95715E+01	-95075E+01	0.	-70159E+01	-75545E+01	-85023E+01	43.24	12.19
1 K-L	-46710E+01	-17613E+01	0.	-75018E+01	-16852E+02	-44251E+01	39.51	13.62
ELEMENTO (23)								
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGLO	T. EQUIV.
1 CEN	-38254E+01	-66670E+01	0.	-72887E+01	-12672E+02	-21757E+01	-50.52	13.89
1 L-I	-32417E+01	-10269E+02	0.	-74279E+01	-14573E+02	-14618E+01	-57.66	15.75
1 J-K	-20163E+01	-53932E+01	0.	-65063E+01	-16744E+02	-28342E+01	-53.30	12.41
1 I-J	-4114E+01	-26451E+01	0.	-65109E+01	-11166E+02	-25051E+01	36.14	12.61
1 K-L	-96555E+01	-26887E+01	0.	-73203E+01	-14265E+02	-19401E+01	32.31	15.33
ELEMENTO (24)								
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGLO	T. EQUIV.
1 CEN	-44570E+01	-18141E+02	0.	-71108E+01	-15660E+02	-50521E+01	-57.57	15.68
1 L-I	-42555E+01	-19801E+02	0.	-6821E+01	-1870E+02	-10859E+01	-65.10	16.45
1 J-K	-42099E+01	-93521E+01	0.	-60755E+01	-12659E+02	-10844E+01	-59.80	15.47
1 I-J	-11035E+02	-31759E+01	0.	-59061E+01	-14177E+02	-63478E+01	26.02	14.21
1 K-L	-13731E+02	-31737E+01	0.	-68520E+01	-17295E+02	-18959E+02	26.01	17.39
ELEMENTO (25)								
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGLO	T. EQUIV.
1 CEN	-45932E+01	-14910E+02	0.	-61745E+01	-17768E+02	-17351E+01	-65.03	16.97
1 L-I	-20376E+01	-20376E+02	0.	-54413E+01	-22094E+02	-31420E+01	-72.48	20.70
1 J-K	-25355E+01	-12066E+02	0.	-48562E+01	-14132E+02	-46623E+00	-67.11	13.91
1 I-J	-14959E+02	-34614E+01	0.	-45424E+01	-16537E+02	-18334E+01	15.16	15.65
1 K-L	-17230E+02	-33564E+01	0.	-57019E+01	-15273E+02	-13137E+01	15.71	16.65
ELEMENTO (26)								
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGLO	T. EQUIV.
1 CEN	-3228E+01	-17570E+02	0.	-42395E+01	-18503E+02	-30900E+01	-73.79	17.56
1 L-I	-1470E+01	-23518E+02	0.	-31720E+01	-27051E+02	-46155E+01	-80.47	22.11
1 J-K	-2430E+01	-13844E+02	0.	-26839E+01	-17515E+02	-17515E+01	-76.59	13.74
1 I-J	-1730E+02	-35384E+01	0.	-23502E+01	-18255E+02	-31631E+01	5.67	16.50
1 K-L	-15184E+02	-33834E+01	0.	-30469E+01	-15885E+02	-25623E+01	12.39	16.83
ELEMENTO (27)								
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGLO	T. EQUIV.
1 CEN	-5795E+01	-19054E+02	0.	-16251E+01	-15266E+02	-36250E+01	-83.59	17.73
1 L-I	-2158E+01	-24755E+02	0.	-25547E+01	-27358E+02	-5445E+01	-83.59	17.73

1	K-L	-02389E+01	-45705E+00	0.	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
ELEMENTO (33)										
CRGTO. LUC										
1	CLN	-16625E+01	-70163E+01	0.	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-19201E+01	-10873E+02	0.			-41613E+00	-90965E+01	27.87	5.31
1	J-K	-25076E+00	-49111E+01	0.			-60187E+02	-12191E+02	15.71	11.50
1	I-J	-70011E+01	-67080E+00	0.			-13553E+01	-65172E+01	26.85	7.29
1	K-L	-05346E+01	-10546E+01	0.			-36917E+00	-80616E+01	-69.26	8.26
ELEMENTO (33)										
CRGTO. LUC										
1	CLN	-16706E+01	-88675E+01	0.	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-24224E+01	-12731E+02	0.			-12454E+01	-52925E+01	13.29	8.74
1	J-K	-24689E+00	-60402E+01	0.			-22744E+01	-12675E+02	6.73	11.51
1	I-J	-90228E+01	-11633E+01	0.			-34083E+00	-62402E+01	10.62	6.07
1	K-L	-25727E+01	-13110E+01	0.			-11325E+01	-90534E+01	-82.43	6.54
ELEMENTO (33)										
CRGTO. LUC										
1	CLN	-24234E+02	-74974E+00	0.	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-25486E+02	-77161E+01	0.			-13277E+01	-26355E+02	-74.10	27.05
1	J-K	-25269E+02	-69615E+00	0.			-17644E+01	-27347E+02	-75.35	26.28
1	I-J	-25013E+01	-30253E+02	0.			-11412E+01	-25714E+02	-82.60	26.20
1	K-L	-27300E+01	-23034E+02	0.			-44405E+00	-32316E+02	14.72	32.10
ELEMENTO (33)										
CRGTO. LUC										
1	CLN	-12783E+02	-33450E+01	0.	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-15560E+02	-37134E+01	0.			-42935E+01	-20667E+02	-56.34	23.14
1	J-K	-14304E+02	-55777E+00	0.			-52172E+01	-24595E+02	-56.68	27.64
1	I-J	-22889E+01	-22562E+02	0.			-3516E+01	-17656E+02	-66.96	15.87
1	K-L	-29402E+01	-67549E+01	0.			-92157E+00	-29782E+02	25.02	30.27
ELEMENTO (33)										
CRGTO. LUC										
1	CLN	-29815E+01	-20278E+01	0.	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-24297E+01	-34546E+01	0.			-73278E+01	-13137E+02	-45.22	17.56
1	J-K	-41771E+01	-10192E+01	0.			-76739E+01	-16551E+02	-47.34	21.45
1	I-J	-47599E+01	-89054E+01	0.			-71448E+01	-10303E+02	-53.66	15.19
1	K-L	-22302E+01	-223557E+00	0.			-45110E+01	-18556E+02	35.89	21.44
ELEMENTO (40)										
CRGTO. LUC										
1	CLN	-41242E+01	-59563E+00	0.	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-21531E+00	-17753E+01	0.			-10051E+02	-73315E+01	-42.48	15.12
1	J-K	-09018E+00	-23959E+01	0.			-10846E+02	-85531E+01	-46.86	16.64
1	I-J	-31307E+00	-94157E+00	0.			-9704E+01	-62804E+01	-46.14	11.64
1	K-L	-44665E+01	-22287E+01	0.			-35983E+01	-96153E+01	44.00	15.58
ELEMENTO (41)										
CRGTO. LUC										
1	CLN	-40460E+01	-38029E+01	0.	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-29017E+01	-61411E+01	0.			-12008E+02	-41555E+01	-44.57	14.54
1	J-K	-24154E+01	-44041E+01	0.			-12343E+02	-43051E+01	-50.29	15.93
1	I-J	-32670E+01	-13928E+01	0.			-10862E+02	-40421E+01	-48.83	11.35
1	K-L	-72393E+01	-32550E+01	0.			-14626E+02	-53023E+01	42.52	11.49
ELEMENTO (42)										
CRGTO. LUC										
1	CLN	-40460E+01	-38029E+01	0.	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-29017E+01	-61411E+01	0.			-12008E+02	-41555E+01	-44.57	14.54
1	J-K	-24154E+01	-44041E+01	0.			-12343E+02	-43051E+01	-50.29	15.93
1	I-J	-32670E+01	-13928E+01	0.			-10862E+02	-40421E+01	-48.83	11.35
1	K-L	-72393E+01	-32550E+01	0.			-14626E+02	-53023E+01	42.52	11.49

ELEMENTO (42)									
CRGTO. LUC	I11	I22	I33	I12	T-PAX	T-PIN	ANGLO	I. EQUIV.	
1 GEN	.45950E+01	.65241E+01	0.	-.73472E+01	.12570E+02	-.18506E+01	-48.74	12.59	
1 L-I	.38850E+01	.97537E+01	0.	-.75436E+01	.14914E+02	-.12749E+01	-55.63	15.59	
1 J-K	.28287E+01	.60281E+01	0.	-.66531E+01	.11324E+02	-.23777E+01	-51.82	12.68	
1 I-J	.82459E+01	.30217E+01	0.	.68735E+01	.11495E+02	-.22316E+01	38.21	12.76	
1 K-L	.95265E+01	.34442E+01	0.	.74248E+01	.14513E+02	-.15416E+01	33.87	15.34	
ELEMENTO (43)									
CRGTO. LUC	I11	I22	I33	I12	T-PAX	T-PIN	ANGLO	I. EQUIV.	
1 GEN	.43198E+01	.86217E+01	0.	-.59256E+01	.12778E+02	.16383E+01	-54.97	12.70	
1 L-I	.41334E+01	.12514E+02	0.	-.57807E+01	.15463E+02	-.11840E+01	-62.97	14.51	
1 J-K	.25239E+01	.71225E+01	0.	-.51947E+01	.10534E+02	-.78762E+01	-56.71	10.55	
1 I-J	.35468E+01	.31697E+01	0.	.48855E+01	.11417E+02	.29927E+01	30.54	11.27	
1 K-L	.10991E+02	.31752E+01	0.	.50201E+01	.14264E+02	-.94101E+01	26.50	14.31	
ELEMENTO (44)									
CRGTO. LUC	I11	I22	I33	I12	T-PAX	T-PIN	ANGLO	I. EQUIV.	
1 GEN	.36638E+01	.10386E+02	0.	-.37484E+01	.11811E+02	-.19351E+01	-65.29	10.57	
1 L-I	.40733E+01	.14301E+02	0.	-.32808E+01	.15266E+02	.31082E+01	-73.64	13.57	
1 J-K	.21294E+01	.75729E+01	0.	-.30019E+01	.85131E+01	.84911E+01	-65.94	8.52	
1 I-J	.10201E+02	.29537E+01	0.	.23773E+01	.10505E+02	.22446E+01	18.62	5.58	
1 K-L	.11555E+02	.27909E+01	0.	.38558E+01	.13010E+02	.13359E+01	20.67	12.40	
ELEMENTO (45)									
CRGTO. LUC	I11	I22	I33	I12	T-PAX	T-PIN	ANGLO	I. EQUIV.	
1 GEN	.29528E+01	.10963E+02	0.	-.10700E+01	.11090E+02	.28058E+01	-82.89	5.99	
1 L-I	.39174E+01	.15008E+02	0.	-.29206E+01	.15016E+02	.39078E+01	-88.43	13.19	
1 J-K	.15683E+01	.75507E+01	0.	.31865E+01	.77073E+01	.18511E+01	-88.93	8.57	
1 I-J	.11244E+02	.27335E+01	0.	-.51012E+01	.11274E+02	.26734E+01	-3.41	10.20	
1 K-L	.11327E+02	.25179E+01	0.	.11064E+01	.11464E+02	.23810E+01	7.05	10.48	
ELEMENTO (46)									
CRGTO. LUC	I11	I22	I33	I12	T-PAX	T-PIN	ANGLO	I. EQUIV.	
1 GEN	.22963E+01	.11253E+02	0.	-.18654E+01	.11866E+02	.19233E+01	78.72	10.83	
1 L-I	.37253E+01	.14663E+02	0.	.24150E+01	.15289E+02	.30410E+01	76.32	14.02	
1 J-K	.17252E+01	.77063E+01	0.	.24555E+01	.85935E+01	.90755E+01	70.14	8.18	
1 I-J	.11714E+02	.26282E+01	0.	.33439E+01	.12811E+02	.15283E+01	-18.18	12.12	
1 K-L	.10460E+02	.23761E+01	0.	-.18540E+01	.10889E+02	.19490E+01	-12.53	10.06	
ELEMENTO (47)									
CRGTO. LUC	I11	I22	I33	I12	T-PAX	T-PIN	ANGLO	I. EQUIV.	
1 GEN	.17724E+01	.11032E+02	0.	.45322E+01	.12881E+02	-.76689E+01	87.61	12.52	
1 L-I	.34598E+01	.13139E+02	0.	.56323E+01	.15726E+02	.87352E+01	65.34	15.31	
1 J-K	.19147E+01	.76187E+01	0.	.49262E+01	.10482E+02	-.94889E+01	55.97	10.99	
1 I-J	.11552E+02	.26736E+01	0.	-.57255E+01	.14379E+02	.15336E+01	-26.17	14.46	
1 K-L	.90289E+01	.22946E+01	0.	-.47639E+01	.11540E+02	-.15694E+01	-27.25	11.62	
ELEMENTO (48)									
CRGTO. LUC	I11	I22	I33	I12	T-PAX	T-PIN	ANGLO	I. EQUIV.	
1 GEN	.13083E+01	.13068E+02	0.	.66392E+01	.13642E+02	-.22265E+01	81.71	14.90	
1 L-I	.30590E+01	.10745E+02	0.	.78115E+01	.15608E+02	-.18037E+01	58.10	16.58	
1 J-K	.20700E+01	.72126E+01	0.	.68567E+01	.11554E+02	-.26817E+01	55.28	13.51	
1 I-J	.10445E+02	.27297E+01	0.	-.74730E+01	.11424E+02	-.17696E+01	-31.05	16.10	
1 K-L	.72173E+01	.21624E+01	0.	-.70578E+01	.12224E+02	-.28445E+01	-35.20	13.87	
ELEMENTO (49)									
CRGTO. LUC	I11	I22	I33	I12	T-PAX	T-PIN	ANGLO	I. EQUIV.	
1 GEN	.86133E+00	.63156E+01	0.	-.79756E+01	.13395E+02	-.42139E+01	57.53	15.93	
1 L-I	.25110E+01	.70213E+01	0.	.91040E+01	.14522E+02	-.43696E+01	52.84	17.14	

1 J-K	-21235E+01	-62371E+01	0.	-79829E+01	-12824E+02	--40633E+01	52.22	14.88
1 I-J	-56732E+01	-26317E+01	0.	-83756E+01	-14797E+02	--31819E+01	-34.76	16.53
1 K-L	-46949E+01	-19419E+01	0.	-85560E+01	-12140E+02	--53035E+01	-40.13	15.49
ELEMENTO (50)								
CRGTO. LUC	111	T22		T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1 CEN	-47034E+00	-59301E+01	0.	-83954E+01	-11563E+02	--56624E+01	53.85	15.59
1 L-I	-13736E+01	-40618E+01	0.	-93477E+01	-12388E+02	--64327E+01	46.31	16.57
1 J-K	-20342E+01	-45641E+01	0.	-82034E+01	-11599E+02	--50011E+01	45.58	14.75
1 I-J	-3452E+01	-23460E+01	0.	-84075E+01	-12568E+02	--42952E+01	-36.31	15.59
1 K-L	-22427E+01	-16630E+01	0.	-90272E+01	-10366E+02	--70779E+01	-44.08	15.77
ELEMENTO (51)								
CRGTO. LUC	111	T22		T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1 CEN	-15543E+00	-28721E+01	0.	-77897E+01	-94253E+01	--63678E+01	45.93	13.78
1 L-I	-12544E+01	-48338E+00	0.	-84708E+01	-9336E+01	--76155E+01	43.70	14.72
1 J-K	-17635E+01	-23744E+01	0.	-74155E+01	-9503E+01	--53423E+01	46.14	13.02
1 I-J	-32711E+01	-19577E+01	0.	-75040E+01	-10161E+02	--49064E+01	-42.45	13.31
1 K-L	-43702E+00	-12581E+01	0.	-82855E+01	-81285E+01	--79166E+01	-47.92	14.43
ELEMENTO (52)								
CRGTO. LUC	111	T22		T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1 CEN	-11972E+00	-53742E+00	0.	-62248E+01	-61597E+01	--62863E+01	45.26	10.78
1 L-I	-2907E+00	-26362E+01	0.	-66235E+01	-57813E+01	--78665E+01	36.29	11.85
1 J-K	-13330E+01	-24216E+00	0.	-57165E+01	-65312E+01	--49540E+01	42.27	5.98
1 I-J	-31050E+00	-14677E+01	0.	-57182E+01	-66351E+01	--48569E+01	-47.89	5.99
1 K-L	-25722E+01	-65646E+00	0.	-65605E+01	-57481E+01	--77637E+01	-52.08	11.76
ELEMENTO (53)								
CRGTO. LUC	111	T22		T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1 CEN	-35054E+00	-22948E+01	0.	-40533E+01	-28456E+01	--54855E+01	38.29	7.35
1 L-I	-20825E+00	-43991E+01	0.	-41640E+01	-22886E+01	--73310E+01	30.30	8.66
1 J-K	-7939E+00	-13351E+01	0.	-35394E+01	-34251E+01	--39682E+01	36.63	6.41
1 I-J	-21345E+01	-73722E+00	0.	-33793E+01	-3078E+01	--43553E+01	-56.69	6.41
1 K-L	-40466E+01	-87459E+01	0.	-42850E+01	-27816E+01	--67407E+01	-57.67	8.48
ELEMENTO (54)								
CRGTO. LUC	111	T22		T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1 CEN	-53314E+00	-37150E+01	0.	-16136E+01	-31094E+00	--43651E+01	21.82	4.53
1 L-I	-56872E+00	-60739E+01	0.	-14183E+01	-32115E+01	--64214E+01	13.81	6.27
1 J-K	-42641E+00	-21626E+01	0.	-11529E+01	-8522E+00	--26264E+01	-21.33	3.17
1 I-J	-37597E+01	-10767E+00	0.	-82028E+00	-31251E+00	--39243E+01	-72.66	4.10
1 K-L	-44154E+01	-13076E+00	0.	-17735E+01	-51590E+00	--50524E+01	-70.27	5.34
ELEMENTO (55)								
CRGTO. LUC	111	T22		T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1 CEN	-15708E+02	-28494E+01	0.	-46125E+01	-35326E+01	--16791E+02	-76.78	15.06
1 L-I	-15465E+02	-31614E+01	0.	-37758E+01	-3842E+01	--17168E+02	-75.47	15.39
1 J-K	-16283E+02	-38118E+01	0.	-21912E+01	-4049E+01	--16515E+02	-23.85	16.87
1 I-J	-20206E+01	-13479E+02	0.	-49255E+01	-31470E+01	--19605E+02	12.86	21.35
1 K-L	-46442E+01	-13963E+02	0.	-11655E+01	-47282E+01	--13979E+02	3.65	16.44
ELEMENTO (56)								
CRGTO. LUC	111	T22		T12	T-PAX	T-PIN	ANGULO	T. EQUIV.
1 CEN	-96066E+01	-12617E+01	0.	-80971E+01	-5565E+01	--13971E+02	-62.51	17.42
1 L-I	-11319E+02	-14105E+01	0.	-87782E+01	-56838E+01	--15792E+02	-62.98	15.41
1 J-K	-10703E+02	-3007E+01	0.	-55016E+01	-54792E+01	--12574E+02	-71.22	16.03
1 I-J	-47604E+00	-15337E+02	0.	-69536E+01	-37312E+01	--19544E+02	25.16	21.65
1 K-L	-52687E+01	-62611E+01	0.	-56052E+01	-75427E+01	--85372E+01	22.10	13.93
ELEMENTO (57)								

ELEMENTO (57)				ELEMENTO (57)			
CRGTO. LUC	I11	I22	I33	I12	I-PAX	I-PIN	ANGULO I- EQUIV.
1 CEN	-28944E+01	.61057E+00	0.	-87421E+01	-78943E+02	-99781E+01	-50.93
1 L-I	-47914E+01	.64719E+00	0.	-98558E+01	-82791E+01	-12221E+02	-52.58
1 J-K	-40293E+01	.35679E+01	0.	-68200E+01	-76632E+01	-81241E+01	-55.38
1 I-J	-78141E+00	-79547E+01	0.	.93181E+01	-5580E+01	-14691E+02	11.41
1 K-L	.50543E+01	-49569E+00	0.	.72919E+01	-1008E+02	-55193E+01	34.57

ELEMENTO (58)				ELEMENTO (58)			
CRGTO. LUC	I11	I22	I33	I12	I-PAX	I-PIN	ANGULO I- EQUIV.
1 CEN	.16318E+01	.16975E+01	0.	-82263E+01	-98509E+01	-65618E+01	-45.11
1 L-I	-58216E+01	.21903E+01	0.	-91379E+01	-10237E+02	-81601E+01	-42.51
1 J-K	.43190E+01	.39401E+01	0.	-71166E+01	-5882E+01	-52112E+01	-51.86
1 I-J	.54167E+00	-17340E+01	0.	.68378E+01	-63711E+01	-94634E+01	41.17
1 K-L	.54254E+01	.25251E+01	0.	.75393E+01	-11572E+02	-3221E+01	35.19

ELEMENTO (59)				ELEMENTO (59)			
CRGTO. LUC	I11	I22	I33	I12	I-PAX	I-PIN	ANGULO I- EQUIV.
1 CEN	.5594E+01	.31113E+01	0.	-74520E+01	-1052E+02	-4151E+01	-44.09
1 L-I	.22684E+01	.43623E+01	0.	-20581E+01	-1144E+02	-48102E+01	-42.70
1 J-K	.22967E+01	.44540E+01	0.	-88740E+01	-10339E+02	-35785E+01	-45.48
1 I-J	.2508E+01	.15544E+01	0.	.76519E+01	-96769E+01	-56596E+01	43.13
1 K-L	.02345E+01	.30951E+01	0.	.72358E+01	-12101E+02	-27172E+01	32.79

ELEMENTO (60)				ELEMENTO (60)			
CRGTO. LUC	I11	I22	I33	I12	I-PAX	I-PIN	ANGULO I- EQUIV.
1 CEN	.37854E+01	.41020E+01	0.	-64649E+01	-10331E+02	-24433E+01	-45.71
1 L-I	.27311E+01	.61064E+01	0.	-66601E+01	-11357E+02	-23272E+01	-51.71
1 J-K	.24593E+01	.44234E+01	0.	-59118E+01	-9434E+02	-25513E+01	-45.72
1 I-J	.3710E+01	.24009E+01	0.	.60870E+01	-52225E+01	-30308E+01	41.74
1 K-L	.57213E+01	.26613E+01	0.	.64052E+01	-11485E+02	-19020E+01	36.62

ELEMENTO (61)				ELEMENTO (61)			
CRGTO. LUC	I11	I22	I33	I12	I-PAX	I-PIN	ANGULO I- EQUIV.
1 CEN	.31455E+01	.43732E+01	0.	-47029E+01	-85021E+01	-98359E+01	-48.72
1 L-I	.29036E+01	.72008E+01	0.	-47718E+01	-10285E+02	-18092E+01	-57.12
1 J-K	.18446E+01	.34167E+01	0.	-43055E+01	-70124E+01	-17491E+01	-50.18
1 I-J	.42935E+01	.21807E+01	0.	.38596E+01	-72752E+01	-80422E+01	37.43
1 K-L	.53290E+01	.22370E+01	0.	.51150E+01	-97520E+01	-12260E+01	34.10

ELEMENTO (62)				ELEMENTO (62)			
CRGTO. LUC	I11	I22	I33	I12	I-PAX	I-PIN	ANGULO I- EQUIV.
1 CEN	.22675E+01	.51981E+01	0.	-26572E+01	-60595E+01	-40570E+01	-54.93
1 L-I	.25790E+01	.77100E+01	0.	-23556E+01	-87832E+01	-16057E+01	-67.25
1 J-K	.10723E+01	.19718E+01	0.	-23329E+01	-35176E+01	-27342E+01	-50.41
1 I-J	.43223E+01	.16751E+01	0.	.13836E+01	-45135E+01	-10838E+01	23.14
1 K-L	.53517E+01	.15521E+01	0.	.34860E+01	-74442E+01	-51042E+01	30.61

ELEMENTO (63)				ELEMENTO (63)			
CRGTO. LUC	I11	I22	I33	I12	I-PAX	I-PIN	ANGULO I- EQUIV.
1 CEN	.15502E+01	.41878E+01	0.	-46157E+00	.42662E+01	-14718E+01	-20.36
1 L-I	.25039E+01	.78665E+01	0.	-22120E+00	.78777E+01	-24948E+01	-27.64
1 J-K	.00906E+01	.10903E+01	0.	-22355E+00	.11816E+01	-51458E+01	-68.28
1 I-J	.44619E+01	.12945E+01	0.	-10708E+01	.47899E+01	-96650E+01	-17.03
1 K-L	.45522E+01	.11275E+01	0.	.15132E+01	-51150E+01	-60450E+01	21.07

ELEMENTO (64)				ELEMENTO (64)			
CRGTO. LUC	I11	I22	I33	I12	I-PAX	I-PIN	ANGULO I- EQUIV.
1 CEN	.11300E+01	.47994E+01	0.	.16400E+01	.54256E+01	-50438E+01	65.10
1 L-I	.23115E+01	.78733E+01	0.	.20838E+01	.87555E+01	-16853E+01	71.38
1 J-K	.01031E+01	.15333E+01	0.	.16027E+01	.28349E+01	-78553E+01	52.14

7.12
4.05-25.19
-12.87-36104E+00
-87953E+00-65279E+01
-44136E+01-31035E+01
-76724E+00-13729E+01
-10548E+01-51940E+01
-42364E+01ELEMENTO (65)
CRGTO. LUCI11
I12
I13

T22

I12
I13I-PAX
I-PIN

I-PIN

ANGULO

I. ECLIV.

11.52
12.65
10.57
12.43
10.7456.66
55.68
53.41
33.02
37.36-22832E+01
-20161E+01
-25251E+01
-18234E+01
-20040E+01-10208E+02
-11520E+02
-90748E+01
-11415E+02
-90630E+01-54458E+01
-62452E+01
-55516E+01
-60404E+01
-57236E+01-70206E+01
-72607E+01
-49540E+01
-21071E+01
-15551E+01I11
I12ELEMENTO (66)
CRGTO. LUCI11
I12

T22

I12
I13I-PAX
I-PIN

I-PIN

ANGULO

I. ECLIV.

13.75
14.53
13.08
13.94
13.7157.70
56.36
53.03
34.41
40.25-24151E+01
-38226E+01
-11876E+02
-23252E+01
-45445E+01-11725E+02
-12240E+02
-11765E+02
-12627E+02
-10862E+02-68330E+01
-72477E+01
-68833E+01
-69710E+01
-75578E+01-74019E+01
-62455E+01
-60945E+01
-24455E+01
-19877E+01I11
I12ELEMENTO (67)
CRGTO. LUCI11
I12

T22

I12
I13I-PAX
I-PIN

I-PIN

ANGULO

I. ECLIV.

14.58
15.18
14.10
14.23
15.0855.26
49.10
51.38
26.60
43.06-42624E+01
-51611E+01
-34507E+01
-20549E+01
-57029E+01-11973E+02
-11824E+02
-12624E+02
-12854E+02
-11392E+02-76023E+01
-84576E+01
-75654E+01
-73854E+01
-85275E+01-67012E+01
-46010E+01
-59804E+01
-26347E+01
-22518E+01I11
I12ELEMENTO (68)
CRGTO. LUCI11
I12

T22

I12
I13I-PAX
I-PIN

I-PIN

ANGULO

I. ECLIV.

13.55
14.12
13.13
12.57
14.2651.59
45.44
46.47
39.57
46.30-45180E+01
-56540E+01
-35473E+01
-30931E+01
-59741E+01-10717E+02
-10419E+02
-10977E+02
-1143E+02
-10322E+02-73920E+01
-60355E+01
-72186E+01
-70068E+01
-81356E+01-49369E+01
-25071E+01
-49043E+01
-27817E+01
-25444E+01I11
I12ELEMENTO (69)
CRGTO. LUCI11
I12

T22

I12
I13I-PAX
I-PIN

I-PIN

ANGULO

I. ECLIV.

10.62
11.30
10.13
10.06
11.3746.12
41.36
45.01
44.62
49.44-39567E+01
-52053E+01
-28971E+01
-25870E+01
-53752E+01-80264E+01
-77613E+01
-63741E+01
-93033E+01
-78555E+01-59795E+01
-6410E+01
-56324E+01
-55512E+01
-64520E+01-27364E+01
-45627E+01
-27434E+01
-25944E+01
-21633E+01I11
I12ELEMENTO (70)
CRGTO. LUCI11
I12

T22

I12
I13I-PAX
I-PIN

I-PIN

ANGULO

I. ECLIV.

6.62
7.46
6.40
6.25
7.5743.29
35.76
40.94
50.71
53.53-28054E+01
-40643E+01
-17586E+01
-17445E+01
-39350E+01-45018E+01
-45635E+01
-5369E+01
-53401E+01
-47674E+01-38787E+01
-40559E+01
-35128E+01
-34018E+01
-41691E+01-84400E+00
-11035E+01
-12881E+01
-24136E+01
-17061E+01I11
I12ELEMENTO (71)
CRGTO. LUCI11
I12

T22

I12
I13I-PAX
I-PIN

I-PIN

ANGULO

I. ECLIV.

6.62
7.46
6.40
6.25
7.5743.29
35.76
40.94
50.71
53.53-28054E+01
-40643E+01
-17586E+01
-17445E+01
-39350E+01-45018E+01
-45635E+01
-5369E+01
-53401E+01
-47674E+01-38787E+01
-40559E+01
-35128E+01
-34018E+01
-41691E+01-84400E+00
-11035E+01
-12881E+01
-24136E+01
-17061E+01I11
I12ELEMENTO (72)
CRGTO. LUCI11
I12

T22

I12
I13I-PAX
I-PIN

I-PIN

ANGULO

I. ECLIV.

6.62
7.46
6.40
6.25
7.5743.29
35.76
40.94
50.71
53.53-28054E+01
-40643E+01
-17586E+01
-17445E+01
-39350E+01-45018E+01
-45635E+01
-5369E+01
-53401E+01
-47674E+01-38787E+01
-40559E+01
-35128E+01
-34018E+01
-41691E+01-84400E+00
-11035E+01
-12881E+01
-24136E+01
-17061E+01I11
I12ELEMENTO (73)
CRGTO. LUCI11
I12

T22

I12
I13I-PAX
I-PIN

I-PIN

ANGULO

I. ECLIV.

CRGTO. LUC		T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	.13787E+01	.-40527E+00	0.	.14651E+01	.22020E+01	-.12225E+01	29.33	3.01
1	L-I	.12503E+01	.-19251E+01	0.	.13970E+01	.17857E+01	-.24545E+01	26.61	3.69
1	J-K	.19329E+01	.87277E+00	0.	.11228E+01	.26013E+01	-.19570E+00	25.27	2.70
1	I-J	.-39176E+00	.18338E+01	0.	.-94503E+00	.21602E+01	-.74420E+00	-85.87	2.63
1	K-L	.-10314E+01	.15663E+01	0.	.-16359E+01	.23500E+01	-.18392E+01	-64.30	3.64
ELEMENTO (73)									
CRGTO. LUC		T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	.-10218E+02	.55043E+01	0.	.-32459E+01	.55728E+01	-.10887E+02	-72.51	14.81
1	L-I	.-10785E+02	.53520E+01	0.	.-23287E+01	.56808E+01	-.11114E+02	-81.95	14.80
1	J-K	.-10772E+02	.61111E+01	0.	.-15822E+01	.65313E+01	-.10707E+02	-84.88	14.85
1	I-J	.48151E+01	.-11779E+02	0.	.58105E+01	.55308E+01	-.12519E+02	11.67	16.03
1	K-L	.63855E+01	.-92481E+01	0.	.34616E+00	.63929E+01	-.92558E+01	1.27	12.63
ELEMENTO (74)									
CRGTO. LUC		T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	.-54737E+01	.63477E+01	0.	.-59173E+01	.63543E+01	-.90853E+01	-66.23	13.33
1	L-I	.-76367E+01	.84617E+01	0.	.-59637E+01	.58823E+01	-.10057E+02	-67.27	14.74
1	J-K	.-72133E+01	.60274E+01	0.	.-35854E+01	.71362E+01	-.83271E+01	-74.47	13.80
1	I-J	.32080E+01	.-10138E+02	0.	.58429E+01	.58111E+01	-.12810E+02	22.22	18.35
1	K-L	.70461E+01	.-83751E+01	0.	.55521E+01	.86604E+01	-.53938E+01	15.94	11.73
ELEMENTO (75)									
CRGTO. LUC		T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	.-18265E+01	.37932E+01	0.	.-69851E+01	.84875E+01	-.65308E+01	-55.99	13.05
1	L-I	.-33290E+01	.37640E+01	0.	.-74377E+01	.84593E+01	-.80243E+01	-57.74	14.28
1	J-K	.-26979E+01	.80180E+01	0.	.-54348E+01	.66263E+01	-.53063E+01	-64.36	12.18
1	I-J	.25731E+01	.-56316E+01	0.	.77778E+01	.72641E+01	-.10323E+02	31.10	15.31
1	K-L	.70287E+01	.-35843E+01	0.	.52699E+01	.51404E+01	-.28465E+01	28.08	11.53
ELEMENTO (76)									
CRGTO. LUC		T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	.18057E+01	.-33758E+01	0.	.-69414E+01	.91766E+01	-.42912E+01	-45.65	12.49
1	L-I	.63795E+01	.38465E+01	0.	.-74254E+01	.96183E+01	-.57032E+01	-52.12	13.41
1	J-K	.72114E+00	.61520E+01	0.	.-59432E+01	.91707E+01	-.30976E+01	-57.28	11.83
1	I-J	.29493E+01	.-11791E+01	0.	.77664E+01	.68574E+01	-.70872E+01	37.50	13.64
1	K-L	.59123E+01	.-22886E+01	0.	.57777E+01	.16786E+02	-.15856E+01	34.03	11.66
ELEMENTO (77)									
CRGTO. LUC		T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	.29050E+01	.39737E+01	0.	.-61997E+01	.96820E+01	-.27833E+01	-47.46	11.31
1	L-I	.16218E+01	.42750E+01	0.	.-64635E+01	.95468E+01	-.36458E+01	-50.80	11.80
1	J-K	.20264E+01	.57200E+01	0.	.-56144E+01	.97835E+01	-.20371E+01	-54.10	10.55
1	I-J	.34554E+01	.13151E+01	0.	.66847E+01	.91237E+01	-.43733E+01	40.48	11.93
1	K-L	.58729E+01	.25342E+01	0.	.53858E+01	.16238E+02	-.12311E+01	34.96	10.91
ELEMENTO (78)									
CRGTO. LUC		T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	.25212E+01	.34322E+01	0.	.-46229E+01	.76220E+01	-.16686E+01	-47.81	8.58
1	L-I	.17213E+01	.42170E+01	0.	.-47225E+01	.78541E+01	-.19146E+01	-52.40	8.57
1	J-K	.42781E+01	.42378E+01	0.	.-42378E+01	.74178E+01	-.14520E+01	-53.22	8.24
1	I-J	.16051E+01	.16051E+01	0.	.46855E+01	.71391E+01	-.23681E+01	40.27	8.57
1	K-L	.32677E+01	.16215E+01	0.	.42405E+01	.81265E+01	-.99798E+00	34.18	8.67
ELEMENTO (79)									
CRGTO. LUC		T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	.15800E+01	.14474E+01	0.	.-24901E+01	.40047E+01	-.97725E+00	-44.24	4.57
1	L-I	.15545E+01	.33378E+01	0.	.-26439E+01	.52361E+01	-.34422E+00	-54.32	5.42
1	J-K	.78024E+00	.59362E+00	0.	.-23046E+01	.25966E+01	-.16166E+01	-43.80	4.05

1	I-J	.13786E+01	.79830E+00	0.	.18439E+01	.25571E+01	.78014E+00	40.53	2.41
1	K-L	.26136E+01	.12643E+01	0.	.30688E+01	.51015E+01	.12236E+01	38.84	5.81
ELEMENTO (80)									
CRGTO- LUC									
1	CLN	.77046E+00		0.					
1	L-I	.15092E+01	.20942E+01	0.					
1	J-K	.16289E+00	.38774E+01	0.					
1	I-J	.10303E+01	.24168E+01	0.					
1	K-L	.25619E+00	.44314E+00	0.					
ELEMENTO (81)									
CRGTO- LUC									
1	CLN	.35478E+00		0.					
1	L-I	.13640E+01	.15585E+01	0.					
1	J-K	.62976E+00	.54733E+01	0.					
1	I-J	.24477E+01	.78876E+01	0.					
1	K-L	.24124E+01	.15947E+00	0.					
ELEMENTO (82)									
CRGTO- LUC									
1	CLN	.20133E+00		0.					
1	L-I	.14754E+01	.17739E+01	0.					
1	J-K	.22535E+00	.53758E+01	0.					
1	I-J	.14488E+01	.4937E+00	0.					
1	K-L	.19263E+01	.22138E+00	0.					
ELEMENTO (83)									
CRGTO- LUC									
1	CLN	.28030E+00		0.					
1	L-I	.12499E+01	.32161E+01	0.					
1	J-K	.14180E+01	.11970E+01	0.					
1	I-J	.13567E+01	.24436E+00	0.					
1	K-L	.37426E+00	.78591E+01	0.					
ELEMENTO (84)									
CRGTO- LUC									
1	CLN	.49378E+00		0.					
1	L-I	.12426E+01	.43551E+01	0.					
1	J-K	.91039E+00	.36502E+01	0.					
1	I-J	.21234E+01	.15515E+01	0.					
1	K-L	.34074E+01	.73279E+00	0.					
ELEMENTO (85)									
CRGTO- LUC									
1	CLN	.79094E+00		0.					
1	L-I	.15170E+01	.59216E+01	0.					
1	J-K	.17957E+01	.87170E+01	0.					
1	I-J	.75070E+01	.19031E+01	0.					
1	K-L	.15227E+01	.15372E+01	0.					
ELEMENTO (86)									
CRGTO- LUC									
1	CLN	.12810E+01		0.					
1	L-I	.20243E+01	.58325E+01	0.					
1	J-K	.27222E+01	.81250E+01	0.					
1	I-J	.34031E+01	.25198E+01	0.					
1	K-L	.25365E+01	.25020E+01	0.					

CRGTU.	LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGLO	I. EQUIV.
8J)									
1	CEN	.21367E+01	-73544E+01	0.	.67239E+01	.11958E+C2	-.24666E+C1	55.60	13.26
1	L-I	.29174E+01	.45246E+01	0.	.73035E+01	.11124E+02	-.35222E+C1	48.33	13.28
1	J-K	.37204E+01	.52062E+01	0.	.68723E+01	.12733E+C2	-.15198E+C1	52.67	13.56
1	I-J	.74694E+01	.31632E+01	0.	-.60598E+01	.11727E+02	-.11549E+C1	-35.09	12.35
1	K-L	.45297E+01	.38801E+01	0.	-.79601E+01	.12192E+02	-.37817E+C1	-43.83	14.46
8K)									
1	CEN	.29199E+01	-.51625E+01	0.	.56810E+01	-.97515E+C1	-.18095E+C1	50.83	10.61
1	L-I	.34861E+01	.29523E+01	0.	.61270E+01	.97520E+C1	-.29138E+C1	43.75	11.10
1	J-K	.41221E+01	.25237E+01	0.	.55674E+01	.11208E+C2	-.86205E+C0	47.85	10.68
1	I-J	.34037E+01	.41262E+01	0.	.51891E+01	.93561E+C1	-.46114E+C0	-41.48	10.23
1	K-L	.27024E+01	.37263E+01	0.	-.63225E+01	.96175E+C1	-.31165E+C1	-47.29	11.55
8L)									
1	CEN	.29017E+01	-.31125E+01	0.	.37522E+01	.67177E+C1	-.79951E+C0	45.44	7.15
1	L-I	.33361E+01	.15809E+01	0.	.39570E+01	.65117E+01	-.15947E+C1	38.75	7.44
1	J-K	.37486E+01	.30541E+01	0.	.54537E+C1	.65123E+C1	-.10954E+C0	42.18	6.57
1	I-J	.22405E+01	.38659E+01	0.	-.34687E+01	.71022E+C1	-.77372E+C1	-47.73	6.96
1	K-L	.14933E+01	.33531E+01	0.	-.39760E+01	.64722E+01	-.17154E+C1	-51.89	7.48
9I)									
1	CEN	.20439E+01	.18035E+01	0.	.13483E+01	.35260E+C1	-.52151E+C0	32.81	3.56
1	L-I	.50209E+01	.71563E+01	0.	.13358E+01	.36727E+C1	.18403E+C0	24.90	3.59
1	J-K	.34674E+01	.22735E+01	0.	.11515E+01	.41674E+01	.15732E+C1	31.30	3.64
1	I-J	.18434E+01	.34762E+01	0.	-.10196E+01	.35653E+C1	.13536E+C1	-64.34	3.49
1	K-L	.12922E+01	.31732E+01	0.	-.14684E+01	.35562E+01	.41926E+C0	-61.93	3.76
9J)									
1	CEN	-.55476E+01	.70902E+01	0.	-.26122E+01	.74734E+C1	-.70308E+C1	-75.52	12.65
1	L-I	.59874E+01	.71156E+01	0.	.16224E+01	.71032E+C1	-.71718E+C1	-55.52	12.54
1	J-K	.56157E+01	.77251E+01	0.	-.11775E+01	.78238E+C1	-.89114E+C1	-85.40	12.77
1	I-J	.37619E+01	-.75480E+01	0.	.28555E+01	.71117E+C1	-.80976E+C1	10.89	13.35
1	K-L	.76367E+01	-.59655E+01	0.	.56843E+02	.71237E+C1	-.59655E+C1	0.02	11.99
9K)									
1	CEN	-.59512E+01	.60395E+01	0.	-.46405E+01	.93251E+C1	-.56961E+C1	-65.39	12.27
1	L-I	.44667E+01	.66859E+01	0.	-.42511E+01	.80615E+C1	-.62624E+C1	-71.82	12.46
1	J-K	.45052E+01	.79768E+01	0.	.31052E+01	.87084E+C1	-.52388E+C1	-76.75	12.20
1	I-J	.28113E+01	-.53326E+01	0.	.51913E+01	.77643E+C1	-.84256E+C1	20.03	13.57
1	K-L	.33999E+01	-.25020E+01	0.	.23117E+01	.50695E+C1	-.29719E+C1	11.39	10.66
9L)									
1	CEN	-.55568E+00	-.83427E+01	0.	-.57054E+01	-.55605E+01	-.37735E+C1	-60.58	11.50
1	L-I	.17733E+01	.52763E+01	0.	-.56871E+01	.92123E+C1	-.47173E+C1	-62.65	12.28
1	J-K	.12405E+01	.81265E+01	0.	-.44184E+01	.95336E+01	-.29876E+C1	-68.43	11.72
1	I-J	.33975E+01	-.33987E+01	0.	.64551E+01	.88138E+01	-.68150E+C1	27.87	13.57
1	K-L	.48300E+01	.74458E+00	0.	.37680E+01	-.10335E+02	-.75951E+C0	21.61	10.73
9M)									
1	CEN	.18154E+01	.63471E+01	0.	-.58455E+01	.10488E+C2	-.21424E+C1	-56.02	11.70
1	L-I	.42768E+00	.60714E+01	0.	-.58137E+01	.97112E+C1	-.32118E+C1	-57.94	11.65
1	J-K	.12044E+01	.84382E+01	0.	-.49245E+01	.11252E+C2	-.12098E+C1	-53.69	11.90

1	J-K	1	1	1.00	1.00	11-65	
2	J-K	1	1	1.00	1.00	11-65	
3	J-K	1	1	1.00	1.00	11-65	
4	J-K	1	1	1.00	1.00	11-65	
5	J-K	1	1	1.00	1.00	11-65	
6	J-K	1	1	1.00	1.00	11-65	
7	J-K	1	1	1.00	1.00	11-65	
8	J-K	1	1	1.00	1.00	11-65	
9	J-K	1	1	1.00	1.00	11-65	
10	J-K	1	1	1.00	1.00	11-65	
11	J-K	1	1	1.00	1.00	11-65	
12	J-K	1	1	1.00	1.00	11-65	
13	J-K	1	1	1.00	1.00	11-65	
14	J-K	1	1	1.00	1.00	11-65	
15	J-K	1	1	1.00	1.00	11-65	
16	J-K	1	1	1.00	1.00	11-65	
17	J-K	1	1	1.00	1.00	11-65	
18	J-K	1	1	1.00	1.00	11-65	
19	J-K	1	1	1.00	1.00	11-65	
20	J-K	1	1	1.00	1.00	11-65	
21	J-K	1	1	1.00	1.00	11-65	
22	J-K	1	1	1.00	1.00	11-65	
23	J-K	1	1	1.00	1.00	11-65	
24	J-K	1	1	1.00	1.00	11-65	
25	J-K	1	1	1.00	1.00	11-65	
26	J-K	1	1	1.00	1.00	11-65	
27	J-K	1	1	1.00	1.00	11-65	
28	J-K	1	1	1.00	1.00	11-65	
29	J-K	1	1	1.00	1.00	11-65	
30	J-K	1	1	1.00	1.00	11-65	
31	J-K	1	1	1.00	1.00	11-65	
32	J-K	1	1	1.00	1.00	11-65	
33	J-K	1	1	1.00	1.00	11-65	
34	J-K	1	1	1.00	1.00	11-65	
35	J-K	1	1	1.00	1.00	11-65	
36	J-K	1	1	1.00	1.00	11-65	
37	J-K	1	1	1.00	1.00	11-65	
38	J-K	1	1	1.00	1.00	11-65	
39	J-K	1	1	1.00	1.00	11-65	
40	J-K	1	1	1.00	1.00	11-65	
41	J-K	1	1	1.00	1.00	11-65	
42	J-K	1	1	1.00	1.00	11-65	
43	J-K	1	1	1.00	1.00	11-65	
44	J-K	1	1	1.00	1.00	11-65	
45	J-K	1	1	1.00	1.00	11-65	
46	J-K	1	1	1.00	1.00	11-65	
47	J-K	1	1	1.00	1.00	11-65	
48	J-K	1	1	1.00	1.00	11-65	
49	J-K	1	1	1.00	1.00	11-65	
50	J-K	1	1	1.00	1.00	11-65	
51	J-K	1	1	1.00	1.00	11-65	
52	J-K	1	1	1.00	1.00	11-65	
53	J-K	1	1	1.00	1.00	11-65	
54	J-K	1	1	1.00	1.00	11-65	
55	J-K	1	1	1.00	1.00	11-65	
56	J-K	1	1	1.00	1.00	11-65	
57	J-K	1	1	1.00	1.00	11-65	
58	J-K	1	1	1.00	1.00	11-65	
59	J-K	1	1	1.00	1.00	11-65	
60	J-K	1	1	1.00	1.00	11-65	
61	J-K	1	1	1.00	1.00	11-65	
62	J-K	1	1	1.00	1.00	11-65	
63	J-K	1	1	1.00	1.00	11-65	
64	J-K	1	1	1.00	1.00	11-65	
65	J-K	1	1	1.00	1.00	11-65	
66	J-K	1	1	1.00	1.00	11-65	
67	J-K	1	1	1.00	1.00	11-65	
68	J-K	1	1	1.00	1.00	11-65	
69	J-K	1	1	1.00	1.00	11-65	
70	J-K	1	1	1.00	1.00	11-65	
71	J-K	1	1	1.00	1.00	11-65	
72	J-K	1	1	1.00	1.00	11-65	
73	J-K	1	1	1.00	1.00	11-65	
74	J-K	1	1	1.00	1.00	11-65	
75	J-K	1	1	1.00	1.00	11-65	
76	J-K	1	1	1.00	1.00	11-65	
77	J-K	1	1	1.00	1.00	11-65	
78	J-K	1	1	1.00	1.00	11-65	
79	J-K	1	1	1.00	1.00	11-65	
80	J-K	1	1	1.00	1.00	11-65	
81	J-K	1	1	1.00	1.00	11-65	
82	J-K	1	1	1.00	1.00	11-65	
83	J-K	1	1	1.00	1.00	11-65	
84	J-K	1	1	1.00	1.00	11-65	
85	J-K	1	1	1.00	1.00	11-65	
86	J-K	1	1	1.00	1.00	11-65	
87	J-K	1	1	1.00	1.00	11-65	
88	J-K	1	1	1.00	1.00	11-65	
89	J-K	1	1	1.00	1.00	11-65	
90	J-K	1	1	1.00	1.00	11-65	
91	J-K	1	1	1.00	1.00	11-65	
92	J-K	1	1	1.00	1.00	11-65	
93	J-K	1	1	1.00	1.00	11-65	
94	J-K	1	1	1.00	1.00	11-65	
95	J-K	1	1	1.00	1.00	11-65	
96	J-K	1	1	1.00	1.00	11-65	
97	J-K	1	1	1.00	1.00	11-65	
98	J-K	1	1	1.00	1.00	11-65	
99	J-K	1	1	1.00	1.00	11-65	
100	J-K	1	1	1.00	1.00	11-65	
101	J-K	1	1	1.00	1.00	11-65	
102	J-K	1	1	1.00	1.00	11-65	
103	J-K	1	1	1.00	1.00	11-65	
104	J-K	1	1	1.00	1.00	11-65	
105	J-K	1	1	1.00	1.00	11-65	
106	J-K	1	1	1.00	1.00	11-65	
107	J-K	1	1	1.00	1.00	11-65	
108	J-K	1	1	1.00	1.00	11-65	
109	J-K	1	1	1.00	1.00	11-65	
110	J-K	1	1	1.00	1.00	11-65	
111	J-K	1	1	1.00	1.00	11-65	
112	J-K	1	1	1.00	1.00	11-65	
113	J-K	1	1	1.00	1.00	11-65	
114	J-K	1	1	1.00	1.00	11-65	
115	J-K	1	1	1.00	1.00	11-65	
116	J-K	1	1	1.00	1.00	11-65	
117	J-K	1	1	1.00	1.00	11-65	
118	J-K	1	1	1.00	1.00	11-65	
119	J-K	1	1	1.00	1.00	11-65	
120	J-K	1	1	1.00	1.00	11-65	
121	J-K	1	1	1.00	1.00	11-65	
122	J-K	1	1	1.00	1.00	11-65	
123	J-K	1	1	1.00	1.00	11-65	
124	J-K	1	1	1.00	1.00	11-65	
125	J-K	1	1	1.00	1.00	11-65	
126	J-K	1	1	1.00	1.00	11-65	
127	J-K	1	1	1.00	1.00	11-65	
128	J-K	1	1	1.00	1.00	11-65	
129	J-K	1	1	1.00	1.00	11-65	
130	J-K	1	1	1.00	1.00	11-65	
131	J-K	1	1	1.00	1.00	11-65	
132	J-K	1	1	1.00	1.00	11-65	
133	J-K	1	1	1.00	1.00	11-65	
134	J-K	1	1	1.00	1.00	11-65	
135	J-K	1	1	1.00	1.00	11-65	
136	J-K	1	1	1.00	1.00	11-65	
137	J-K	1	1	1.00	1.00	11-65	
138	J-K	1	1	1.00	1.00	11-65	
139	J-K	1	1	1.00	1.00	11-65	
140	J-K	1	1	1.00	1.00	11-65	
141	J-K	1	1	1.00	1.00	11-65	
142	J-K	1	1	1.00	1.00	11-65	
143	J-K	1	1	1.00	1.00	11-65	
144	J-K	1	1	1.00	1.00	11-65	
145	J-K	1	1	1.00	1.00	11-65	
146	J-K	1	1	1.00	1.00	11-65	
147	J-K	1	1	1.00	1.00	11-65	
148	J-K	1	1	1.00	1.00	11-65	
149	J-K	1	1	1.00	1.00	11-65	
150	J-K	1	1	1.00	1.00	11-65	
151	J-K	1	1	1.00	1.00	11-65	
152	J-K	1	1	1.00	1.00	11-65	
153	J-K	1	1	1.00	1.00	11-65	
154	J-K	1	1	1.00	1.00	11-65	
155	J-K	1	1	1.00	1.00	11-65	
156	J-K	1	1	1.00	1.00	11-65	
157	J-K	1	1	1.00	1.00	11-65	
158	J-K	1	1	1.00	1.00	11-65	
159	J-K	1	1	1.00	1.00	11-65	
160	J-K	1	1	1.00	1.00	11-65	
161	J-K	1	1	1.00	1.00	11-65	
162	J-K	1	1	1.00	1.00	11-65	
163	J-K	1	1	1.00	1.00	11-65	
164	J-K	1	1	1.00	1.00	11-65	
165	J-K	1	1	1.00	1.00	11-65	
166	J-K	1	1	1.00	1.00	11-65	
167	J-K	1	1	1.00	1.00	11-65	
168	J-K	1	1	1.00	1.00	11-65	
169	J-K	1	1	1.00	1.00	11-65	
170	J-K	1	1	1.00	1.00	11-65	
171	J-K	1	1	1.00	1.00	11-65	
172	J-K	1	1	1.00	1.00	11-65	
173	J-K	1	1	1.00	1.00	11-65	
174	J-K	1	1	1.00	1.00	11-65	
175	J-K	1	1	1.00	1.00	11-65	
176	J-K	1	1	1.00	1.00	11-65	
177	J-K	1	1	1.00	1.00	11-65	
178	J-K	1	1	1.00	1.00	11-65	
179	J-K	1	1	1.00	1.00	11-65	
180	J-K	1	1	1.00	1.00	11-65	
181	J-K	1	1	1.00	1.00	11-65	
182	J-K	1	1	1.00	1.00	11-65	
183	J-K	1	1	1.00	1.00	11-65	
184	J-K	1	1	1.00	1.00	11-65	
185	J-K	1	1	1.00	1.00	11-65	
186	J-K	1	1	1.00	1.00	11-65	
187	J-K	1	1	1.00	1.00	11-65	
188	J-K	1	1	1.00	1.00	11-65	
189	J-K	1	1	1.00	1.00	11-65	
190	J-K	1	1	1.00	1.00	11-65	
191	J-K	1	1	1.00	1.00	11-65	
192	J-K	1	1	1.00	1.00	11-65	
193	J-K	1	1	1.00	1.00	11-65	
194	J-K	1	1	1.00	1.00	11-65	
195	J-K	1	1	1.00	1.00	11-65	
196	J-K	1	1	1.00	1.00	11-65	
197	J-K	1	1	1.00	1.00	11-65	
198	J-K	1	1	1.00	1.00	11-65	
199	J-K	1	1	1.00	1.00	11-65	
200	J-K	1	1	1.00	1.00	11-65	
201	J-K	1	1	1.00	1.00	11-65	
202	J-K	1	1				

1	L-I	.28090E+01	-83455E+01	0.	-45673E+01	.15521E+02	.23806E+00	60.62	1C.60
1	J-K	.82638E+01	.20955E+01	0.	.46182E+01	.15521E+02	.23806E+00	25.92	1C.60
1	I-J	.71006E+01	.20587E+01	0.	-.40189E+01	.15521E+02	.23806E+00	-24.38	1C.60

ELEMENTO C	1033	T11	T22	T33	T12	T13	T23	T-MAX	T-MIN	AVGUG	T. EQUIV.
1 C2N	-3574.5E+01	-63429E+01	0.	-21827E+01	-85241E+01	-3955E+01	-3955E+01	-85241E+01	-3955E+01	-80.09	11.43
1 L-I	-39443E+01	85335E+01	0.	-12804E+01	-2450E+01	-40780E+01	-40780E+01	-2450E+01	-40780E+01	-84.17	11.27
1 J-K	-53747E+01	-20939E+01	0.	-92762E+00	-51603E+01	-39533E+01	-39533E+01	-51603E+01	-39533E+01	-85.90	11.58
1 I-J	-63021E+01	-42954E+01	0.	-23767E+01	-87333E+01	-47296E+01	-47296E+01	-87333E+01	-47296E+01	-10.34	11.83
1 K-L	11235E+01	-11819E+01	0.	-12311E+00	-91136E+01	-31831E+01	-31831E+01	-91136E+01	-31831E+01	-0.57	11.05

ELEMENTO (104)	I11	I22	I33	I12	I+MAX	I+MIN	ANGULO	I- ECLIV.
GRG- LUC	- .17133E+01	.86003E+01	0.	- .39791E+01	.57266E+01	-.39955E+01	-70.32	11.54
1 GEN	- .24650E+01	.84408E+01	0.	- .35157E+01	.95746E+01	-.34917E+01	-73.72	11.52
1 L-1	- .24650E+01	.84408E+01	0.	- .26158E+01	.10030E+02	-.27754E+01	-77.91	11.56
1 J-K	- .21525E+01	.94402E+01	0.	.43235E+01	.92823E+01	-.50045E+01	16.66	12.57
1 I-J	- .78439E+01	.35411E+01	0.	.18877E+01	.10275E+02	-.11862E+01	5.62	10.52
1 K-L	- .99349E+01	-.56843E+00	0.					

ELEMENTO (10.)	111	122	133	142	1-MAX	1-MIN	ACCLG	1- ECLIF-
ERGIO. LUC	0.	0.	0.	0.	0.	0.	0.	0.
1 LCN	98301E+00	91552E+01	-49274E+01	13476E+02	13358E+01	-64.81	12.80	12.80
1 L-I	-2283E+00	44711E+01	-4773E+01	1050E+02	-2331E+01	-66.16	11.92	11.92
1 J-K	5503E+00	112671E+02	-35951E+01	12362E+02	-53607E+00	-73.06	12.64	12.64
1 I-J	3323E+01	-13251E+01	56112E+01	1168E+02	40689E+01	25.20	13.27	13.27
1 K-L	1151E+02	23162E+01	-66457E+01	11895E+02	13971E+01	15.17	11.25	11.25

ELEMENTO (100)		Y22	Y33	Y12	I+AX	I+IN	ANGLO	I. EQU.
CEM	1	95606E+01	0.	-54659E+01	-12462E+02	-76659E+00	-65.11	12.86
L-1	1	87047E+01	0.	-49442E+01	.11065E+02	-16360E+01	-65.45	11.87
J-K	1	13755E+02	0.	-24401E+00	13802E+02	-5679E+02	-55.99	12.11
J-L	1	14325E+01	0.	-84281E+01	12470E+02	-23113E+01	30.22	12.77
K-L	1	26933E+01	0.	18757E+01	12600E+02	23403E+01	10.66	11.87

ELEMENT (107)	T11	T22	T33	T12	T+AX	T+JA	AXCLO	T- EQUIV.
PERIOD. LOC								
1 C2N	-13074E+01	-75733E+01	0.	-.42371E+01	.97222E+01	-.78117E+00	-63.11	10.14
1 L-I	-.07913E+01	-.6519E+01	0.	-.36239E+01	.97222E+01	-.78117E+00	-63.11	10.14
1 J-K	-.70983E+00	.7651E+01	0.	-.06235E+00	.97222E+00	-.78117E+00	-15.27	10.14
1 I-J	-.57333E+01	.15673E+01	0.	-.42371E+01	.97222E+01	-.78117E+00	26.69	10.14

ELEMENTO (103)	I11	Y22	I13	T12	I+PX	I+PIN	ARGULO	1- EQUIV.
CCR10. LUC	- .43546E+00	.98446E+01	0.	-.18661E+01	.10355E+02	-.11502E+01	-28.43	10.78
1 L-I	-.11533E+01	.95324E+01	0.	-.13737E+01	.95288E+01	-.12464E+01	-84.67	10.61
1 J-K	-.10675E+01	.10367E+02	0.	-.25401E+01	-1.0367E+02	-1.0677E+01	-55.85	10.54
1 I-J	.96875E+01	-.12682E+01	0.	.20123E+01	.10355E+02	.16402E+01	1.03	10.55
1 K-L	.10295E+02	-.50893E+00	0.	-.16130E+00	.10355E+02	-.61201E+00	-0.96	10.62

ELEMENTO (109)	III	I-2	T33	I-12	I-1X	I-11N	ANCLG	I. EQUI.
ERGID. LOC								
1 CEN	-3458E+00	.27648E+01	0.	-34509E+01	-1C51EE+02	-8068EE+00	-71.73	11.34
1 L-1	-29875E+00	.99773E+01	0.	-.29271E+01	1.075EE+01	-1.075EE+01	-75.14	11.33
1 J-K	-.25105E+00	.11057E+02	0.	-54C53E+00	-11082E+02	-57696E+00	87.34	11.18
1 I-J	.35029E+01	-.88671E+00	0.	.375C6E+01	1.0588E+02	-21422E+01	16.32	11.18
1 K-L	.16344E+02	.16344E+01	0.	.14271E+01	1.1511E+02	1.4001E+01	8.17	10.68

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CROU. LUC	T11	T12	T33	T12	T-PAX	I-PIN	ANGILO	I- EOLIV.
1 CEN	.13314E+01	.10333E+02	0.	.55704E+01	.12594E+02	.13292E+01	-84.47	13.71
1 L-I	.43253E+00	.11232E+02	0.	.47042E+01	.12594E+02	.13292E+01	-65.47	13.71
1 J-K	-.13335E+01	.11929E+02	0.	.24671E+00	.12594E+02	.13292E+01	25.02	13.71
1 I-J	.10335E+02	.13314E+01	0.	.55704E+01	.12594E+02	.13292E+01	25.53	13.71
ELEMENTO (111)								
CROU. LUC	T11	T22	T33	T12	T-PAX	I-PIN	ANGILO	I- EOLIV.
1 CEN	.30358E+01	.89475E+01	0.	.75834E+01	.14147E+02	.21127E+01	-55.56	15.31
1 L-I	.10110E+02	.19165E+01	0.	.70212E+01	.14147E+02	.21127E+01	-25.86	15.31
1 J-K	-.18211E+01	.13555E+02	0.	.21579E+01	.14147E+02	.21127E+01	22.30	15.31
1 I-J	.49475E+01	.30868E+01	0.	.75834E+01	.14147E+02	.21127E+01	34.44	15.31
ELEMENTO (112)								
CROU. LUC	T11	T22	T33	T12	T-PAX	I-PIN	ANGILO	I- EOLIV.
1 CEN	.30987E+01	.14331E+02	0.	.64905E+01	.17297E+02	.13175E+00	65.43	17.23
1 L-I	.7753E+01	.10653E+02	0.	.83613E+01	.17297E+02	.13175E+00	-51.53	17.23
1 J-K	.29943E+03	.17139E+02	0.	.16429E+01	.17297E+02	.13175E+00	84.48	17.23
1 I-J	.14331E+02	.30967E+01	0.	.64905E+01	.17297E+02	.13175E+00	-24.57	17.23
ELEMENTO (113)								
CROU. LUC	T11	T22	T33	T12	T-PAX	I-PIN	ANGILO	I- EOLIV.
1 CEN	.9221E+01	.17674E+01	0.	.68828E+01	.13168E+02	.21145E+01	30.38	14.36
1 L-I	.35080E+01	.74499E+01	0.	.74051E+01	.13168E+02	.21145E+01	52.34	14.36
1 J-K	.12047E+02	.10282E+01	0.	.39503E+01	.13168E+02	.21145E+01	-15.70	14.36
1 I-J	.17674E+01	.92511E+01	0.	.68828E+01	.13168E+02	.21145E+01	-55.62	14.36
ELEMENTO (114)								
CROU. LUC	T11	T22	T33	T12	T-PAX	I-PIN	ANGILO	I- EOLIV.
1 CEN	.35454E+00	.17700E+02	0.	.21269E+01	.17560E+02	.29415E+00	84.03	17.61
1 L-I	.19160E+01	.12332E+02	0.	.87741E+01	.17560E+02	.29415E+00	-41.69	17.61
1 J-K	.29569E+00	.11429E+02	0.	.18224E+00	.17560E+02	.29415E+00	85.46	17.61
1 I-J	.17700E+02	.35454E+00	0.	.21269E+01	.17560E+02	.29415E+00	-6.57	17.61
ELEMENTO (115)								
CROU. LUC	T11	T22	T33	T12	T-PAX	I-PIN	ANGILO	I- EOLIV.
1 CEN	.72425E+01	.70536E+01	0.	.60124E+01	.12161E+02	.11349E+01	44.55	12.63
1 L-I	.19160E+01	.12332E+02	0.	.29637E+01	.12161E+02	.11349E+01	-75.24	12.63
1 J-K	.11429E+02	.26670E+01	0.	.4227E+01	.12161E+02	.11349E+01	22.30	12.63
1 I-J	.70330E+01	.72425E+01	0.	.60124E+01	.12161E+02	.11349E+01	-45.45	12.63
ELEMENTO (116)								
CROU. LUC	T11	T22	T33	T12	T-PAX	I-PIN	ANGILO	I- EOLIV.
1 CEN	.11744E+02	.37625E+00	0.	.27601E+01	.12354E+02	.96830E+00	12.35	12.67
1 L-I	.57161E+01	.56659E+01	0.	.66813E+01	.12354E+02	.96830E+00	44.50	12.67
1 J-K	.57564E+01	.66238E+01	0.	.85759E+01	.12354E+02	.96830E+00	-40.41	12.67
1 I-J	.57564E+01	.11744E+02	0.	.27601E+01	.12354E+02	.96830E+00	-77.64	12.67
ELEMENTO (117)								
CROU. LUC	T11	T22	T33	T12	T-PAX	I-PIN	ANGILO	I- EOLIV.
1 CEN	.47514E+01	.71913E+01	0.	.36104E+01	.19628E+01	.19628E+01	53.86	5.16
1 L-I	.41745E+01	.77601E+01	0.	.35033E+01	.19628E+01	.19628E+01	-56.32	5.16
1 J-K	.86361E+01	.33065E+01	0.	.29943E+01	.95799E+01	.95799E+01	24.17	5.16
1 I-J	.71913E+01	.47514E+01	0.	.36104E+01	.95799E+01	.95799E+01	-36.14	5.16
ELEMENTO (118)								
CROU. LUC	T11	T22	T33	T12	T-PAX	I-PIN	ANGILO	I- EOLIV.
1 CEN	.76708E+01	.33268E+01	0.	.28100E+01	.91537E+01	.23436E+01	27.82	8.24
1 L-I	.23600E+01	.91315E+01	0.	.38751E+00	.91537E+01	.23436E+01	-66.73	8.24
1 J-K	.83341E+01	.31635E+01	0.	.22158E+01	.91537E+01	.23436E+01	20.30	8.24

[illegible]

ELEMENTO (127)									
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	.79485E+01	.38001E+01	0.	.20727E+01	.86056E+01	.29426E+01	22.49	7.77	
1 L-I	.80286E+01	.40861E+01	0.	.25560E+01	.92868E+01	.28279E+01	26.19	8.24	
1 J-K	.60834E+01	.35141E+01	0.	.15873E+01	.83559E+01	.29989E+01	18.05	7.36	
1 I-J	.59221E+01	.55965E+01	0.	.21223E+01	.94259E+01	.31547E+01	-68.70	8.31	
1 K-L	.36181E+01	.72955E+01	0.	.20230E+01	.81530E+01	.27235E+01	-66.15	7.23	
ELEMENTO (123)									
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	.70250E+01	.38356E+01	0.	.12533E+01	.74592E+01	.24032E+01	15.11	6.47	
1 L-I	.70273E+01	.38461E+01	0.	.15256E+01	.76410E+01	.32344E+01	21.91	6.64	
1 J-K	.70273E+01	.38312E+01	0.	.98192E+00	.72003E+01	.35531E+01	15.80	6.32	
1 I-J	.59416E+01	.73350E+01	0.	.12552E+01	.77576E+01	.35330E+01	-71.97	6.76	
1 K-L	.37377E+01	.65609E+01	0.	.11554E+01	.71240E+01	.32746E+01	-65.71	6.18	
ELEMENTO (129)									
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	.55727E+01	.39583E+01	0.	.45361E+00	.66504E+01	.39206E+01	9.71	5.79	
1 L-I	.55738E+01	.40861E+01	0.	.58435E+00	.67272E+01	.39587E+01	12.49	5.86	
1 J-K	.55476E+01	.39083E+01	0.	.32323E+00	.65867E+01	.38258E+01	6.88	5.73	
1 I-J	.43474E+01	.67476E+01	0.	.48535E+00	.62692E+01	.36822E+01	-60.42	5.94	
1 K-L	.39373E+01	.63979E+01	0.	.43626E+00	.64739E+01	.38734E+01	-60.15	5.64	
ELEMENTO (130)									
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	.14382E+02	.74023E+00	0.	.17127E+01	.14813E+02	.50857E+00	7.36	14.37	
1 L-I	.14368E+02	.69101E+00	0.	.28413E+01	.14630E+02	.49467E+00	10.56	14.76	
1 J-K	.14395E+02	.78546E+00	0.	.94412E+00	.14618E+02	.72428E+00	3.95	14.11	
1 I-J	.11565E+01	.15944E+02	0.	.17813E+01	.16116E+02	.95426E+00	-83.21	15.66	
1 K-L	.51390E+00	.12859E+02	0.	.13042E+01	.12314E+02	.59651E+01	-81.98	13.08	
ELEMENTO (131)									
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	.12224E+02	.21959E+01	0.	.24857E+01	.12837E+02	.16118E+01	13.20	15.08	
1 L-I	.12484E+02	.31260E+01	0.	.32573E+01	.12529E+02	.20805E+01	17.59	12.62	
1 J-K	.11963E+02	.12658E+01	0.	.16822E+01	.12231E+02	.10075E+01	6.73	11.75	
1 I-J	.25494E+01	.13455E+02	0.	.26781E+01	.14106E+02	.19266E+01	-76.95	13.25	
1 K-L	.18426E+01	.10961E+02	0.	.23014E+01	.11509E+02	.12947E+01	-76.61	11.92	
ELEMENTO (132)									
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	.10475E+02	.29631E+01	0.	.20610E+01	.11004E+02	.24404E+01	14.39	10.01	
1 L-I	.10994E+02	.37514E+01	0.	.26177E+01	.11571E+02	.28751E+01	18.51	10.43	
1 J-K	.10258E+02	.21863E+01	0.	.15043E+01	.10527E+02	.19155E+01	10.22	5.71	
1 I-J	.32125E+01	.11345E+02	0.	.22134E+01	.11911E+02	.26404E+01	-75.69	10.83	
1 K-L	.27253E+01	.95053E+01	0.	.19023E+01	.10096E+02	.22344E+01	-75.53	5.19	
ELEMENTO (133)									
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	.92527E+01	.34527E+01	0.	.14447E+01	.95912E+01	.30362E+01	13.60	6.48	
1 L-I	.93674E+01	.39338E+01	0.	.18648E+01	.95572E+01	.33402E+01	17.38	6.78	
1 J-K	.90980E+01	.29735E+01	0.	.10846E+01	.92843E+01	.27822E+01	9.75	6.25	
1 I-J	.36270E+01	.95503E+01	0.	.15821E+01	.10373E+02	.32490E+01	-76.54	9.06	
1 K-L	.32776E+01	.66075E+01	0.	.11387E+01	.85469E+01	.29382E+01	-76.25	7.90	
ELEMENTO (134)									
CRGTO. LUC	T11	T22	T33	T12	T-PAX	T-PIN	ANGULO	T. EQUIV.	
1 CEN	.54010E+01	.38521E+01	0.	.89746E+00	.85718E+01	.36813E+01	10.77	7.45	
1 L-I	.55119E+01	.42482E+01	0.	.11530E+01	.88637E+01	.39564E+01	14.20	7.64	
1 J-K	.42901E+01	.34561E+01	0.	.64265E+00	.82741E+01	.33721E+01	7.45	7.30	
1 I-J	.59637E+01	.87956E+01	0.	.97406E+00	.85899E+01	.37734E+01	-76.99	7.82	
1 K-L	.57403E+01	.80024E+01	0.	.81765E+00	.81319E+01	.35908E+01	-78.50	7.08	

1	L-I	.454119E+01	.424826E+01	0.	.115301E+01	.88037E+01	.39564E+01	14.20	7.64
1	J-K	.+2901E+01	.34561E+01	0.	.64276E+00	.83741E+01	.33221E+01	7.45	7.30
1	I-J	.+9637E+01	.87956E+01	0.	.+97616E+00	.85295E+01	.37734E+01	-76.59	7.82
1	K-L	.+7405E+01	.80024E+01	0.	.+81766E+00	.81539E+01	.35890E+01	-75.50	7.08
ELEMENTO (135)									
CRGTO. LUC									
1	CEN	.79704E+01	.40264E+01	0.	T12	T-PAX	T-PIN	ANGILO	T. EQUIV.
1	L-I	.+0557E+01	.43311E+01	0.	.29154E+00	.75518E+01	.40050E+01	4.20	6.52
1	J-K	.72051E+01	.37217E+01	0.	.36538E+00	.81520E+01	.42948E+01	5.61	7.01
1	I-J	.40005E+01	.60920E+01	0.	.+21701E+00	.78505E+01	.37106E+01	3.53	6.84
1	K-L	.+9923E+01	.73477E+01	0.	.+35324E+00	.81227E+01	.40297E+01	-85.63	7.03
ELEMENTO (136)									
CRGTO. LUC									
1	CEN	.12238E+02	.25922E+00	0.	T12	T-PAX	T-PIN	ANGILO	T. EQUIV.
1	L-I	.12221E+02	.18074E+00	0.	.33920E+00	.12247E+02	.22963E+00	1.62	12.13
1	J-K	.12254E+02	.29770E+00	0.	.+2305E+00	.12236E+02	.17631E+00	1.10	12.14
1	I-J	.17592E+00	.17605E+02	0.	.44757E+00	.12271E+02	.28097E+00	2.14	12.13
1	K-L	.+0450E+00	.12471E+02	0.	.+35557E+00	.12013E+02	.16512E+00	-68.44	11.93
ELEMENTO (137)									
CRGTO. LUC									
1	CEN	.12096E+02	.11193E+01	0.	T12	T-PAX	T-PIN	ANGILO	T. EQUIV.
1	L-I	.12152E+02	.13126E+01	0.	.76481E+00	.12155E+02	.10663E+01	3.97	11.65
1	J-K	.12040E+02	.91938E+00	0.	.+1153E+01	.12255E+02	.12031E+01	5.61	11.71
1	I-J	.13029E+01	.12750E+02	0.	.+1545E+00	.12055E+02	.90448E+00	2.14	11.63
1	K-L	.+3599E+00	.11441E+02	0.	.+81304E+00	.12208E+02	.12452E+01	-25.96	12.23
ELEMENTO (138)									
CRGTO. LUC									
1	CEN	.11034E+02	.21583E+01	0.	T12	T-PAX	T-PIN	ANGILO	T. EQUIV.
1	L-I	.11103E+02	.24255E+01	0.	.73566E+00	.11095E+02	.20971E+01	4.71	10.21
1	J-K	.10959E+02	.13911E+01	0.	.+1693E+01	.11264E+02	.22708E+01	7.54	10.32
1	I-J	.23009E+01	.11847E+02	0.	.+3020E+00	.11099E+02	.13681E+01	1.91	10.16
1	K-L	.19307E+01	.10221E+02	0.	.+20061E+00	.11914E+02	.23187E+01	-85.20	10.94
ELEMENTO (139)									
CRGTO. LUC									
1	CEN	.99121E+01	.29977E+01	0.	T12	T-PAX	T-PIN	ANGILO	T. EQUIV.
1	L-I	.99734E+01	.32167E+01	0.	.53562E+00	.95534E+01	.29565E+01	4.40	8.45
1	J-K	.98508E+01	.27788E+01	0.	.88729E+00	.10088E+02	.31021E+01	7.35	8.55
1	I-J	.31824E+01	.10571E+02	0.	.18398E+00	.98536E+01	.27740E+01	1.49	8.80
1	K-L	.24131E+01	.92577E+01	0.	.+5882E+00	.10181E+02	.31337E+01	-85.47	5.45
ELEMENTO (140)									
CRGTO. LUC									
1	CEN	.90777E+01	.35432E+01	0.	T12	T-PAX	T-PIN	ANGILO	T. EQUIV.
1	L-I	.91183E+01	.38800E+01	0.	.31517E+00	.90556E+01	.35253E+01	3.25	7.54
1	J-K	.90372E+01	.35955E+01	0.	.53475E+00	.91734E+01	.26358E+01	5.57	8.00
1	I-J	.36585E+01	.94855E+01	0.	.+9588E+01	.93965E+01	.33965E+01	0.97	7.91
1	K-L	.34279E+01	.85600E+01	0.	.35034E+00	.95104E+01	.36375E+01	-86.57	8.21
ELEMENTO (141)									
CRGTO. LUC									
1	CEN	.36444E+01	.30197E+01	0.	T12	T-PAX	T-PIN	ANGILO	T. EQUIV.
1	L-I	.86772E+01	.39461E+01	0.	.10641E+00	.86437E+01	.38174E+01	1.26	7.51
1	J-K	.36096E+01	.36954E+01	0.	.18221E+00	.86862E+01	.39771E+01	2.20	7.53
1	I-J	.56595E+01	.27369E+01	0.	.30209E+01	.86098E+01	.36952E+01	0.35	7.42
1	K-L	.57799E+01	.85019E+01	0.	.+13042E+00	.87507E+01	.38559E+01	-86.42	7.63
ELEMENTO (142)									
CRGTO. LUC									
1	CEN	.36444E+01	.30197E+01	0.	T12	T-PAX	T-PIN	ANGILO	T. EQUIV.
1	L-I	.86772E+01	.39461E+01	0.	.10641E+00	.86437E+01	.38174E+01	1.26	7.51
1	J-K	.36096E+01	.36954E+01	0.	.18221E+00	.86862E+01	.39771E+01	2.20	7.53
1	I-J	.56595E+01	.27369E+01	0.	.30209E+01	.86098E+01	.36952E+01	0.35	7.42
1	K-L	.57799E+01	.85019E+01	0.	.+13042E+00	.87507E+01	.38559E+01	-86.42	7.63

TEMPO UTILIZADO NA SOLUCAO ESTATICA

SOLUCAO DAS EQUACOES.....=	12.93
SAIDA DE DESLOCAMENTOS..=	1.63
CALCULO DE TENSORES.....=	19.32

RELA T O R I O D E T E M P O G A S T O	
LEITURA DE PONTOS NODAIS.....=	3.67
CALCULO DA RIGIDEZ DE ELEMENTOS....=	43.70
LEITURA DE CARGAS/MASSAS NODAIS....=	0.20
CALCULO DA MATRIZ RIGIDEZ GLOBAL...=	9.33
ANALISE ESFALICA.....=	33.95
CALCULO DE AJU-VALORES.....=	0.00
ANALISE DE RESPOSTA FORCADA.....=	0.00
ANALISE DE ESPALCIRIO DE RESPOSTA....=	0.00
INTEGRACAO PASSO-1-PASSO.....=	0.00
TEMPO TOTAL DE RESOLUCAO.....=	90.85

LISTAGEM: CARGA DISTRIBUÍDA

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PPPPPPPP MM MM CCCCCC 5555555555 11 999999
PPPPPPPP MM MM CCCCCC 5555555555 111 99999999
PP PP MM MM CCCC 55 11 999 999
PP PP MM MM MM CC 555555 11 99 99
PP PP MM MM CC 555555 11 999 999
PPPPPPPP MM MM CC 555555 11 5555555555
PPPPPPPP MM MM CC 555 11 99999999
PP PP MM CC 555 11 99999999
PP PP MM CCCC 555 11 99
PP PP MM CCCCCC 555 555 11 9999999999
PP MM MM CCCCCC 555555 111 99999997

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DATE: NOV 20, 1985 15:31:12, SYSTEM SERIAL: 1017, 86900 MCP: SYSTEM/TMCP. 33-260.1872, POSTNAME: F2

P R K F L W S T A T E M E N T S

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00000100 ?BEGIN JOB OLHAL:CHARGE=KAJIHARA:CLASS=1;
00000150 ?MAXPROTIME=600;MAXTIME=600;MAXLINES=3500;
00000200 ?RUN CURSOS/PROTECA/EST/CCDE/AVSAP;
00000300 ?***** POLI/MFCANICA *****
00000400 ?***** CARLOS YGSHIO KAJIHARA *****
00000500 ?***** POLI/MFCANICA *****
00000600 ?DATA
00002000 ?END JOB

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J C B S U M M A R Y

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NOV 20, 1985      BOJ 2431  OLHAL.
14:35:57          JOE ENTERED SYSTEM: NOV 20, 1985 14:35:40 FROM WFL 33-260
                                QUEUE: 1
                                ORIGINATING LSN: 65  MCS: 3
                                PRIORITY: 30
                                USECODE: PMC5150226767.
                                CHARGE CODE: KAJIHARA.
                                2435 THIS 29 CODE FILE IS TOO OLD TO BE RUN ON THIS RELEASE.
                                ECT 2435 CURSOS/PROTECA/EST/CCDE/AVSAP.
                                PROCESSOR TIME: 00:01:10.544  USECODE: PMC5190226767. CHARGE CODE: KAJIHARA.
                                I/O TIME: 00:00:22.929  CARDS READ: 118. LINES PRINTED: 1304.
                                ELAPSED TIME: 00:53:55.202  INITIAL PRITS: 355, OTHER PRITS: 40.
                                PEN. ALLOC.: 0.000 MGY.  CUSTO C.500 UU

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10-467 UU

15:31:03

EOJ 2431

OLH4L

PROCESSOR

I/C

ELAPSED

TIME: 00:00:30.237

TIME: 00:00:00.945

TIME: 00:55:08.750

USEFCODE: PWC5190226767.CHARGECODE: KAJIHARA.

INITIAL PRITS: 60.

ALLOC: 0.000 MBY. CUSTD 0.000 UU

(VHLOR 00 JCB 1) (RESTAM 19 PROCESSAMENTOS)

0.073 UU

*EXECUTADO PARA: OLHAL DA ALCA DO SNIVEL - ESTADO PLANO DE TENSOES - UNID. EM KGF MM

* INFORMACOES PARA CONTROLE GERAL DE PROCESSAMENTO

NUMERO DE PONTOS NODAIS.....= 164
 NUMERO DE TIPOS DE ELEMENTOS.....= 1
 NUMERO DE CONDICIONES DE CARGAMENTO.....= 1
 NUMERO DE FREQUENCIAS.....= 0
 CODIGO DE ANALISE (NDYN).....= 0
 EQ.0, ESTATICA,
 EQ.1, FREQUENCIAS E MODOS,
 EQ.2, RESPOSTA FORCADA,
 EQ.3, ESPECTRO DE RESPOSTA,
 EQ.4, INTEGRACAO DIRETA
 OPCAO DE EXECUCAO (MODEX).....= 0
 EQ.0, EXECUCAO,
 EQ.1, VERIFICACAO DE DADOS
 NUMERO DE VETORES DE
 ITERACAO POR SUB-ESPACOS (NAD).....= 0
 NUMERO DE EQUACOES POR BLOCO.....= 8
 OPCAO DE ARMAZENAGEM PARA REINICIO.....= 0
 OPCAO DE ARMAZENAGEM PARA DESENHOS
 EM POS-PROCESSAMENTO (IDPCS).....= 0

*DADOS DE ENTRADA DOS PONTOS NODAIS

NUMERO DO NO	CONDICIONES DE CONTORNO				COORDENADAS DOS NC'S			T			
	X	Y	Z	XX	YY	ZZ	X	Y	Z		
C 13	0	1	0	1	1	1	70.250	0.000	180.000	0	0.000
C 19	0	1	0	1	1	1	70.250	0.000	0.000	1	0.000
C 1	1	1	0	1	1	1	70.250	0.000	180.000	0	0.000
C 19	1	1	0	1	1	1	70.250	0.000	0.000	0	0.000
C 20	0	1	0	1	1	1	83.000	0.000	180.000	0	0.000
C 38	0	1	0	1	1	1	83.000	0.000	0.000	1	0.000
C 20	1	1	0	1	1	1	83.000	0.000	180.000	0	0.000
C 38	1	1	0	1	1	1	83.000	0.000	0.000	0	0.000
C 39	0	1	0	1	1	1	97.000	0.000	180.000	0	0.000
C 57	0	1	0	1	1	1	97.000	0.000	0.000	1	0.000
C 39	1	1	0	1	1	1	97.000	0.000	180.000	0	0.000
C 57	1	1	0	1	1	1	97.000	0.000	0.000	0	0.000
C 58	0	1	0	1	1	1	112.500	0.000	180.000	0	0.000
C 76	0	1	0	1	1	1	112.500	0.000	0.000	1	0.000
C 58	1	1	0	1	1	1	112.500	0.000	180.000	0	0.000
C 76	1	1	0	1	1	1	112.500	0.000	0.000	2	0.000
C 77	0	1	0	1	1	1	129.000	0.000	180.000	0	0.000
C 95	0	1	0	1	1	1	129.000	0.000	0.000	1	0.000
C 77	1	1	0	1	1	1	129.000	0.000	180.000	0	0.000
C 95	1	1	0	1	1	1	129.000	0.000	0.000	0	0.000

[illegible]

*DADOS DOS PONTOS GERADOS

[illegible]

[illegible]

[illegible]

133	0	1	1	0	1	1	13.500	C.000	168.000	C.000
134	1	1	1	0	1	1	C.000	C.000	168.000	C.000
135	1	1	1	0	1	1	-C.000	C.000	-182.000	C.000
136	0	1	1	0	1	1	21.604	C.000	-179.235	C.000
137	0	1	1	0	1	1	62.248	C.000	-171.024	C.000
138	0	1	1	0	1	1	51.000	C.000	-157.617	C.000
139	0	1	1	0	1	1	109.917	C.000	-130.994	C.000
140	1	1	1	0	1	1	-G.000	C.000	-205.400	C.000
141	0	1	1	0	1	1	35.424	C.000	-200.901	C.000
142	0	1	1	0	1	1	66.694	C.000	-133.240	C.000
143	0	1	1	0	1	1	63.000	C.000	196.000	C.000
144	0	1	1	0	1	1	67.500	C.000	195.000	C.000
145	0	1	1	0	1	1	54.000	C.000	196.000	C.000
146	0	1	1	0	1	1	40.500	C.000	196.000	C.000
147	0	1	1	0	1	1	27.000	C.000	196.000	C.000
148	0	1	1	0	1	1	13.500	C.000	196.000	C.000
149	1	1	1	0	1	1	0.000	C.000	196.000	C.000
150	0	1	1	0	1	1	63.000	C.000	220.000	C.000
151	0	1	1	0	1	1	67.500	C.000	220.000	C.000
152	0	1	1	0	1	1	54.000	C.000	220.000	C.000
153	0	1	1	0	1	1	40.500	C.000	220.000	C.000
154	0	1	1	0	1	1	27.000	C.000	220.000	C.000
155	0	1	1	0	1	1	13.500	C.000	220.000	C.000
156	1	1	1	0	1	1	C.000	C.000	220.000	C.000
157	0	1	1	1	1	1	63.000	C.000	240.000	C.000
158	0	1	1	1	1	1	67.500	C.000	240.000	C.000
159	0	1	1	1	1	1	54.000	C.000	240.000	C.000
160	0	1	1	1	1	1	40.500	C.000	240.000	C.000
161	0	1	1	1	1	1	27.000	C.000	240.000	C.000
162	0	1	1	1	1	1	13.500	C.000	240.000	C.000
163	1	1	1	1	1	1	C.000	C.000	240.000	C.000
164	1	1	1	0	1	1	C.000	C.000	240.000	C.000

*NUMEROS DAS EQUACOES

N	X	Y	Z	XX	YY	ZZ
1	0	0	1	0	0	C
2	2	0	3	0	0	C
3	4	0	5	0	0	C
4	6	0	7	0	0	C
5	8	0	9	0	0	C
6	10	0	11	0	0	C
7	12	0	13	0	0	C
8	14	0	15	0	0	C
9	16	0	17	0	0	C
10	18	0	19	0	0	C
11	20	0	21	0	0	C
12	22	0	23	0	0	C
13	24	0	25	0	0	C
14	26	0	27	0	0	C
15	28	0	29	0	0	C
16	30	0	31	0	0	C
17	32	0	33	0	0	C
18	34	0	35	0	0	C
19	0	0	36	0	0	C
20	0	0	37	0	0	C
21	38	0	39	0	0	C
22	40	0	41	0	0	C
23	42	0	43	0	0	C

24	44	0	45	0	0	0
25	46	0	47	0	0	0
26	48	0	49	0	0	0
27	50	0	51	0	0	0
28	52	0	53	0	0	0
29	54	0	55	0	0	0
30	56	0	57	0	0	0
31	58	0	59	0	0	0
32	60	0	61	0	0	0
33	62	0	63	0	0	0
34	64	0	65	0	0	0
35	66	0	67	0	0	0
36	68	0	69	0	0	0
37	70	0	71	0	0	0
38	0	0	72	0	0	0
39	0	0	73	0	0	0
40	74	0	75	0	0	0
41	76	0	77	0	0	0
42	78	0	79	0	0	0
43	80	0	81	0	0	0
44	82	0	83	0	0	0
45	84	0	85	0	0	0
46	86	0	87	0	0	0
47	88	0	89	0	0	0
48	90	0	91	0	0	0
49	92	0	93	0	0	0
50	94	0	95	0	0	0
51	96	0	97	0	0	0
52	98	0	99	0	0	0
53	100	0	101	0	0	0
54	102	0	103	0	0	0
55	104	0	105	0	0	0
56	106	0	107	0	0	0
57	0	0	108	0	0	0
58	0	0	109	0	0	0
59	110	0	111	0	0	0
60	112	0	113	0	0	0
61	114	0	115	0	0	0
62	116	0	117	0	0	0
63	118	0	119	0	0	0
64	120	0	121	0	0	0
65	122	0	123	0	0	0
66	124	0	125	0	0	0
67	126	0	127	0	0	0
68	128	0	129	0	0	0
69	130	0	131	0	0	0
70	132	0	133	0	0	0
71	134	0	135	0	0	0
72	136	0	137	0	0	0
73	138	0	139	0	0	0
74	140	0	141	0	0	0
75	142	0	143	0	0	0
76	0	0	144	0	0	0
77	0	0	145	0	0	0
78	146	0	147	0	0	0
79	148	0	149	0	0	0
80	150	0	151	0	0	0
81	152	0	153	0	0	0
82	154	0	155	0	0	0
83	156	0	157	0	0	0

144	271	0	272	0	0	0	0
145	273	0	274	0	0	0	0
146	275	0	276	0	0	0	0
147	277	0	278	0	0	0	0
148	279	0	280	0	0	0	0
149	0	0	281	0	0	0	0
150	282	0	283	0	0	0	0
151	284	0	285	0	0	0	0
152	286	0	287	0	0	0	0
153	288	0	289	0	0	0	0
154	290	0	291	0	0	0	0
155	292	0	293	0	0	0	0
156	0	0	294	0	0	0	0
157	295	0	0	0	0	0	0
158	296	0	0	0	0	0	0
159	297	0	0	0	0	0	0
160	298	0	0	0	0	0	0
161	299	0	0	0	0	0	0
162	300	0	0	0	0	0	0
163	0	0	0	0	0	0	0
164	0	0	301	0	0	0	0

*ELEMENTOS DE ESTADO PLANO DE TENSOES

MODOS INCOMPATIVELIS SUPRIMIDOS

NUMERO DE ELEMENTOS...= 141
NUMERO DE MATERIAIS...= 1
NO. MAXIMO DE TEMP. 1
POR MATERIAL...= 1
CODIGO DE ANALISE...= 2
CODIGO DE INCLUSAO
DE MODOS DE FLEXAO...= 1
EQ.0, INCLUI
GT.0, SUPRIME

NUMERO DO MATERIAL.....= 1
NUMERO DE TEMPERATURAS...= 1
PESO ESPECIFIC...= 0.
MASSA ESPECIFICA.....= 0.
ANGULO BETA.....= 0.000
TENSAO ADMISSIVEL.....= .2300E+02

TEMPERATURA E(N) E(S) ECT) NICKS) NICKT) NICKST) G(KNS) ALFA(N) ALFA(S) ALFA(T)
0.00 .2100E+05 .2100E+05 .2100E+05 0.2300 0.2800 0.2800 .8203E+04 0. 0. 0.

MULTIPLICADORES DE CARGAS NAO NODAIS

CASO	TEMPERATURA	PRESSAO	GRAVID.-X	GRAVID.-Y	GRAVID.-Z
A	0.000	1.000	0.000	0.000	0.000
B	0.000	0.000	0.000	0.000	0.000
C	0.000	0.000	0.000	0.000	0.000
D	0.000	0.000	0.000	0.000	0.000

ELEMENTO NUMERO	I	J	K	L	NATL TIPO	TEMPERATURA DE REF.	PRESSAO EM I-J	OPCAO TENS.	KG	ESPESURA
1	2	1	20	21	1	0.000	.234E+C2	20	1	130.0000
2	3	2	21	22	1	0.000	.216E+C2	20	1	130.0000
3	4	3	22	23	1	0.000	.173E+C2	20	1	130.0000
4	5	4	23	24	1	0.000	.985E+C1	20	1	130.0000
5	6	24	24	25	1	0.000	0.	20	1	130.0000
6	7	25	25	26	1	0.000	0.	20	1	130.0000
7	8	26	26	27	1	0.000	0.	20	1	130.0000
8	9	27	27	28	1	0.000	0.	20	1	130.0000
9	10	28	28	29	1	0.000	0.	20	1	130.0000
10	11	29	29	30	1	0.000	0.	20	1	130.0000
11	12	30	30	31	1	0.000	0.	20	1	130.0000
12	13	31	31	32	1	0.000	0.	20	1	130.0000
13	14	32	32	33	1	0.000	0.	20	1	130.0000
14	15	33	33	34	1	0.000	0.	20	1	130.0000
15	16	34	34	35	1	0.000	0.	20	1	130.0000
16	17	35	35	36	1	0.000	0.	20	1	130.0000
17	18	36	36	37	1	0.000	0.	20	1	130.0000
18	19	37	37	38	1	0.000	0.	20	1	130.0000
19	20	38	38	39	1	0.000	0.	20	1	130.0000
20	21	39	39	40	1	0.000	0.	20	1	130.0000
21	22	40	40	41	1	0.000	0.	20	1	130.0000
22	23	41	41	42	1	0.000	0.	20	1	130.0000
23	24	42	42	43	1	0.000	0.	20	1	130.0000
24	25	43	43	44	1	0.000	0.	20	1	130.0000
25	26	44	44	45	1	0.000	0.	20	1	130.0000
26	27	45	45	46	1	0.000	0.	20	1	130.0000
27	28	46	46	47	1	0.000	0.	20	1	130.0000
28	29	47	47	48	1	0.000	0.	20	1	130.0000
29	30	48	48	49	1	0.000	0.	20	1	130.0000
30	31	49	49	50	1	0.000	0.	20	1	130.0000
31	32	50	50	51	1	0.000	0.	20	1	130.0000
32	33	51	51	52	1	0.000	0.	20	1	130.0000
33	34	52	52	53	1	0.000	0.	20	1	130.0000
34	35	53	53	54	1	0.000	0.	20	1	130.0000
35	36	54	54	55	1	0.000	0.	20	1	130.0000
36	37	55	55	56	1	0.000	0.	20	1	130.0000
37	38	56	56	57	1	0.000	0.	20	1	130.0000
38	39	57	57	58	1	0.000	0.	20	1	130.0000
39	40	58	58	59	1	0.000	0.	20	1	130.0000
40	41	59	59	60	1	0.000	0.	20	1	130.0000
41	42	60	60	61	1	0.000	0.	20	1	130.0000
42	43	61	61	62	1	0.000	0.	20	1	130.0000
43	44	62	62	63	1	0.000	0.	20	1	130.0000
44	45	63	63	64	1	0.000	0.	20	1	130.0000
45	46	64	64	65	1	0.000	0.	20	1	130.0000
46	47	65	65	66	1	0.000	0.	20	1	130.0000
47	48	66	66	67	1	0.000	0.	20	1	130.0000
48	49	67	67	68	1	0.000	0.	20	1	130.0000
49	50	68	68	69	1	0.000	0.	20	1	130.0000
50	51	69	69	70	1	0.000	0.	20	1	130.0000
51	52	70	70	71	1	0.000	0.	20	1	130.0000
52	53	71	71	72	1	0.000	0.	20	1	130.0000
53	54	72	72	73	1	0.000	0.	20	1	130.0000
54	55	73	73	74	1	0.000	0.	20	1	130.0000
55	56	74	74	75	1	0.000	0.	20	1	130.0000
56	57	75	75	76	1	0.000	0.	20	1	130.0000
57	58	76	76	77	1	0.000	0.	20	1	130.0000
58	59	77	77	78	1	0.000	0.	20	1	130.0000
59	60	78	78	79	1	0.000	0.	20	1	130.0000
60	61	79	79	80	1	0.000	0.	20	1	130.0000

59	62	81	100	123	141	159	177	195	213	231	249	267	285	303	321	339	357	375	393	411	429	447	465	483	501	519	537	555	573	591	609	627	645	663	681	699	717	735	753	771	789	807	825	843	861	879	897	915	933	951	969	987	1005	1023	1041	1059	1077	1095	1113	1131	1149	1167	1185	1203	1221	1239	1257	1275	1293	1311	1329	1347	1365	1383	1401	1419	1437	1455	1473	1491	1509	1527	1545	1563	1581	1599	1617	1635	1653	1671	1689	1707	1725	1743	1761	1779	1797	1815	1833	1851	1869	1887	1905	1923	1941	1959	1977	1995	2013	2031	2049	2067	2085	2103	2121	2139	2157	2175	2193	2211	2229	2247	2265	2283	2301	2319	2337	2355	2373	2391	2409	2427	2445	2463	2481	2499	2517	2535	2553	2571	2589	2607	2625	2643	2661	2679	2697	2715	2733	2751	2769	2787	2805	2823	2841	2859	2877	2895	2913	2931	2949	2967	2985	3003	3021	3039	3057	3075	3093	3111	3129	3147	3165	3183	3201	3219	3237	3255	3273	3291	3309	3327	3345	3363	3381	3399	3417	3435	3453	3471	3489	3507	3525	3543	3561	3579	3597	3615	3633	3651	3669	3687	3705	3723	3741	3759	3777	3795	3813	3831	3849	3867	3885	3903	3921	3939	3957	3975	3993	4011	4029	4047	4065	4083	4101	4119	4137	4155	4173	4191	4209	4227	4245	4263	4281	4299	4317	4335	4353	4371	4389	4407	4425	4443	4461	4479	4497	4515	4533	4551	4569	4587	4605	4623	4641	4659	4677	4695	4713	4731	4749	4767	4785	4803	4821	4839	4857	4875	4893	4911	4929	4947	4965	4983	5001	5019	5037	5055	5073	5091	5109	5127	5145	5163	5181	5199	5217	5235	5253	5271	5289	5307	5325	5343	5361	5379	5397	5415	5433	5451	5469	5487	5505	5523	5541	5559	5577	5595	5613	5631	5649	5667	5685	5703	5721	5739	5757	5775	5793	5811	5829	5847	5865	5883	5901	5919	5937	5955	5973	5991	6009	6027	6045	6063	6081	6099	6117	6135	6153	6171	6189	6207	6225	6243	6261	6279	6297	6315	6333	6351	6369	6387	6405	6423	6441	6459	6477	6495	6513	6531	6549	6567	6585	6603	6621	6639	6657	6675	6693	6711	6729	6747	6765	6783	6801	6819	6837	6855	6873	6891	6909	6927	6945	6963	6981	6999	7017	7035	7053	7071	7089	7107	7125	7143	7161	7179	7197	7215	7233	7251	7269	7287	7305	7323	7341	7359	7377	7395	7413	7431	7449	7467	7485	7503	7521	7539	7557	7575	7593	7611	7629	7647	7665	7683	7701	7719	7737	7755	7773	7791	7809	7827	7845	7863	7881	7899	7917	7935	7953	7971	7989	8007	8025	8043	8061	8079	8097	8115	8133	8151	8169	8187	8205	8223	8241	8259	8277	8295	8313	8331	8349	8367	8385	8403	8421	8439	8457	8475	8493	8511	8529	8547	8565	8583	8601	8619	8637	8655	8673	8691	8709	8727	8745	8763	8781	8799	8817	8835	8853	8871	8889	8907	8925	8943	8961	8979	8997	9015	9033	9051	9069	9087	9105	9123	9141	9159	9177	9195	9213	9231	9249	9267	9285	9303	9321	9339	9357	9375	9393	9411	9429	9447	9465	9483	9501	9519	9537	9555	9573	9591	9609	9627	9645	9663	9681	9699	9717	9735	9753	9771	9789	9807	9825	9843	9861	9879	9897	9915	9933	9951	9969	9987	10005	10023	10041	10059	10077	10095	10113	10131	10149	10167	10185	10203	10221	10239	10257	10275	10293	10311	10329	10347	10365	10383	10401	10419	10437	10455	10473	10491	10509	10527	10545	10563	10581	10599	10617	10635	10653	10671	10689	10707	10725	10743	10761	10779	10797	10815	10833	10851	10869	10887	10905	10923	10941	10959	10977	10995	11013	11031	11049	11067	11085	11103	11121	11139	11157	11175	11193	11211	11229	11247	11265	11283	11301	11319	11337	11355	11373	11391	11409	11427	11445	11463	11481	11499	11517	11535	11553	11571	11589	11607	11625	11643	11661	11679	11697	11715	11733	11751	11769	11787	11805	11823	11841	11859	11877	11895	11913	11931	11949	11967	11985	12003	12021	12039	12057	12075	12093	12111	12129	12147	12165	12183	12201	12219	12237	12255	12273	12291	12309	12327	12345	12363	12381	12399	12417	12435	12453	12471	12489	12507	12525	12543	12561	12579	12597	12615	12633	12651	12669	12687	12705	12723	12741	12759	12777	12795	12813	12831	12849	12867	12885	12903	12921	12939	12957	12975	12993	13011	13029	13047	13065	13083	13101	13119	13137	13155	13173	13191	13209	13227	13245	13263	13281	13299	13317	13335	13353	13371	13389	13407	13425	13443	13461	13479	13497	13515	13533	13551	13569	13587	13605	13623	13641	13659	13677	13695	13713	13731	13749	13767	13785	13803	13821	13839	13857	13875	13893	13911	13929	13947	13965	13983	14001	14019	14037	14055	14073	14091	14109	14127	14145	14163	14181	14199	14217	14235	14253	14271	14289	14307	14325	14343	14361	14379	14397	14415	14433	14451	14469	14487	14505	14523	14541	14559	14577	14595	14613	14631	14649	14667	14685	14703	14721	14739	14757	14775	14793	14811	14829	14847	14865	14883	14901	14919	14937	14955	14973	14991	15009	15027	15045	15063	15081	15099	15117	15135	15153	15171	15189	15207	15225	15243	15261	15279	15297	15315	15333	15351	15369	15387	15405	15423	15441	15459	15477	15495	15513	15531	15549	15567	15585	15603	15621	15639	15657	15675	15693	15711	15729	15747	15765	15783	15801	15819	15837	15855	15873	15891	15909	15927	15945	15963	15981	16000	16018	16036	16054	16072	16090	16108	16126	16144	16162	16180	16198	16216	16234	16252	16270	16288	16306	16324	16342	16360	16378	16396	16414	16432	16450	16468	16486	16504	16522	16540	16558	16576	16594	16612	16630	16648	16666	16684	16702	16720	16738	16756	16774	16792	16810	16828	16846	16864	16882	16900	16918	16936	16954	16972	16990	17008	17026	17044	17062	17080	17098	17116	17134	17152	17170	17188	17206	17224	17242	17260	17278	17296	17314	17332	17350	17368	17386	17404	17422	17440	17458	17476	17494	17512	17530	17548	17566	17584	17602	17620	17638	17656	17674	17692	17710	17728	17746	17764	17782	17800	17818	17836	17854	17872	17890	17908	17926	17944	17962	17980	18000	18018	18036	18054	18072	18090	18108	18126	18144	18162	18180	18198	18216	18234	18252	18270	18288	18306	18324	18342	18360	18378	18396	18414	18432	18450	18468	18486	18504	18522	18540	18558	18576	18594	18612	18630	18648	18666	18684	18702	18720	18738	18756	18774	18792	18810	18828	18846	18864	18882	18900	18918	18936	18954	18972	18990	19008	19026	19044	19062	19080	19098	19116	19134	19152	19170	19188	19206	19224	19242	19260	19278	19296	19314	19332	19350	19368	19386	19404	19422	19440	19458	19476	19494	19512	19530	19548	19566	19584	19602	19620	19638	19656	19674	19692	19710	19728	19746	19764	19782	19800	19818	19836	19854	19872	19890	19908	19926	19944	19962	19980	20000	20018	20036	20054	20072	20090	20108	20126	20144	20162	20180	20198	20216	20234	20252	20270	20288	20306	20324	20342	20360	20378	20396	20414	20432	20450	20468	20486	20504	20522	20540	20558	20576	20594	20612	20630	20648	20666	20684	20702	20720	20738	20756	20774	20792	20810	20828	20846	20864	20882	20900	20918	20936	20954	20972	20990	21008	21026	21044	21062	21080	21098	21116	21134	21152	21170	21188	21206	21224	21242	21260	21278	21296	21314	21332	21350	21368	21386	21404	21422	21440	21458	21476	21494	21512	21530	21548	21566	21584	21602	21620	21638	21656	21674	21692	21710	21728	21746	21764	21782	21800	21818	21836	21854	21872	21890	21908	21926	21944	21962	21980	21998	22016	22034	22052	22070	22088	22106	22124	22142	22160	22178	22196	22214	22232	22250	22268	22286	22304	22322	22340	22358	22376	22394	22412	22430	22448	22466	22484	22502	22520	22538	22556	22574	22592	22610	22628	22646	22664	22682	22700	22718	22736	22754	22772	22790	22808	22826	22844	22862	22880	22898	22916	22934	22952	22970	22988	23006	23024	23042	23060	23078	23096	23114	23132	23150	23168	23186	23204	23222	23240	23258	23276	23294	23312	23330	23348	23366	233
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119	131	131	0.000	0.000	16	1	130.0000
120	113	113	0.000	0.000	16	1	130.0000
121	132	132	0.000	0.000	16	1	130.0000
122	133	133	0.000	0.000	16	1	130.0000
123	114	114	0.000	0.000	16	1	130.0000
124	133	134	0.000	0.000	16	1	130.0000
125	143	144	0.000	0.000	20	1	130.0000
126	144	145	0.000	0.000	20	1	130.0000
127	145	146	0.000	0.000	20	1	130.0000
128	131	147	0.000	0.000	20	1	130.0000
129	132	148	0.000	0.000	20	1	130.0000
130	133	149	0.000	0.000	20	1	130.0000
131	143	150	0.000	0.000	20	1	130.0000
132	144	151	0.000	0.000	20	1	130.0000
133	145	152	0.000	0.000	20	1	130.0000
134	146	153	0.000	0.000	20	1	130.0000
135	147	154	0.000	0.000	20	1	130.0000
136	148	155	0.000	0.000	20	1	130.0000
137	149	156	0.000	0.000	20	1	130.0000
138	150	157	0.000	0.000	20	1	130.0000
139	151	158	0.000	0.000	20	1	130.0000
140	152	159	0.000	0.000	20	1	130.0000
141	153	160	0.000	0.000	20	1	130.0000
	161	161	0.000	0.000	20	1	130.0000
	162	162	0.000	0.000	20	1	130.0000
	163	163	0.000	0.000	20	1	130.0000
	164	164	0.000	0.000	20	1	130.0000
	165	165	0.000	0.000	20	1	130.0000
	166	166	0.000	0.000	20	1	130.0000
	167	167	0.000	0.000	20	1	130.0000
	168	168	0.000	0.000	20	1	130.0000
	169	169	0.000	0.000	20	1	130.0000
	170	170	0.000	0.000	20	1	130.0000
	171	171	0.000	0.000	20	1	130.0000
	172	172	0.000	0.000	20	1	130.0000
	173	173	0.000	0.000	20	1	130.0000
	174	174	0.000	0.000	20	1	130.0000
	175	175	0.000	0.000	20	1	130.0000
	176	176	0.000	0.000	20	1	130.0000
	177	177	0.000	0.000	20	1	130.0000
	178	178	0.000	0.000	20	1	130.0000
	179	179	0.000	0.000	20	1	130.0000
	180	180	0.000	0.000	20	1	130.0000
	181	181	0.000	0.000	20	1	130.0000
	182	182	0.000	0.000	20	1	130.0000
	183	183	0.000	0.000	20	1	130.0000
	184	184	0.000	0.000	20	1	130.0000
	185	185	0.000	0.000	20	1	130.0000
	186	186	0.000	0.000	20	1	130.0000
	187	187	0.000	0.000	20	1	130.0000
	188	188	0.000	0.000	20	1	130.0000
	189	189	0.000	0.000	20	1	130.0000
	190	190	0.000	0.000	20	1	130.0000
	191	191	0.000	0.000	20	1	130.0000
	192	192	0.000	0.000	20	1	130.0000
	193	193	0.000	0.000	20	1	130.0000
	194	194	0.000	0.000	20	1	130.0000
	195	195	0.000	0.000	20	1	130.0000
	196	196	0.000	0.000	20	1	130.0000
	197	197	0.000	0.000	20	1	130.0000
	198	198	0.000	0.000	20	1	130.0000
	199	199	0.000	0.000	20	1	130.0000
	200	200	0.000	0.000	20	1	130.0000

* PARAMETROS DO SISTEMA DE EQUACOES

NUMERO TOTAL DE EQUACOES.....	=	301
LARGURA DE BANDA.....	=	42
NUMERO DE EQUACOES POR BLOCO.....	=	301
NUMERO DE BLOCOS.....	=	1

*CARGAS (ESTATICO) OU MASSAS (DINAMICO) NODAIS

NO. CRGTO NUMERO NUMERO	DIR. X FORÇA	DIR. Y FORÇA	DIR. Z FORÇA	DIR. X MOMENTO	DIR. Y MOMENTO	DIR. Z MOMENTO
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CONDICAO MULTIPLICADORES DE CARGAS NAC NODAIS

CONDICAO DE CRGTO.	A	B	C	D
1	1.000E+00	0.	0.	0.

*DESLOCAMENTOS E ROTACAO DOS NO'S

NUMERO DO NO'	COND. CRGTO.	TRANSLACAO EV X	TRANSLACAO EM Y	TRANSLACAO EV Z	ROTACAO EM X	ROTACAO EM Y	ROTACAO EM Z
164	1	0.	0.	0.	0.	0.	0.
163	1	0.	0.	0.	0.	0.	0.
162	1	0.	0.	0.	0.	0.	0.
161	1	0.	0.	0.	0.	0.	0.
160	1	0.	0.	0.	0.	0.	0.
159	1	0.	0.	0.	0.	0.	0.
158	1	0.	0.	0.	0.	0.	0.
157	1	0.	0.	0.	0.	0.	0.
156	1	0.	0.	0.	0.	0.	0.
155	1	0.	0.	0.	0.	0.	0.
154	1	0.	0.	0.	0.	0.	0.
153	1	0.	0.	0.	0.	0.	0.
152	1	0.	0.	0.	0.	0.	0.
151	1	0.	0.	0.	0.	0.	0.
150	1	0.	0.	0.	0.	0.	0.
149	1	0.	0.	0.	0.	0.	0.
148	1	0.	0.	0.	0.	0.	0.
147	1	0.	0.	0.	0.	0.	0.
146	1	0.	0.	0.	0.	0.	0.
145	1	0.	0.	0.	0.	0.	0.
144	1	0.	0.	0.	0.	0.	0.
143	1	0.	0.	0.	0.	0.	0.
142	1	0.	0.	0.	0.	0.	0.
141	1	0.	0.	0.	0.	0.	0.
140	1	0.	0.	0.	0.	0.	0.
139	1	0.	0.	0.	0.	0.	0.
138	1	0.	0.	0.	0.	0.	0.
137	1	0.	0.	0.	0.	0.	0.
136	1	0.	0.	0.	0.	0.	0.
135	1	0.	0.	0.	0.	0.	0.
134	1	0.	0.	0.	0.	0.	0.
133	1	0.	0.	0.	0.	0.	0.
132	1	0.	0.	0.	0.	0.	0.
131	1	0.	0.	0.	0.	0.	0.
130	1	0.	0.	0.	0.	0.	0.
129	1	0.	0.	0.	0.	0.	0.
128	1	0.	0.	0.	0.	0.	0.
127	1	0.	0.	0.	0.	0.	0.
126	1	0.	0.	0.	0.	0.	0.
125	1	0.	0.	0.	0.	0.	0.
124	1	0.	0.	0.	0.	0.	0.
123	1	0.	0.	0.	0.	0.	0.
122	1	0.	0.	0.	0.	0.	0.
121	1	0.	0.	0.	0.	0.	0.
120	1	0.	0.	0.	0.	0.	0.
119	1	0.	0.	0.	0.	0.	0.
118	1	0.	0.	0.	0.	0.	0.
117	1	0.	0.	0.	0.	0.	0.
116	1	0.	0.	0.	0.	0.	0.
115	1	0.	0.	0.	0.	0.	0.
114	1	0.	0.	0.	0.	0.	0.
113	1	0.	0.	0.	0.	0.	0.
112	1	0.	0.	0.	0.	0.	0.
111	1	0.	0.	0.	0.	0.	0.
110	1	0.	0.	0.	0.	0.	0.

109	1	--31346E-01	0.	--11211E+00	0.	0.
108	1	--52302E-01	0.	--14141E+00	0.	0.
107	1	--74154E-01	0.	--15571E+00	0.	0.
106	1	--91268E-01	0.	--15894E+00	0.	0.
105	1	--97182E-01	0.	--15401E+00	0.	0.
104	1	--39370E-01	0.	--14862E+00	0.	0.
103	1	--62242E-01	0.	--15117E+00	0.	0.
102	1	--43410E-01	0.	--16558E+00	0.	0.
101	1	--18411E-01	0.	--19007E+00	0.	0.
100	1	--73436E-03	0.	--21919E+00	0.	0.
99	1	--11159E-01	0.	--24761E+00	0.	0.
98	1	--13095E-01	0.	--27102E+00	0.	0.
97	1	--83565E-92	0.	--23637E+00	0.	0.
96	1	0.	0.	--29174E+00	0.	0.
95	1	0.	0.	--27568E-01	0.	0.
94	1	--41197E-03	0.	--31674E-01	0.	0.
93	1	--29286E-02	0.	--43660E-01	0.	0.
92	1	--94751E-02	0.	--62496E-01	0.	0.
91	1	--21263E-01	0.	--86003E-01	0.	0.
90	1	--37992E-01	0.	--11037E+00	0.	0.
89	1	--58003E-01	0.	--13116E+00	0.	0.
88	1	--77752E-01	0.	--14543E+00	0.	0.
87	1	--92533E-01	0.	--15263E+00	0.	0.
86	1	--97572E-01	0.	--15485E+00	0.	0.
85	1	--91137E-01	0.	--15695E+00	0.	0.
84	1	--74126E-01	0.	--16396E+00	0.	0.
83	1	--51043E-01	0.	--17867E+00	0.	0.
82	1	--27267E-01	0.	--20079E+00	0.	0.
81	1	--75982E-02	0.	--22746E+00	0.	0.
80	1	--48005E-02	0.	--25455E+00	0.	0.
79	1	--90164E-02	0.	--27775E+00	0.	0.
78	1	--64194E-02	0.	--29336E+00	0.	0.
77	1	0.	0.	--29285E+00	0.	0.
76	1	0.	0.	--29152E-01	0.	0.
75	1	--21628E-02	0.	--33025E-01	0.	0.
74	1	--63769E-02	0.	--44235E-01	0.	0.
73	1	--14329E-01	0.	--61528E-01	0.	0.
72	1	--26854E-01	0.	--82688E-01	0.	0.
71	1	--43462E-01	0.	--12452E+00	0.	0.
70	1	--52270E-01	0.	--12406E+00	0.	0.
69	1	--80074E-01	0.	--13902E+00	0.	0.
68	1	--92968E-01	0.	--14913E+00	0.	0.
67	1	--97525E-01	0.	--15609E+00	0.	0.
66	1	--92184E-01	0.	--16304E+00	0.	0.
65	1	--77817E-01	0.	--17327E+00	0.	0.
64	1	--57460E-01	0.	--18389E+00	0.	0.
63	1	--35237E-01	0.	--21028E+00	0.	0.
62	1	--15435E-01	0.	--23596E+00	0.	0.
61	1	--15002E-02	0.	--26271E+00	0.	0.
60	1	--46775E-02	0.	--28617E+00	0.	0.
59	1	--42497E-02	0.	--32214E+00	0.	0.
58	1	0.	0.	--30778E+00	0.	0.
57	1	0.	0.	--30080E-01	0.	0.
56	1	--43992E-02	0.	--33621E-01	0.	0.
55	1	--10527E-01	0.	--43850E-01	0.	0.
54	1	--19736E-01	0.	--59570E-01	0.	0.
53	1	--32592E-01	0.	--73819E-01	0.	0.
52	1	--43541E-01	0.	--93099E-01	0.	0.
51	1	--55815E-01	0.	--11801E+00	0.	0.
50	1	--81682E-01	0.	--13395E+00	0.	0.

49	1	--.92935E-01	0.	--.14670E+00	0.	0.
48	1	--.97038E-01	0.	--.15741E+00	0.	0.
47	1	--.92806E-01	0.	--.16823E+00	0.	0.
46	1	--.80889E-01	0.	--.18135E+00	0.	0.
45	1	--.53379E-01	0.	--.19843E+00	0.	0.
44	1	--.43113E-01	0.	--.21998E+00	0.	0.
43	1	--.23572E-01	0.	--.24555E+00	0.	0.
42	1	--.85502E-02	0.	--.27258E+00	0.	0.
41	1	--.35358E-03	0.	--.29649E+00	0.	0.
40	1	--.15925E-02	0.	--.31270E+00	0.	0.
39	1	0.	0.	--.31839E+00	0.	0.
38	1	0.	0.	--.30965E-01	0.	0.
37	1	--.75102E-02	0.	--.33960E-01	0.	0.
36	1	--.16155E-01	0.	--.42664E-01	0.	0.
35	1	--.26798E-01	0.	--.56218E-01	0.	0.
34	1	--.39731E-01	0.	--.73210E-01	0.	0.
33	1	--.54436E-01	0.	--.91974E-01	0.	0.
32	1	--.69511E-01	0.	--.11048E+00	0.	0.
31	1	--.82869E-01	0.	--.12784E+00	0.	0.
30	1	--.92714E-01	0.	--.14363E+00	0.	0.
29	1	--.95703E-01	0.	--.15846E+00	0.	0.
28	1	--.92555E-01	0.	--.17359E+00	0.	0.
27	1	--.83279E-01	0.	--.19033E+00	0.	0.
26	1	--.69354E-01	0.	--.20958E+00	0.	0.
25	1	--.52229E-01	0.	--.23177E+00	0.	0.
24	1	--.33645E-01	0.	--.25748E+00	0.	0.
23	1	--.17663E-01	0.	--.28493E+00	0.	0.
22	1	--.73729E-02	0.	--.30875E+00	0.	0.
21	1	--.22660E-02	0.	--.32443E+00	0.	0.
20	1	0.	0.	--.32985E+00	0.	0.
19	1	0.	0.	--.33257E-01	0.	0.
18	1	--.12519E-01	0.	--.35265E-01	0.	0.
17	1	--.25187E-01	0.	--.41227E-01	0.	0.
16	1	--.38038E-01	0.	--.50934E-01	0.	0.
15	1	--.50889E-01	0.	--.63998E-01	0.	0.
14	1	--.63279E-01	0.	--.79844E-01	0.	0.
13	1	--.74471E-01	0.	--.97013E-01	0.	0.
12	1	--.83536E-01	0.	--.11727E+00	0.	0.
11	1	--.87531E-01	0.	--.13771E+00	0.	0.
10	1	--.91737E-01	0.	--.15284E+00	0.	0.
9	1	--.99881E-01	0.	--.18051E+00	0.	0.
8	1	--.84235E-01	0.	--.20267E+00	0.	0.
7	1	--.75472E-01	0.	--.22539E+00	0.	0.
6	1	--.64368E-01	0.	--.24889E+00	0.	0.
5	1	--.49502E-01	0.	--.27508E+00	0.	0.
4	1	--.33071E-01	0.	--.30177E+00	0.	0.
3	1	--.19386E-01	0.	--.32297E+00	0.	0.
2	1	--.37739E-02	0.	--.33624E+00	0.	0.
1	1	0.	0.	--.34071E+00	0.	0.

1)	ELEMENTO (	111	122	133	112	T-MAX	T-MIN	ANGULO	T. EQUIV.
	CRGIO. LOC								
	1 CEN	-14175E+02	-22168E+02	0.	-58635E+00	-14133E+02	-22211E+02	4.17	19.47
	1 L-I	-14475E+02	-21330E+02	0.	-24435E+01	-13640E+02	-22106E+02	-17.63	19.32
	1 J-K	-14387E+02	-22055E+02	0.	-36566E+01	-13351E+02	-23591E+02	-22.79	20.49
	1 I-J	-24099E+02	-21070E+02	0.	-76073E+00	-20889E+02	-24279E+02	-76.67	22.77
	1 K-L	-20535E+02	-83413E+01	0.	-43877E+00	-83255E+01	-20950E+02	-87.94	17.90
2)	ELEMENTO (	111	122	133	112	T-MAX	T-MIN	ANGULO	T. EQUIV.
	CRGIO. LOC								
	1 CEN	-11589E+02	-20082E+02	0.	-12848E+01	-11268E+02	-20465E+02	12.07	17.77
	1 L-I	-11321E+02	-18399E+02	0.	-86752E+00	-11277E+02	-13504E+02	-6.89	16.14
	1 J-K	-12382E+02	-20900E+02	0.	-47782E+01	-10653E+02	-23128E+02	25.00	20.05
	1 I-J	-21796E+02	-17790E+02	0.	-24771E+01	-16603E+02	-22979E+02	-64.48	20.55
	1 K-L	-18631E+02	-64873E+01	0.	-13835E+01	-63317E+01	-13787E+02	-83.58	16.56
3)	ELEMENTO (	111	122	133	112	T-MAX	T-MIN	ANGULO	T. EQUIV.
	CRGIO. LOC								
	1 CEN	-64532E+01	-15498E+02	0.	-33761E+01	-53428E+01	-16620E+02	16.39	14.70
	1 L-I	-53535E+01	-12836E+02	0.	-13210E+01	-51271E+01	-13062E+02	9.72	11.40
	1 J-K	-82035E+01	-17528E+02	0.	-56973E+01	-55086E+01	-20228E+02	25.36	18.11
	1 I-J	-16648E+02	-10573E+02	0.	-44770E+01	-82003E+01	-17021E+02	-62.08	16.52
	1 K-L	-14525E+02	-29888E+01	0.	-24443E+01	-24922E+01	-15921E+02	-78.52	13.94
4)	ELEMENTO (	111	122	133	112	T-MAX	T-MIN	ANGULO	T. EQUIV.
	CRGIO. LOC								
	1 CEN	-12384E+01	-81464E+01	0.	-46782E+01	-31891E+01	-10077E+02	22.43	11.99
	1 L-I	-32249E+01	-45138E+01	0.	-39287E+01	-48690E+01	-61588E+01	22.72	9.57
	1 J-K	-89773E+00	-11588E+02	0.	-58323E+01	-16683E+01	-14154E+02	23.75	15.06
	1 I-J	-82372E+01	-86265E+00	0.	-63113E+01	-49889E+01	-11483E+02	-62.92	13.98
	1 K-L	-80526E+01	-15934E+01	0.	-32959E+01	-26120E+01	-90712E+01	-72.83	10.62
5)	ELEMENTO (	111	122	133	112	T-MAX	T-MIN	ANGULO	T. EQUIV.
	CRGIO. LOC								
	1 CEN	-32315E+00	-91254E+01	0.	-51151E+01	-11364E+02	-25618E+01	-66.36	12.84
	1 L-I	-81565E-01	-13721E+02	0.	-51333E+01	-15421E+02	-17820E+01	-71.68	16.38
	1 J-K	-20351E+01	-67436E+01	0.	-34406E+01	-79314E+01	-32229E+01	-70.95	9.94
	1 I-J	-86519E+01	-29540E+01	0.	-39771E+01	-58604E+01	-42226E+01	17.17	12.54
	1 K-L	-11519E+02	-42765E+00	0.	-46359E+01	-13201E+02	-12548E+01	19.95	13.87
6)	ELEMENTO (	111	122	133	112	T-MAX	T-MIN	ANGULO	T. EQUIV.
	CRGIO. LOC								
	1 CEN	-21986E+01	-16475E+02	0.	-43655E+01	-17708E+02	-96985E+00	-74.28	17.24
	1 L-I	-31860E+01	-22975E+02	0.	-30312E+01	-23429E+02	-27321E+01	-81.48	22.19
	1 J-K	-16355E+00	-12180E+02	0.	-30831E+01	-12925E+02	-58129E+00	-76.42	13.23
	1 I-J	-16355E+02	-19212E+01	0.	-23626E+01	-17218E+02	-15563E+01	8.73	16.49
	1 K-L	-17872E+02	-70895E+00	0.	-36566E+01	-18618E+02	-35447E-01	11.53	18.64
7)	ELEMENTO (	111	122	133	112	T-MAX	T-MIN	ANGULO	T. EQUIV.
	CRGIO. LOC								
	1 CEN	-24722E+01	-22279E+02	0.	-43393E+01	-23188E+02	-15633E+01	-78.17	22.45
	1 L-I	-38719E+01	-30035E+02	0.	-25445E+01	-30280E+02	-35268E+01	-24.50	28.64
	1 J-K	*****	*****	*****	TENSAO ADMISSIVEL ULTRAPASSADA *****	*****	*****	*****	*****
	1 I-J	-17412E+00	-16828E+02	0.	-17214E+02	-17214E+02	-21091E+00	-81.45	17.32
	1 I-J	-22717E+02	-20655E+01	0.	-18930E+01	-22889E+02	-18934E+01	5.19	22.00

1	CEN	-19434E+00	-49111E+01	0.	0.	-35701E+01	-67473E+01	-20305E+01	62.78	7.96
1	L-I	-48588E+00	-43291E+01	0.	0.	-39580E+01	-68073E+01	-19923E+01	57.95	7.99
1	J-K	-44620E+00	-41874E+01	0.	0.	-39602E+01	-66566E+01	-20625E+01	57.64	7.93
1	I-J	-49148E+01	-20216E+00	0.	0.	-35962E+01	-67698E+01	-20571E+01	-27.29	8.00
1	K-L	-35417E+01	-11792E+01	0.	0.	-42015E+01	-67243E+01	-20039E+01	-37.15	7.92
ELEMENTO (15)										
CRGTG.	LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T.	EQUIV.
1	CEN	-68471E+00	-24338E+01	0.	0.	-22408E+01	-53641E+01	36.33	6.77	
1	L-I	-70351E+00	-54034E+01	0.	0.	-11536E+01	-72665E+01	26.06	7.91	
1	J-K	-49795E+00	-10910E+01	0.	0.	-34852E+01	-32810E+01	38.58	6.20	
1	I-J	-25765E+01	-53383E+00	0.	0.	-29023E+01	-15216E+01	-54.69	5.55	
1	K-L	-37949E+01	-65849E+00	0.	0.	-39758E+01	-29586E+01	-59.63	8.95	
ELEMENTO (16)										
CRGTG.	LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T.	EQUIV.
1	CEN	-10453E+01	-86247E+01	0.	0.	-24416E+00	-99142E+01	20.87	10.04	
1	L-I	-17090E+01	-13416E+02	0.	0.	-11240E+01	-14001E+02	12.31	13.47	
1	J-K	-47436E+00	-55471E+01	0.	0.	-15015E+01	-65543E+01	20.71	7.42	
1	I-J	-88745E+01	-76377E+00	0.	0.	-32939E+00	-93089E+01	-77.29	9.15	
1	K-L	-98167E+01	-11493E+00	0.	0.	-11336E+01	-10333E+02	-73.04	11.44	
ELEMENTO (17)										
CRGTG.	LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T.	EQUIV.
1	CEN	-12479E+01	-13060E+02	0.	0.	-65153E+00	-13656E+02	12.37	13.34	
1	L-I	-24264E+01	-19018E+02	0.	0.	-22612E+01	-19183E+02	5.87	18.16	
1	J-K	-45607E+00	-87234E+01	0.	0.	-74191E+00	-90092E+01	9.86	9.40	
1	I-J	-13388E+02	-8502E+00	0.	0.	-83195E+00	-13441E+02	-86.28	13.05	
1	K-L	-13978E+02	-36451E+00	0.	0.	-60840E+01	-14403E+02	-80.13	14.43	
ELEMENTO (18)										
CRGTG.	LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T.	EQUIV.
1	CEN	-12629E+01	-15431E+02	0.	0.	-10343E+01	-15660E+02	7.13	15.17	
1	L-I	-28009E+01	-21872E+02	0.	0.	-27845E+01	-21869E+02	1.88	20.64	
1	J-K	-42179E+00	-10362E+02	0.	0.	-45006E+00	-10391E+02	2.93	10.62	
1	I-J	-15804E+02	-87572E+00	0.	0.	-86905E+00	-15810E+02	88.79	15.39	
1	K-L	-16003E+02	-70549E+00	0.	0.	-57601E+00	-15113E+02	-84.77	15.85	
ELEMENTO (19)										
CRGTG.	LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T.	EQUIV.
1	CEN	-18226E+02	-52990E+01	0.	0.	-48235E+01	-13537E+02	-80.04	16.74	
1	L-I	-19382E+02	-80186E+01	0.	0.	-78378E+01	-19563E+02	-82.86	17.05	
1	J-K	-17309E+02	-23993E+01	0.	0.	-23395E+01	-17868E+02	-86.44	16.92	
1	I-J	-57999E+01	-18776E+02	0.	0.	-48298E+01	-19656E+02	14.10	17.74	
1	K-L	-48694E+01	-17693E+02	0.	0.	-47798E+01	-17783E+02	-4.76	15.94	
ELEMENTO (20)										
CRGTG.	LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T.	EQUIV.
1	CEN	-15623E+02	-43373E+01	0.	0.	-26598E+01	-17301E+02	-70.21	16.14	
1	L-I	-17326E+02	-69379E+01	0.	0.	-44817E+01	-19582E+02	-70.60	16.80	
1	J-K	-15766E+02	-15385E+01	0.	0.	-96110E+00	-15344E+02	-75.83	15.89	
1	I-J	-51570E+01	-17774E+02	0.	0.	-29631E+01	-19968E+02	21.05	18.66	
1	K-L	-25773E+01	-14413E+02	0.	0.	-23364E+01	-14554E+02	8.04	13.64	
ELEMENTO (21)										
CRGTG.	LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T.	EQUIV.
1	CEN	-10337E+02	-21860E+01	0.	0.	-15879E+01	-14611E+02	-61.14	15.47	
1	L-I	-12327E+02	-23735E+01	0.	0.	-73490E+01	-15226E+02	-62.05	17.04	
1	J-K	-11646E+02	-59073E+01	0.	0.	-17958E+01	-13383E+02	-70.23	14.36	
1	I-J	-33869E+01	-14639E+02	0.	0.	-42191E+00	-18448E+02	26.70	18.66	

1	K-L	.92612E+00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
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1	CEN	-22771E+01	-16385E+02	0.	-33168E+01	-17126E+02	-15362E+01	77.41	16.41
1	L-I	-41001E+01	-19773E+02	0.	-47885E+01	-21120E+02	-27529E+01	74.29	19.89
1	J-K	-19349E+01	-12218E+02	0.	-42370E+01	-13745E+02	-45831E+00	70.19	13.52
1	I-J	-15393E+02	-28648E+01	0.	-48676E+01	-18417E+02	-13413E+01	-17.38	17.78
1	K-L	-14845E+02	-27213E+01	0.	-40857E+01	-16093E+02	-14729E+01	-16.99	15.41
30)									
ELEMENTO (									
CRGIO.	LOC	T11	T22	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	CEN	-15227E+01	-13685E+02	0.	-53808E+01	-15724E+02	-51602E+00	69.25	15.99
1	L-I	-33591E+01	-15586E+02	0.	-67789E+01	-18602E+02	-35242E+00	66.01	18.43
1	J-K	-18432E+01	-10154E+02	0.	-55924E+01	-13292E+02	-12897E+01	62.36	13.98
1	I-J	-14224E+02	-25475E+01	0.	-65336E+01	-17143E+02	-37638E+00	-24.11	17.34
1	K-L	-11319E+02	-23255E+01	0.	-61361E+01	-14430E+02	-73350E+00	-26.88	14.84
31)									
ELEMENTO (									
CRGIO.	LOC	T11	T22	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	CEN	-75152E+00	-99779E+01	0.	-66876E+01	-13458E+02	-27683E+01	62.24	15.03
1	L-I	-24156E+01	-10253E+02	0.	-78828E+01	-15138E+02	-24687E+01	58.22	16.51
1	J-K	-16121E+01	-73835E+01	0.	-69565E+01	-12029E+02	-30335E+01	56.27	13.80
1	I-J	-10449E+02	-20818E+01	0.	-73463E+01	-14719E+02	-21387E+01	-30.17	15.93
1	K-L	-70632E+01	-17850E+01	0.	-73764E+01	-12253E+02	-34102E+01	-35.15	14.27
32)									
ELEMENTO (									
CRGIO.	LOC	T11	T22	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	CEN	-30426E-01	-55673E+01	0.	-71146E+01	-10433E+02	-48354E+01	55.63	13.52
1	L-I	-13501E+01	-44405E+01	0.	-75939E+01	-11042E+02	-52514E+01	50.47	14.40
1	J-K	-12718E+01	-41609E+01	0.	-70495E+01	-99124E+01	-44797E+01	50.79	12.76
1	I-J	-59779E+01	-14868E+01	0.	-72622E+01	-11347E+02	-33621E+01	-36.37	13.69
1	K-L	-25560E+01	-11548E+01	0.	-76692E+01	-95565E+01	-53457E+01	-42.39	13.47
33)									
ELEMENTO (									
CRGIO.	LOC	T11	T22	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	CEN	-57326E+00	-11052E+01	0.	-66511E+01	-69675E+01	-64409E+01	48.61	11.62
1	L-I	-28353E+00	-1151CE+01	0.	-71860E+01	-67680E+01	-76355E+01	42.14	12.48
1	J-K	-84943E+00	-87002E+00	0.	-62945E+01	-71542E+01	-54348E+01	45.05	10.94
1	I-J	-14215E+01	-83725E+00	0.	-63351E+01	-74712E+01	-52125E+01	-43.68	11.04
1	K-L	-15767E+01	-4711CE+00	0.	-70233E+01	-65021E+01	-77077E+01	-49.35	12.32
34)									
ELEMENTO (									
CRGIO.	LOC	T11	T22	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	CEN	-10497E+01	-28669E+01	0.	-54237E+01	-35410E+01	-74576E+01	40.25	9.72
1	L-I	-70647E+00	-58834E+01	0.	-55686E+01	-28457E+01	-94355E+01	32.53	11.13
1	J-K	-37867E+00	-20075E+01	0.	-48543E+01	-41842E+01	-53134E+01	38.09	8.70
1	I-J	-26358E+01	-18862E+00	0.	-47259E+01	-36501E+01	-61373E+01	-53.46	8.64
1	K-L	-51191E+01	-21695E+00	0.	-56233E+01	-34662E+01	-83023E+01	-56.78	10.95
35)									
ELEMENTO (									
CRGIO.	LOC	T11	T22	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	CEN	-13311E+01	-58694E+01	0.	-36837E+01	-72631E+00	-79268E+01	29.18	8.31
1	L-I	-15096E+01	-52738E+01	0.	-34866E+01	-17243E+00	-10611E+02	20.97	10.53
1	J-K	-55224E-01	-40794E+01	0.	-30156E+01	-15579E+01	-58926E+01	26.14	6.51
1	I-J	-58413E+01	-41511E+00	0.	-27032E+01	-69616E+00	-69565E+01	-67.56	7.33
1	K-L	-73837E+01	-75693E+00	0.	-37606E+01	-94193E+00	-90825E+01	-65.69	9.59
36)									
ELEMENTO (									
CRGIO.	LOC	T11	T22	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	CEN	-13214E+01	-76203E+01	0.	-16660E+01	-90795E+00	-80337E+01	13.94	7.62
1	L-I	-19675E+01	-11031E+02	0.	-18157E+01	-18157E+01	-11183E+02	7.31	10.40
1	J-K	-32055E+00	-51474E+01	0.	-10174E+01	-11494E+00	-53550E+01	11.42	5.30
1	I-J	-77524E+01	-86015E+00	0.	-51627E+00	-82169E+00	-77969E+01	-95.74	7.41

1	K-L	-82791E+01	-99175E+00	0.	T33	T12	T-MAX	T-PIN	ANGULO	T.	EQUIV.
37)											
ELEMENTO (											
CRGTO. LOC											
1	CEN	-13379E+02	-33186E+00	0.			-45636E+01	-14307E+02	-80.06		14.33
1	L-I	-14504E+02	-15019E+01	0.			-13339E+01	-14772E+02	-83.58		14.15
1	J-K	-13352E+02	-11819E+01	0.			-12488E+01	-13919E+02	-86.19		14.58
1	I-J	-70330E+00	-14574E+02	0.			-67381E+01	-15215E+02	11.87		15.18
1	K-L	-17476E+00	-13414E+02	0.			-19502E+00	-13435E+02	-2.21		13.53
38)											
ELEMENTO (											
CRGTO. LOC											
1	CEN	-11478E+02	-20600E+00	0.			-15045E+01	-13189E+02	-70.05		14.00
1	L-I	-12536E+02	-63400E+00	0.			-83561E+00	-14006E+02	-71.66		14.44
1	J-K	-11731E+02	-15275E+01	0.			-21649E+01	-12568E+02	-77.99		13.78
1	I-J	-95474E+00	-13731E+02	0.			-96383E+00	-15649E+02	19.87		16.15
1	K-L	-15557E+01	-10335E+02	0.			-20453E+01	-10729E+02	10.06		11.88
39)											
ELEMENTO (											
CRGTO. LOC											
1	CEN	-74580E+01	-43131E+00	0.			-42582E+01	-11235E+02	-60.41		13.86
1	L-I	-87506E+01	-86575E+00	0.			-45842E+01	-12465E+02	-62.13		15.28
1	J-K	-83323E+01	-21852E+01	0.			-40721E+01	-10269E+02	-68.73		12.60
1	I-J	-58327E+00	-10567E+02	0.			-30569E+01	-14613E+02	27.01		16.36
1	K-L	-34399E+01	-58876E+01	0.			-55418E+01	-77394E+01	22.96		11.74
40)											
ELEMENTO (											
CRGTO. LOC											
1	CEN	-27790E+01	-16581E+01	0.			-76183E+01	-87383E+01	-52.87		14.18
1	L-I	-41618E+01	-28106E+01	0.			-86736E+01	-10025E+02	-55.95		16.21
1	J-K	-40677E+01	-31470E+01	0.			-67469E+01	-75675E+01	-60.02		12.49
1	I-J	-51708E+00	-67220E+01	0.			-58474E+01	-12059E+02	33.09		15.82
1	K-L	-53399E+01	-13679E+01	0.			-95834E+01	-56114E+01	31.90		13.31
41)											
ELEMENTO (											
CRGTO. LOC											
1	CEN	-11528E+01	-33526E+01	0.			-10429E+02	-58835E+01	-48.95		14.31
1	L-I	-95024E+01	-52714E+01	0.			-11834E+02	-65581E+01	-53.44		16.22
1	J-K	-35206E+00	-43535E+01	0.			-92196E+01	-52184E+01	-54.51		12.66
1	I-J	-24829E+01	-21679E+01	0.			-85791E+01	-82542E+01	36.99		14.59
1	K-L	-70655E+01	-17105E+01	0.			-12452E+02	-35762E+01	35.30		14.64
42)											
ELEMENTO (											
CRGTO. LOC											
1	CEN	-33433E+01	-55315E+01	0.			-11685E+02	-30057E+01	-49.22		13.64
1	L-I	-24725E+01	-81742E+01	0.			-13594E+02	-29468E+01	-55.09		15.28
1	J-K	-17527E+01	-56036E+01	0.			-10419E+02	-39631E+01	-53.30		12.24
1	I-J	-50184E+01	-11372E+01	0.			-10305E+02	-41498E+01	37.21		12.89
1	K-L	-85867E+01	-29172E+01	0.			-13574E+02	-19698E+01	34.11		14.66
43)											
ELEMENTO (											
CRGTO. LOC											
1	CEN	-38392E+01	-76185E+01	0.			-12002E+02	-49400E+00	-53.68		12.26
1	L-I	-35408E+01	-10979E+02	0.			-14261E+02	-25374E+00	-61.04		14.13
1	J-K	-23140E+01	-65974E+01	0.			-10097E+02	-11354E+01	-56.16		10.74
1	I-J	-74475E+01	-25702E+01	0.			-10682E+02	-65467E+00	32.27		11.03
1	K-L	-10039E+02	-29591E+01	0.			-13424E+02	-42601E+00	29.63		13.64
44)											
ELEMENTO (											
CRGTO. LOC											
1	CEN	-38392E+01	-76185E+01	0.			-12002E+02	-49400E+00	-53.68		12.26
1	L-I	-35408E+01	-10979E+02	0.			-14261E+02	-25374E+00	-61.04		14.13
1	J-K	-23140E+01	-65974E+01	0.			-10097E+02	-11354E+01	-56.16		10.74
1	I-J	-74475E+01	-25702E+01	0.			-10682E+02	-65467E+00	32.27		11.03
1	K-L	-10039E+02	-29591E+01	0.			-13424E+02	-42601E+00	29.63		13.64
45)											
ELEMENTO (											
CRGTO. LOC											
1	CEN	-38392E+01	-76185E+01	0.			-12002E+02	-49400E+00	-53.68		12.26
1	L-I	-35408E+01	-10979E+02	0.			-14261E+02	-25374E+00	-61.04		14.13
1	J-K	-23140E+01	-65974E+01	0.			-10097E+02	-11354E+01	-56.16		10.74
1	I-J	-74475E+01	-25702E+01	0.			-10682E+02	-65467E+00	32.27		11.03
1	K-L	-10039E+02	-29591E+01	0.			-13424E+02	-42601E+00	29.63		13.64

1	CEN	-34925E+01	.92346E+01	0.	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-37243E+01	-13000E+02	0.			-10511E+02	-25544E+01	-79.47	9.50
1	J-K	-20960E+01	.71845E+01	0.			-13598E+02	-35511E+01	-85.73	12.60
1	I-J	-92969E+01	.27511E+01	0.			-75163E+01	-15840E+01	-82.52	6.83
1	K-L	-10773E+02	.26275E+01	0.			-10475E+02	-25420E+01	0.53	9.46
45)										
ELEMENTO (										
CRGTO.	LJC									
1	CEN	-28204E+01	.10245E+02	0.	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-36991E+01	.13540E+02	0.			-13598E+02	-35511E+01	-85.73	12.60
1	J-K	-17329E+01	.74174E+01	0.			-75163E+01	-15840E+01	-82.52	6.83
1	I-J	-10474E+02	.25427E+01	0.			-10475E+02	-25420E+01	0.53	9.46
1	K-L	-10761E+02	.23533E+01	0.			-11000E+02	-21146E+01	9.43	10.11
46)										
ELEMENTO (										
CRGTO.	LJC									
1	CEN	-22048E+01	.10677E+02	0.	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-34405E+01	.13773E+02	0.			-10868E+02	-20134E+01	81.55	10.01
1	J-K	-15756E+01	.74702E+01	0.			-80229E+01	-11229E+01	73.56	7.52
1	I-J	-11040E+02	.24713E+01	0.			-11720E+02	-15912E+01	-15.72	11.03
1	K-L	-10351E+02	.22107E+01	0.			-10314E+02	-19779E+01	-9.62	9.48
47)										
ELEMENTO (										
CRGTO.	LJC									
1	CEN	-17110E+01	.10516E+02	0.	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-32234E+01	.12565E+02	0.			-11554E+02	-27301E+00	59.46	11.82
1	J-K	-17727E+01	.73843E+01	0.			-14632E+02	-11570E+01	65.95	14.09
1	I-J	-10977E+02	.24616E+01	0.			-96929E+01	-53582E+00	61.64	9.97
1	K-L	-88595E+01	.21577E+01	0.			-13269E+02	-16950E+00	-24.73	13.19
48)										
ELEMENTO (										
CRGTO.	LJC									
1	CEN	-12919E+01	.96846E+01	0.	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-28976E+01	.10448E+02	0.			-12725E+02	-17482E+01	62.72	13.68
1	J-K	-19327E+01	.70014E+01	0.			-11114E+02	-21795E+01	59.19	15.29
1	I-J	-10204E+02	.25346E+01	0.			-14089E+02	-13504E+01	-30.11	12.35
1	K-L	-71488E+01	.20654E+01	0.			-11440E+02	-22260E+01	-34.03	14.81
49)										
ELEMENTO (										
CRGTO.	LJC									
1	CEN	-90003E+00	.81155E+01	0.	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-24410E+01	.76156E+01	0.			-12603E+02	-35877E+01	58.23	14.73
1	J-K	-20169E+01	.61010E+01	0.			-13727E+02	-35707E+01	53.65	15.88
1	I-J	-86477E+01	.24834E+01	0.			-11636E+02	-35177E+01	52.82	13.74
1	K-L	-50045E+01	.19015E+01	0.			-13824E+02	-26986E+01	-34.06	15.35
50)										
ELEMENTO (										
CRGTO.	LJC									
1	CEN	-56978E+00	.58407E+01	0.	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-19225E+01	.43430E+01	0.			-11383E+02	-49728E+01	54.40	14.52
1	J-K	-19815E+01	.45539E+01	0.			-11859E+02	-55927E+01	48.99	15.43
1	I-J	-63186E+01	.22695E+01	0.			-10975E+02	-44398E+01	49.80	13.74
1	K-L	-25405E+01	.16524E+01	0.			-12357E+02	-37685E+01	-37.73	14.61
51)										
ELEMENTO (										
CRGTO.	LJC									
1	CEN	-32954E+00	.31053E+01	0.	T33	T12	T-MAX	T-PIN	ANGULO	T. EQUIV.
1	L-I	-13368E+01	.10205E+01	0.			-91105E+01	-55757E+01	50.41	12.92
1	J-K	-18354E+01	.25153E+01	0.			-91196E+01	-67123E+01	44.34	13.76
1	I-J	-35331E+01	.19619E+01	0.			-91122E+01	-47914E+01	46.46	12.23
1	K-L			0.			-98237E+01	-43587E+01	-41.88	12.58

I K-L 30207E+01 13744E+01 0. 77092E+01 84407E+01 70362E+01 47.49 13.42

ELEMENTO (52)

CRGTO. LOC T11 T22 T33 T12 T-MAX T-MIN ANGULO T. EQUIV.
I CEN 11583E+00 41503E+00 0. 58490E+01 61164E+01 55855E+01 45.73 10.14
I L-I 77116E+00 18580E+01 0. 62365E+01 58143E+01 69411E+01 38.96 11.06
I J-K 14464E+01 51372E+00 0. 53979E+01 63980E+01 44379E+01 42.53 9.44
I I-J 71743E+00 15668E+01 0. 54319E+01 65906E+01 43063E+01 47.24 9.51
I K-L 20742E+01 85163E+00 0. 61359E+01 56566E+01 69191E+01 51.71 10.94

ELEMENTO (53)

CRGTO. LOC T11 T22 T33 T12 T-MAX T-MIN ANGULO T. EQUIV.
I CEN 59360E+01 17347E+01 0. 38325E+01 30265E+01 43196E+01 38.83 6.85
I L-I 13563E+00 40260E+01 0. 39384E+01 25091E+01 63995E+01 31.08 7.96
I J-K 98398E+00 57475E+00 0. 33617E+01 35099E+01 34947E+01 36.86 6.07
I I-J 15780E+01 99065E+00 0. 32553E+01 32058E+01 37932E+01 55.77 6.07
I K-L 33760E+01 37724E+00 0. 40097E+01 29277E+01 59265E+01 57.54 7.81

ELEMENTO (54)

CRGTO. LOC T11 T22 T33 T12 T-MAX T-MIN ANGULO T. EQUIV.
I CEN 48480E+02 30807E+01 0. 15212E+01 62042E+01 37059E+01 22.34 4.05
I L-I 27208E+00 51359E+01 0. 13410E+01 73144E+01 54811E+01 14.44 5.52
I J-K 67398E+00 17570E+01 0. 11363E+01 11224E+01 22054E+01 21.54 2.93
I I-J 31094E+01 45192E+00 0. 83777E+00 63516E+01 32968E+01 77.40 3.56
I K-L 37279E+01 21433E+00 0. 16288E+01 80021E+00 43137E+01 70.22 4.76

ELEMENTO (55)

CRGTO. LOC T11 T22 T33 T12 T-MAX T-MIN ANGULO T. EQUIV.
I CEN 10058E+02 26067E+01 0. 21902E+01 29748E+01 10426E+02 80.46 12.19
I L-I 10562E+02 21031E+01 0. 12733E+01 22298E+01 10689E+02 84.32 11.96
I J-K 10149E+02 35775E+01 0. 86504E+00 36327E+01 10204E+02 86.39 12.43
I I-J 23437E+01 10711E+02 0. 25602E+01 28307E+01 11198E+02 10.74 12.05
I K-L 31195E+01 96544E+01 0. 39606E+00 31318E+01 96667E+01 1.77 11.56

ELEMENTO (56)

CRGTO. LOC T11 T22 T33 T12 T-MAX T-MIN ANGULO T. EQUIV.
I CEN 80370E+01 24775E+01 0. 40852E+01 38781E+01 94376E+01 71.08 11.86
I L-I 88587E+01 23848E+01 0. 37259E+01 35066E+01 99905E+01 73.24 12.13
I J-K 84902E+01 37368E+01 0. 25733E+01 42563E+01 90097E+01 78.59 11.73
I I-J 18412E+01 10012E+02 0. 45182E+01 33869E+01 11538E+02 18.66 13.54
I K-L 40863E+01 70341E+01 0. 18628E+01 43900E+01 73379E+01 9.26 10.26

ELEMENTO (57)

CRGTO. LOC T11 T22 T33 T12 T-MAX T-MIN ANGULO T. EQUIV.
I CEN 48004E+01 25681E+01 0. 56542E+01 56324E+01 78647E+01 61.54 11.74
I L-I 58979E+01 28080E+01 0. 58250E+01 57851E+01 83022E+01 63.50 12.72
I J-K 55765E+01 40287E+01 0. 41466E+01 55712E+01 71189E+01 69.60 11.02
I I-J 77095E+01 16709E+01 0. 60925E+01 46774E+01 10713E+02 26.22 13.67
I K-L 50822E+01 35114E+01 0. 39795E+01 66419E+01 50711E+01 21.40 10.17

ELEMENTO (58)

CRGTO. LOC T11 T22 T33 T12 T-MAX T-MIN ANGULO T. EQUIV.
I CEN 12542E+01 28012E+01 0. 68938E+01 78194E+01 61924E+01 53.58 12.16
I L-I 25049E+01 35848E+01 0. 71945E+01 83521E+01 72724E+01 56.47 13.54
I J-K 22303E+01 43951E+01 0. 39455E+01 73933E+01 52589E+01 60.85 11.03
I I-J 19397E+01 43513E+01 0. 70738E+01 65240E+01 89756E+01 32.95 13.46
I K-L 59237E+01 21808E+00 0. 56012E+01 92406E+01 35350E+01 30.63 11.43

ELEMENTO (59)

CRGTO. LOC T11 T22 T33 T12 T-MAX T-MIN ANGULO T. EQUIV.
I CEN 12542E+01 28012E+01 0. 68938E+01 78194E+01 61924E+01 53.58 12.16
I L-I 25049E+01 35848E+01 0. 71945E+01 83521E+01 72724E+01 56.47 13.54
I J-K 22303E+01 43951E+01 0. 39455E+01 73933E+01 52589E+01 60.85 11.03
I I-J 19397E+01 43513E+01 0. 70738E+01 65240E+01 89756E+01 32.95 13.46
I K-L 59237E+01 21808E+00 0. 56012E+01 92406E+01 35350E+01 30.63 11.43

1	CEN	-15925E+01	-34378E+01	0.	-69621E+01	-94592E+01	-45589E+01	-48.96	12.42
1	L-I	-27981E+00	-45304E+01	0.	-74888E+01	-10190E+02	-53795E+01	-52.92	13.70
1	J-K	-33303E+00	-47207E+01	0.	-59902E+01	-89061E+01	-33524E+01	-55.06	11.33
1	I-J	-26729E+01	-11284E+01	0.	-71709E+01	-81508E+01	-66463E+01	37.58	12.27
1	K-L	-65104E+01	-18257E+01	0.	-63343E+01	-10921E+02	-25853E+01	34.85	12.42
ELEMENTO (60)									
CRGTO.	LOC	III	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	-28190E+01	-40143E+01	0.	-63147E+01	-97596E+01	-29263E+01	-47.70	11.51
1	L-I	-18322E+01	-56398E+01	0.	-66564E+01	-10677E+02	-31554E+01	-52.88	12.56
1	J-K	-16902E+01	-46325E+01	0.	-56429E+01	-89594E+01	-27267E+01	-52.52	10.59
1	I-J	-35423E+01	-99463E+00	0.	-61993E+01	-85573E+01	-40606E+01	35.19	11.19
1	K-L	-85903E+01	-24395E+01	0.	-60692E+01	-10596E+02	-18657E+01	35.35	12.04
ELEMENTO (61)									
CRGTO.	LOC	III	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	-28472E+01	-42425E+01	0.	-48841E+01	-85014E+01	-13716E+01	-49.18	9.28
1	L-I	-24331E+01	-66307E+01	0.	-49945E+01	-99496E+01	-89578E+00	-56.40	10.42
1	J-K	-16411E+01	-38020E+01	0.	-44155E+01	-72673E+01	-18242E+01	-51.88	8.33
1	I-J	-41025E+01	-17145E+01	0.	-43091E+01	-73801E+01	-15627E+01	37.26	8.27
1	K-L	-63151E+01	-21270E+01	0.	-50473E+01	-96855E+01	-12434E+01	33.73	10.36
ELEMENTO (62)									
CRGTO.	LOC	III	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	-22911E+01	-42288E+01	0.	-29760E+01	-63590E+01	-70960E+01	-54.41	6.32
1	L-I	-24117E+01	-72729E+01	0.	-28919E+01	-85200E+01	-10646E+01	-65.02	8.14
1	J-K	-19788E+01	-25127E+01	0.	-26352E+01	-45263E+01	-93525E+00	-52.61	5.06
1	I-J	-42388E+01	-15596E+01	0.	-19290E+01	-52870E+01	-55137E+00	27.36	5.03
1	K-L	-55049E+01	-15066E+01	0.	-35537E+01	-75831E+01	-57169E+00	30.32	7.88
ELEMENTO (63)									
CRGTO.	LOC	III	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	-15177E+01	-42397E+01	0.	-86545E+00	-44916E+01	-12658E+01	-73.77	4.01
1	L-I	-22805E+01	-75567E+01	0.	-63611E+00	-76323E+01	-22049E+01	-83.22	6.80
1	J-K	-60975E+00	-15897E+01	0.	-59839E+00	-18731E+01	-32633E+00	-64.66	1.73
1	I-J	-44594E+01	-12135E+01	0.	-47849E+00	-45275E+01	-11444E+01	-6.22	4.03
1	K-L	-47104E+01	-11325E+01	0.	-17000E+01	-53894E+01	-45353E+00	21.77	5.18
ELEMENTO (64)									
CRGTO.	LOC	III	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	-10389E+01	-47442E+01	0.	-11721E+01	-50878E+01	-74539E+00	73.66	4.76
1	L-I	-21884E+01	-76138E+01	0.	-15858E+01	-80438E+01	-17584E+01	74.84	7.32
1	J-K	-56303E+00	-18087E+01	0.	-13712E+01	-26919E+01	-32015E+00	57.21	2.87
1	I-J	-50844E+01	-12372E+01	0.	-25074E+01	-63211E+01	-43133E+03	-26.25	6.32
1	K-L	-43555E+01	-98925E+00	0.	-43880E+00	-44117E+01	-93299E+00	-7.31	4.03
ELEMENTO (65)									
CRGTO.	LOC	III	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	-90118E+00	-57418E+01	0.	-31243E+01	-72736E+01	-63061E+00	83.88	7.61
1	L-I	-21306E+01	-74845E+01	0.	-37274E+01	-93966E+01	-21851E+00	82.84	9.29
1	J-K	-91348E+00	-31378E+01	0.	-32963E+01	-55044E+01	-14533E+01	54.32	6.36
1	I-J	-61329E+01	-14865E+01	0.	-41541E+01	-85694E+01	-94960E+00	-30.39	9.08
1	K-L	-44826E+01	-11836E+01	0.	-28293E+01	-61082E+01	-44169E+00	-29.88	6.34
ELEMENTO (66)									
CRGTO.	LOC	III	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	CEN	-87158E+00	-65915E+01	0.	-48562E+01	-94428E+01	-13798E+01	60.47	10.51
1	L-I	-21091E+01	-70506E+01	0.	-56340E+01	-10731E+02	-15728E+01	56.84	11.60
1	J-K	-14547E+01	-47161E+01	0.	-48857E+01	-83315E+01	-21600E+01	54.06	9.60
1	I-J	-71120E+01	-19198E+01	0.	-54552E+01	-10557E+02	-15254E+01	-32.28	11.40

ELEMENTO (67)									
1	K-L	-46204E+01	-14737E+01	0.	T33	T12	T-MAX	-22930E+01	-36.43 9.74
CRGIO. LOC									
1	CEN	-89550E+00	-70492E+01	0.	T33	T12	T-MAX	T-MIN	ANGULO T. EQUIV.
1	L-I	-20794E+01	-61185E+01	0.					
1	J-K	-19757E+01	-57483E+01	0.					
1	I-J	-74525E+01	-22696E+01	0.					
1	K-L	-43493E+01	-18082E+01	0.					
ELEMENTO (68)									
CRGIO. LOC									
1	CEN	-10291E+01	-64248E+01	0.	T33	T12	T-MAX	T-MIN	ANGULO T. EQUIV.
1	L-I	-21291E+01	-45553E+01	0.					
1	J-K	-24274E+01	-56608E+01	0.					
1	I-J	-67993E+01	-24517E+01	0.					
1	K-L	-34100E+01	-22138E+01	0.					
ELEMENTO (69)									
CRGIO. LOC									
1	CEN	-13194E+01	-48075E+01	0.	T33	T12	T-MAX	T-MIN	ANGULO T. EQUIV.
1	L-I	-22933E+01	-26492E+01	0.					
1	J-K	-27725E+01	-43562E+01	0.					
1	I-J	-51114E+01	-26502E+01	0.					
1	K-L	-19993E+01	-25539E+01	0.					
ELEMENTO (70)									
CRGIO. LOC									
1	CEN	-15201E+01	-27517E+01	0.	T33	T12	T-MAX	T-MIN	ANGULO T. EQUIV.
1	L-I	-22183E+01	-72583E+01	0.					
1	J-K	-27694E+01	-26658E+01	0.					
1	I-J	-30410E+01	-28740E+01	0.					
1	K-L	-34396E+01	-22847E+01	0.					
ELEMENTO (71)									
CRGIO. LOC									
1	CEN	-15117E+01	-98756E+01	0.	T33	T12	T-MAX	T-MIN	ANGULO T. EQUIV.
1	L-I	-18415E+01	-73632E+01	0.					
1	J-K	-24124E+01	-13026E+01	0.					
1	I-J	-11714E+01	-25164E+01	0.					
1	K-L	-60399E+00	-19117E+01	0.					
ELEMENTO (72)									
CRGIO. LOC									
1	CEN	-16194E+01	-18578E+01	0.	T33	T12	T-MAX	T-MIN	ANGULO T. EQUIV.
1	L-I	-15408E+01	-15143E+01	0.					
1	J-K	-21170E+01	-54368E+01	0.					
1	I-J	-27971E+01	-20316E+01	0.					
1	K-L	-78666E+00	-17552E+01	0.					
ELEMENTO (73)									
CRGIO. LOC									
1	CEN	-70084E+01	-45908E+01	0.	T33	T12	T-MAX	T-MIN	ANGULO T. EQUIV.
1	L-I	-73354E+01	-43518E+01	0.					
1	J-K	-71316E+01	-52583E+01	0.					
1	I-J	-43302E+01	-75630E+01	0.					
1	K-L	-50225E+01	-66740E+01	0.					
ELEMENTO (74)									
CRGIO. LOC									
1	CEN	-70084E+01	-45908E+01	0.	T33	T12	T-MAX	T-MIN	ANGULO T. EQUIV.
1	L-I	-73354E+01	-43518E+01	0.					
1	J-K	-71316E+01	-52583E+01	0.					
1	I-J	-43302E+01	-75630E+01	0.					
1	K-L	-50225E+01	-66740E+01	0.					

[illegible]

FORMULÁRIO 4470-200-208 ENCOMENDA PARA USO EXCLUSIVO DO COMENDANTE									
82)	14863E+01	-18923E+00	0.	-20818E+01	-15955E+01	-28926E+01	55.96	3.94	
ELEMENTO (									
CRGTG. LOC									
1 CEN	T11	T22		T12	T-MAX	T-PIN	ANGULO	T. EQUIV.	
1 L-I	-26986E+00	-13594E+01	0.	-63969E+00	-49680E+00	-15164E+01	18.73	1.91	
1 J-K	-13563E+01	-20308E+01	0.	-57948E+00	-23641E+01	-10231E+01	60.10	2.05	
1 I-J	-50472E+00	-46156E+01	0.	-40158E+00	-46586E+00	-46545E+01	5.53	4.44	
1 K-L	-10071E+01	-32341E+00	0.	-23325E+01	-20741E+01	-27578E+01	-52.99	4.20	
	-13744E+01	-20100E+00	0.	-13236E+01	-66011E+00	-22356E+01	56.95	2.63	
83)									
ELEMENTO (									
CRGTG. LOC									
1 CEN	T11	T22		T12	T-MAX	T-PIN	ANGULO	T. EQUIV.	
1 L-I	-26954E+00	-11558E+01	0.	-14929E+01	-22558E+01	-83042E+00	53.62	2.80	
1 J-K	-11745E+01	-32107E+01	0.	-16964E+01	-41710E+01	-21418E+00	60.49	4.07	
1 I-J	-28522E+01	-10259E+01	0.	-14219E+01	-95982E+00	-23743E+01	34.80	2.69	
1 K-L	-15386E+01	-61464E+00	0.	-26003E+01	-37176E+01	-15644E+01	-39.96	4.70	
	-69324E+00	-84303E+01	0.	-52111E+00	-99231E+00	-21475E+00	-29.85	1.12	
84)									
ELEMENTO (									
CRGTG. LOC									
1 CEN	T11	T22		T12	T-MAX	T-PIN	ANGULO	T. EQUIV.	
1 L-I	-46475E+00	-44378E+01	0.	-27742E+01	-58634E+01	-93085E+00	62.80	6.40	
1 J-K	-11763E+01	-46385E+01	0.	-32975E+01	-66320E+01	-81675E+00	52.85	7.08	
1 I-J	-80328E+00	-32958E+01	0.	-28822E+01	-51688E+01	-10927E+01	56.70	5.81	
1 K-L	-47291E+01	-12144E+01	0.	-31607E+01	-65882E+01	-84469E+00	-30.46	6.93	
	-31962E+01	-66541E+00	0.	-30015E+01	-51881E+01	-13266E+01	-33.57	5.96	
85)									
ELEMENTO (									
CRGTG. LOC									
1 CEN	T11	T22		T12	T-MAX	T-PIN	ANGULO	T. EQUIV.	
1 L-I	-74771E+00	-67604E+01	0.	-43276E+01	-90235E+01	-15153E+01	62.39	9.87	
1 J-K	-14429E+01	-55991E+01	0.	-50439E+01	-89762E+01	-19342E+01	56.20	10.08	
1 I-J	-16350E+01	-62851E+01	0.	-45542E+01	-90734E+01	-11533E+01	58.52	9.70	
1 K-L	-70339E+01	-17316E+01	0.	-42161E+01	-93402E+01	-60465E+00	-28.99	9.66	
	-47950E+01	-14857E+01	0.	-53262E+01	-87177E+01	-24370E+01	-36.37	10.16	
86)									
ELEMENTO (									
CRGTG. LOC									
1 CEN	T11	T22		T12	T-MAX	T-PIN	ANGULO	T. EQUIV.	
1 L-I	-12357E+01	-76695E+01	0.	-56348E+01	-10941E+02	-20359E+01	59.86	12.09	
1 J-K	-19509E+01	-55274E+01	0.	-63855E+01	-10370E+02	-28920E+01	52.82	12.03	
1 I-J	-25388E+01	-76271E+01	0.	-82626E+01	-11474E+02	-13078E+01	56.73	12.18	
1 K-L	-78693E+01	-23465E+01	0.	-51741E+01	-10973E+02	-75695E+00	-30.96	11.37	
	-51634E+01	-24311E+01	0.	-69840E+01	-10914E+02	-33192E+01	-39.47	12.90	
87)									
ELEMENTO (									
CRGTG. LOC									
1 CEN	T11	T22		T12	T-MAX	T-PIN	ANGULO	T. EQUIV.	
1 L-I	-20917E+01	-68799E+01	0.	-62769E+01	-11204E+02	-22322E+01	55.44	12.47	
1 J-K	-28436E+01	-44161E+01	0.	-67983E+01	-10473E+02	-32137E+01	48.30	12.40	
1 I-J	-35490E+01	-69353E+01	0.	-64197E+01	-11881E+02	-13971E+01	52.39	12.64	
1 K-L	-69305E+01	-29399E+01	0.	-56937E+01	-11002E+02	-10811E+01	-35.23	11.58	
	-42561E+01	-37568E+01	0.	-73931E+01	-114091E+02	-33861E+01	-44.01	13.43	
88)									
ELEMENTO (									
CRGTG. LOC									
1 CEN	T11	T22		T12	T-MAX	T-PIN	ANGULO	T. EQUIV.	
1 L-I	-29231E+01	-48557E+01	0.	-53567E+01	-92517E+01	-15129E+01	50.37	10.19	
1 J-K	-34765E+01	-28664E+01	0.	-57447E+01	-89202E+01	-25813E+01	43.48	10.46	
1 I-J	-40270E+01	-48322E+01	0.	-51531E+01	-96302E+01	-77907E+00	47.22	10.05	
1 K-L	-50774E+01	-39840E+01	0.	-49330E+01	-94939E+01	-43246E+00	-41.84	9.72	
	-25673E+01	-37289E+01	0.	-59401E+01	-91165E+01	-23203E+01	-47.79	10.81	
89)									
ELEMENTO (									
CRGTG. LOC									
1 CEN	T11	T22		T12	T-MAX	T-PIN	ANGULO	T. EQUIV.	
1 L-I	-29231E+01	-48557E+01	0.	-53567E+01	-92517E+01	-15129E+01	50.37	10.19	
1 J-K	-34765E+01	-28664E+01	0.	-57447E+01	-89202E+01	-25813E+01	43.48	10.46	
1 I-J	-40270E+01	-48322E+01	0.	-51531E+01	-96302E+01	-77907E+00	47.22	10.05	
1 K-L	-50774E+01	-39840E+01	0.	-49330E+01	-94939E+01	-43246E+00	-41.84	9.72	
	-25673E+01	-37289E+01	0.	-59401E+01	-91165E+01	-23203E+01	-47.79	10.81	

1	CEN	-29901E+01	-28715E+01	0.	T33	T12	T22	T11	90)	ELEMENTO (	CRGTO. LOC	1	CEN	-64947E+01	-35634E+01	-63312E+00	44.52	6.83
1	L-I	-34207E+01	-15650E+01	0.		-17413E+01	-15650E+01	-31680E+01				1	L-I	-63366E+01	-37222E+01	-13309E+01	38.07	7.10
1	J-K	-37734E+01	-28445E+01	0.		-21227E+01	-28445E+01	-35533E+01				1	J-K	-66432E+01	-33018E+01	-25331E+01	41.00	6.66
1	I-J	-30511E+01	-38644E+01	0.		-35562E+01	-38644E+01	-17309E+01				1	I-J	-67828E+01	-33091E+01	-13266E+00	-48.51	6.72
1	K-L	-13658E+01	-34415E+01	0.		-32973E+01	-34415E+01	-11322E+01				1	K-L	-62414E+01	-36945E+01	-16337E+01	-52.85	7.07
										ELEMENTO (		CRGTO. LOC		T-MAX	T-MIN	ANGULO	T. EQUIV.	
1	CEN	-46807E+01	-58931E+01	0.	T33	T12	T22	T11	91)	ELEMENTO (	CRGTO. LOC	1	CEN	-39512E+01	-95809E+00	30.77	3.57	
1	L-I	-49532E+01	-58655E+01	0.		-24573E+00	-58655E+01	-31958E+01				1	L-I	-37457E+01	-29583E+00	23.53	3.61	
1	J-K	-48342E+01	-63261E+01	0.		-21227E+01	-63261E+01	-35533E+01				1	J-K	-41429E+01	-15332E+01	26.33	3.63	
1	I-J	-57317E+01	-51346E+01	0.		-35562E+01	-51346E+01	-17309E+01				1	I-J	-40204E+01	-13166E+01	-65.57	3.55	
1	K-L	-62683E+01	-44406E+01	0.		-32973E+01	-44406E+01	-11322E+01				1	K-L	-39409E+01	-53567E+00	-64.22	3.70	
										ELEMENTO (		CRGTO. LOC		T-MAX	T-MIN	ANGULO	T. EQUIV.	
1	CEN	-32779E+01	-59318E+01	0.	T33	T12	T22	T11	92)	ELEMENTO (	CRGTO. LOC	1	CEN	-61593E+01	-49469E+01	-81.09	9.54	
1	L-I	-38371E+01	-59220E+01	0.		-59220E+01	-59220E+01	-49532E+01				1	L-I	-59339E+01	-50315E+01	-85.47	9.51	
1	J-K	-36254E+01	-67382E+01	0.		-67382E+01	-67382E+01	-36254E+01				1	J-K	-63647E+01	-43728E+01	-86.64	9.76	
1	I-J	-54339E+01	-46602E+01	0.		-46602E+01	-46602E+01	-54339E+01				1	I-J	-60432E+01	-54460E+01	-9.48	9.95	
1	K-L	-70426E+01	-25584E+01	0.		-25584E+01	-25584E+01	-70426E+01				1	K-L	-62778E+01	-44504E+01	-1.71	9.34	
										ELEMENTO (		CRGTO. LOC		T-MAX	T-MIN	ANGULO	T. EQUIV.	
1	CEN	-11019E+01	-61228E+01	0.	T33	T12	T22	T11	93)	ELEMENTO (	CRGTO. LOC	1	CEN	-79317E+01	-41592E+01	-73.54	9.59	
1	L-I	-19147E+01	-61781E+01	0.		-61781E+01	-61781E+01	-19147E+01				1	L-I	-76794E+01	-44189E+01	-76.69	9.57	
1	J-K	-15997E+01	-73029E+01	0.		-73029E+01	-73029E+01	-15997E+01				1	J-K	-70574E+01	-37447E+01	-80.19	9.65	
1	I-J	-55050E+01	-29890E+01	0.		-29890E+01	-29890E+01	-55050E+01				1	I-J	-74455E+01	-55375E+01	16.51	10.49	
1	K-L	-77870E+01	-26158E+00	0.		-26158E+00	-26158E+00	-77870E+01				1	K-L	-84233E+01	-25810E+01	6.41	8.82	
										ELEMENTO (		CRGTO. LOC		T-MAX	T-MIN	ANGULO	T. EQUIV.	
1	CEN	-87703E+00	-65684E+01	0.	T33	T12	T22	T11	94)	ELEMENTO (	CRGTO. LOC	1	CEN	-92376E+01	-17922E+01	-60.53	10.25	
1	L-I	-17654E+00	-63580E+01	0.		-63580E+01	-63580E+01	-17654E+00				1	L-I	-86955E+01	-25140E+01	-62.83	10.19	
1	J-K	-34916E+00	-82355E+01	0.		-82355E+01	-82355E+01	-34916E+00				1	J-K	-97693E+01	-11847E+01	-68.03	10.41	
1	I-J	-59686E+01	-77076E+00	0.		-77076E+00	-77076E+00	-59686E+01				1	I-J	-89578E+01	-37600E+01	29.00	11.32	
1	K-L	-84152E+01	-12775E+01	0.		-12775E+01	-12775E+01	-84152E+01				1	K-L	-95193E+01	-17378E+00	20.10	9.43	
										ELEMENTO (		CRGTO. LOC		T-MAX	T-MIN	ANGULO	T. EQUIV.	
1	CEN	-17139E+01	-68304E+01	0.	T33	T12	T22	T11	95)	ELEMENTO (	CRGTO. LOC	1	CEN	-92954E+04	-75111E+00	-50.31	9.69	
1	L-I	-56280E+00	-59735E+01	0.		-59735E+01	-59735E+01	-56280E+00				1	L-I	-81631E+01	-15268E+01	-61.79	9.09	
1	J-K	-13799E+01	-89561E+01	0.		-89561E+01	-89561E+01	-13799E+01				1	J-K	-10378E+02	-23811E+01	-68.30	10.39	
1	I-J	-63357E+01	-69588E+00	0.		-69588E+00	-69588E+00	-63357E+01				1	I-J	-95057E+01	-24741E+01	30.96	10.96	
1	K-L	-83353E+01	-17207E+01	0.		-17207E+01	-17207E+01	-83353E+01				1	K-L	-90586E+01	-95742E+00	17.83	8.66	
										ELEMENTO (		CRGTO. LOC		T-MAX	T-MIN	ANGULO	T. EQUIV.	
1	CEN	-11474E+01	-47854E+01	0.	T33	T12	T22	T11	96)	ELEMENTO (	CRGTO. LOC	1	CEN	-63875E+01	-43470E+00	-61.17	8.60	
1	L-I	-56376E+00	-48817E+01	0.		-48817E+01	-48817E+01	-56376E+00				1	L-I	-61278E+01	-63225E+00	-64.68	6.50	
1	J-K	-71762E-01	-64565E+01	0.		-64565E+01	-64565E+01	-71762E-01				1	J-K	-65380E+01	-21348E+00	-81.71	6.71	
1	I-J	-45169E+01	-65159E+00	0.		-65159E+00	-65159E+00	-45169E+01				1	I-J	-62705E+01	-11019E+01	29.10	6.99	

1	K-L	-59795E+01	-12813E+01	0.	-17132E+01	-65378E+01	.72296E+00	18.05	6.21
ELEMENTO (97)									
CRGTO. LOC									
1	CEN	T11	T22		T33	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	L-I	-47957E+00	-11802E+01	0.	-97082E+00	-12618E+01	-20203E+00	-54.92	1.97
1	L-I	-46705E+00	-1357CE+01	0.	-94691E+00	-23685E+01	-44967E+02	-63.53	2.37
1	J-K	-87531E-01	-10707E+01	0.	-69344E+00	-13954E+01	-41217E+00	-64.93	1.54
1	I-J	-12819E+01	-3401CE-01	0.	-45913E+00	-14263E+01	-17837E+00	17.45	1.52
1	K-L	-16717E+01	-79533E+00	0.	-19465E+01	-32303E+01	-75927E+00	38.69	3.67
ELEMENTO (98)									
CRGTO. LOC									
1	CEN	T11	T22		T33	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	L-I	-26326E+00	-21232E+01	0.	-10631E+01	-21920E+00	-26057E+01	24.41	2.72
1	L-I	-92786E-01	-22937E+01	0.	-88434E+00	-21920E+00	-26057E+01	19.41	2.72
1	J-K	-14114E+00	-25276E+01	0.	-46305E+00	-21920E+00	-26057E+01	9.57	2.72
1	I-J	-21232E+01	-26326E+00	0.	-10631E+01	-21920E+00	-26057E+01	-65.59	2.72
ELEMENTO (99)									
CRGTO. LOC									
1	CEN	T11	T22		T33	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	L-I	-11115E+01	-11984E+00	0.	-57907E+00	-14667E+00	-13780E+01	65.29	1.46
1	L-I	-10334E+01	-22793E+00	0.	-65637E+00	-14667E+00	-13780E+01	60.29	1.46
1	J-K	-46226E-01	-12776E+01	0.	-37824E+00	-14667E+00	-13780E+01	-14.87	1.46
1	I-J	-11984E+00	-11115E+01	0.	-57907E+00	-14667E+00	-13780E+01	-24.71	1.46
ELEMENTO (100)									
CRGTO. LOC									
1	CEN	T11	T22		T33	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	L-I	-14570E+00	-28613E+01	0.	-86972E+00	-31160E+01	-10896E+00	73.68	3.17
1	L-I	-45515E+00	-31592E+01	0.	-11521E+01	-36188E+01	-35566E-01	69.99	3.60
1	J-K	-98301E-01	-24535E+01	0.	-64780E+00	-26369E+01	-25172E+00	76.68	2.77
1	I-J	-30807E+01	-91562E+00	0.	-19387E+01	-42186E+01	-22228E+00	-30.41	4.33
1	K-L	-25477E+01	-42912E-01	0.	-81958E+00	-27853E+01	-23942E+00	-16.16	2.94
ELEMENTO (101)									
CRGTO. LOC									
1	CEN	T11	T22		T33	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	L-I	-47313E+00	-71568E+01	0.	-25104E+01	-79946E+01	-36476E+00	71.54	8.18
1	L-I	-77945E+00	-60455E+01	0.	-31459E+01	-75148E+01	-63986E+00	84.96	7.89
1	J-K	-85027E-01	-82895E+01	0.	-11562E+01	-84503E+01	-74356E-01	82.12	8.49
1	I-J	-74656E+01	-13341E+01	0.	-18873E+01	-79999E+01	-79975E+00	-15.81	7.63
1	K-L	-57866E+01	-11700E+01	0.	-38934E+01	-80045E+01	-10479E+01	-29.67	8.58
ELEMENTO (102)									
CRGTO. LOC									
1	CEN	T11	T22		T33	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	L-I	-13315E+01	-83276E+01	0.	-36976E+01	-10010E+02	-19938E+00	65.54	9.91
1	L-I	-25725E+01	-76265E+01	0.	-42011E+01	-10010E+02	-19938E+00	60.54	9.91
1	J-K	-75311E+01	-2628CE+01	0.	-42341E+01	-10010E+02	-19938E+00	29.84	9.91
1	I-J	-83276E+01	-13815E+01	0.	-36976E+01	-10010E+02	-19938E+00	-24.46	9.91
ELEMENTO (103)									
CRGTO. LOC									
1	CEN	T11	T22		T33	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	L-I	-26185E+01	-67537E+01	0.	-15301E+01	-70362E+01	-23610E+01	-80.99	8.82
1	L-I	-28418E+01	-68840E+01	0.	-79632E+00	-69488E+01	-29065E+01	-85.35	8.77
1	J-K	-27868E+01	-70803E+01	0.	-59468E+00	-71160E+01	-23225E+01	-86.56	8.87
1	I-J	-66646E+01	-30270E+01	0.	-16085E+01	-69246E+01	-32870E+01	9.13	9.03
1	K-L	-71439E+01	-24311E+01	0.	-19769E+00	-71479E+01	-24351E+01	-1.18	8.63
ELEMENTO (104)									
CRGTO. LOC									
1	CEN	T11	T22		T33	T-MAX	T-MIN	ANGULO	T. EQUIV.
1	L-I	-14498E+01	-69489E+01	0.	-27961E+01	-77946E+01	-22956E+01	-73.17	9.16
1	L-I	-19145E+01	-72172E+01	0.	-23170E+01	-77714E+01	-24688E+01	-76.55	9.26
1	J-K	-18333E+01	-75072E+01	0.	-17541E+01	-78292E+01	-21554E+01	-79.65	9.10

ITEM	DESCRIPTION	UNIT	QTY	PRICE	TOTAL	DATE	STATUS
105	ELEMENTO (105)						
106	ELEMENTO (106)						
107	ELEMENTO (107)						
108	ELEMENTO (108)						
109	ELEMENTO (109)						
110	ELEMENTO (110)						
111	ELEMENTO (111)						
112	ELEMENTO (112)						

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
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CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1 CEN	.53197E+01	.32736E+01	0.	.11087E+01	.58052E+01	.27880E+01	23.65	5.03
1 L-I	.28246E+01	.57687E+01	0.	.33005E+00	.58052E+01	.27880E+01	83.68	5.03
1 J-K	.54604E+01	.31329E+01	0.	.95994E+00	.58052E+01	.27880E+01	19.76	5.03
1 I-J	.32736E+01	.53197E+01	0.	-.11087E+01	.58052E+01	.27880E+01	-66.35	5.03
ELEMENTO (122)								
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1 CEN	.56331E+01	.22333E+01	0.	-.60610E+00	.57088E+01	.21276E+01	-9.29	5.00
1 L-I	.52411E+01	.25553E+01	0.	.12067E+01	.57088E+01	.21276E+01	21.19	5.00
1 J-K	.40380E+01	.37484E+01	0.	-.17625E+01	.57088E+01	.21276E+01	-42.28	5.00
1 I-J	.22333E+01	.56331E+01	0.	.60610E+00	.57088E+01	.21276E+01	60.11	5.00
ELEMENTO (123)								
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1 CEN	.37366E+01	.40458E+01	0.	.24011E+00	.47454E+01	.30370E+01	50.21	4.16
1 L-I	.32122E+01	.45702E+01	0.	-.51830E+00	.47454E+01	.30370E+01	-71.32	4.16
1 J-K	.45702E+01	.32122E+01	0.	.51830E+00	.47454E+01	.30370E+01	18.68	4.16
1 I-J	.40458E+01	.37366E+01	0.	-.24011E+00	.47454E+01	.30370E+01	-39.79	4.16
ELEMENTO (124)								
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1 CEN	.15530E+02	.12633E+01	0.	.11512E+01	.16616E+02	.11770E+01	4.29	16.06
1 L-I	.14323E+02	.37418E+01	0.	.62956E+01	.17669E+02	.89587E+00	24.32	17.24
1 J-K	.15477E+02	.11954E+01	0.	.21580E+01	.15796E+02	.97646E+00	8.41	15.38
1 I-J	.23523E+01	.20418E+02	0.	-.80021E+00	.20453E+02	.23168E+01	-87.47	19.40
1 K-L	.16143E+01	.11201E+02	0.	-.42584E+01	.12220E+02	.40737E+02	-69.19	12.82
ELEMENTO (125)								
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1 CEN	.10513E+02	.30931E+01	0.	.31682E+01	.11767E+02	.19359E+01	20.07	10.93
1 L-I	.10781E+02	.37037E+01	0.	.39830E+01	.12570E+02	.19144E+01	24.19	11.73
1 J-K	.10439E+02	.24025E+01	0.	.23534E+01	.11083E+02	.13385E+01	15.39	10.29
1 I-J	.33286E+01	.11701E+02	0.	.32742E+01	.12637E+02	.22628E+01	-70.87	11.87
1 K-L	.27876E+01	.95185E+01	0.	-.30622E+01	.10703E+02	.16029E+01	-68.85	10.00
ELEMENTO (126)								
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1 CEN	.88456E+01	.30878E+01	0.	.25443E+01	.98087E+01	.21246E+01	20.73	8.94
1 L-I	.88588E+01	.31245E+01	0.	.31576E+01	.10254E+02	.17261E+01	23.89	9.51
1 J-K	.98353E+01	.30510E+01	0.	.19310E+01	.94205E+01	.24656E+01	16.86	8.46
1 I-J	.33177E+01	.96665E+01	0.	-.25506E+01	.10565E+02	.21202E+01	-70.61	9.59
1 K-L	.23578E+01	.80242E+01	0.	-.25379E+01	.90623E+01	.13197E+01	-67.75	8.30
ELEMENTO (127)								
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1 CEN	.76302E+01	.34611E+01	0.	.13828E+01	.83721E+01	.27393E+01	20.98	7.39
1 L-I	.77228E+01	.37204E+01	0.	.23226E+01	.87875E+01	.26558E+01	24.63	7.81
1 J-K	.75776E+01	.32019E+01	0.	.14429E+01	.80106E+01	.27689E+01	16.70	7.05
1 I-J	.36261E+01	.82393E+01	0.	-.19278E+01	.89388E+01	.29266E+01	-71.06	7.89
1 K-L	.32962E+01	.70611E+01	0.	-.18378E+01	.78095E+01	.25479E+01	-67.84	6.90
ELEMENTO (128)								
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.
1 CEN	.69174E+01	.35012E+01	0.	.11368E+01	.71697E+01	.31490E+01	17.22	6.22
1 L-I	.69209E+01	.35133E+01	0.	.13992E+01	.73216E+01	.30131E+01	19.93	6.37
1 J-K	.63139E+01	.34887E+01	0.	.89282E+00	.70384E+01	.32641E+01	14.12	6.10
1 I-J	.35927E+01	.71442E+01	0.	-.11390E+01	.74781E+01	.32588E+01	-73.66	6.49
1 K-L	.34097E+01	.64907E+01	0.	-.11346E+01	.68634E+01	.30370E+01	-71.81	5.96
ELEMENTO (129)								

ELEMENTO (130)									
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.	
1 CEN	-64088E+01	-36467E+01	0.	-41332E+00	-64693E+01	-35862E+01	8.33	5.61	
1 L-I	-64331E+01	-37338E+01	0.	-53342E+00	-65347E+01	-36322E+01	10.78	5.67	
1 J-K	-63844E+01	-35598E+01	0.	-29321E+00	-64145E+01	-35295E+01	5.86	5.56	
1 I-J	-36917E+01	-65696E+01	0.	-42843E+00	-66320E+01	-36293E+01	-81.71	5.75	
1 K-L	-35017E+01	-62479E+01	0.	-39820E+00	-63665E+01	-35430E+01	-81.63	5.48	
ELEMENTO (131)									
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.	
1 CEN	-13525E+02	-68390E+00	0.	-16475E+01	-13733E+02	-47589E+00	7.20	13.50	
1 L-I	-13514E+02	-64576E+00	0.	-2437E+01	-13599E+02	-20015E+00	10.37	13.86	
1 J-K	-13535E+02	-72204E+00	0.	-85929E+00	-13593E+02	-65467E+00	3.82	13.27	
1 I-J	-10798E+01	-14939E+02	0.	-16366E+01	-15130E+02	-89873E+00	-83.35	14.71	
1 K-L	-23797E+00	-12111E+02	0.	-16564E+01	-12338E+02	-60288E+01	-82.17	12.31	
ELEMENTO (132)									
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.	
1 CEN	-11534E+02	-20081E+01	0.	-22681E+01	-12047E+02	-14956E+01	12.73	11.37	
1 L-I	-11772E+02	-28557E+01	0.	-30627E+01	-12689E+02	-19387E+01	16.98	11.84	
1 J-K	-11297E+02	-11604E+01	0.	-15335E+01	-11524E+02	-93351E+00	6.42	11.09	
1 I-J	-23295E+01	-12682E+02	0.	-24398E+01	-13228E+02	-17833E+01	-77.38	12.43	
1 K-L	-16867E+01	-10386E+02	0.	-20985E+01	-10665E+02	-12078E+01	-77.13	10.31	
ELEMENTO (133)									
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.	
1 CEN	-99451E+01	-27061E+01	0.	-18723E+01	-10401E+02	-22524E+01	13.68	9.43	
1 L-I	-10144E+02	-34174E+01	0.	-23774E+01	-10899E+02	-25620E+01	17.63	9.84	
1 J-K	-97465E+01	-19588E+01	0.	-13673E+01	-99607E+01	-17646E+01	9.72	9.23	
1 I-J	-29290E+01	-10734E+02	0.	-20190E+01	-11244E+02	-24391E+01	-76.34	10.23	
1 K-L	-24371E+01	-91560E+01	0.	-17287E+01	-95775E+01	-20657E+01	-76.30	8.73	
ELEMENTO (134)									
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.	
1 CEN	-88192E+01	-31472E+01	0.	-13464E+01	-91225E+01	-28438E+01	12.70	8.08	
1 L-I	-89414E+01	-35837E+01	0.	-17087E+01	-94399E+01	-30852E+01	16.27	8.34	
1 J-K	-36969E+01	-27107E+01	0.	-98416E+00	-88346E+01	-25531E+01	9.10	7.89	
1 I-J	-33057E+01	-93852E+01	0.	-14348E+01	-97068E+01	-29841E+01	-77.37	8.61	
1 K-L	-29987E+01	-82531E+01	0.	-12580E+01	-85383E+01	-27035E+01	-77.23	7.56	
ELEMENTO (135)									
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.	
1 CEN	-80660E+01	-35089E+01	0.	-81370E+00	-82069E+01	-33680E+01	9.83	7.15	
1 L-I	-81664E+01	-38273E+01	0.	-10448E+01	-84068E+01	-35269E+01	12.96	7.30	
1 J-K	-79656E+01	-31504E+01	0.	-58262E+00	-80351E+01	-30809E+01	6.80	7.02	
1 I-J	-36100E+01	-84271E+01	0.	-28629E+02	-85850E+01	-34521E+01	-79.90	7.48	
1 K-L	-34078E+01	-77049E+01	0.	-74111E+00	-78292E+01	-32536E+01	-80.48	6.81	
ELEMENTO (136)									
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.	
1 CEN	-76765E+01	-36670E+01	0.	-26384E+00	-76538E+01	-35497E+01	3.75	6.67	
1 L-I	-77538E+01	-39430E+01	0.	-33399E+00	-77828E+01	-39140E+01	4.97	6.74	
1 J-K	-75992E+01	-33919E+01	0.	-19699E+00	-76081E+01	-33821E+01	2.63	6.60	
1 I-J	-36977E+01	-77861E+01	0.	-31973E+00	-78110E+01	-36729E+01	-85.56	6.77	
1 K-L	-35363E+01	-75666E+01	0.	-20794E+00	-75779E+01	-35254E+01	-86.98	6.56	
ELEMENTO (137)									
CRGTO. LOC	T11	T22	T33	T12	T-MAX	T-MIN	ANGULO	T. EQUIV.	
1 CEN	-11563E+02	-21525E+00	0.	-31104E+00	-11572E+02	-21077E+00	1.57	11.47	
1 L-I	-11548E+02	-16560E+00	0.	-21297E+00	-11552E+02	-16162E+00	1.07	11.47	
1 J-K	-11578E+02	-27298E+00	0.	-40911E+00	-11593E+02	-25820E+00	2.07	11.47	

1 I-J	-16018E+00	-11352E+02	0.	-29606E+00	-11360E+02	-15235E+00	-88.49	11.28
1 K-L	-27841E+00	-11774E+02	0.	-32602E+00	-11783E+02	-26917E+00	-88.33	11.65
ELEMENTO (137)								
CRGIO. LOC				T33				
1 CEN	T11	T22			T-MAX	T-MIN	ANGULO	T. EQUIV.
1 L-I	-11430E+02	-10263E+01	0.		-11477E+02	-97950E+00	3.83	11.02
1 J-K	-11442E+02	-12122E+01	0.		-11582E+02	-11115E+01	5.62	11.07
1 I-J	-11378E+02	-84540E+00	0.		-11391E+02	-82679E+00	2.06	11.00
1 K-L	-11945E+01	-12031E+02	0.		-12062E+02	-11435E+01	-86.09	11.55
	-85808E+00	-10825E+02	0.		-10872E+02	-81535E+00	-86.26	10.49
ELEMENTO (138)								
CRGIO. LOC				T33				
1 CEN	T11	T22			T-MAX	T-MIN	ANGULO	T. EQUIV.
1 L-I	-10459E+02	-19725E+01	0.		-10511E+02	-13204E+01	4.43	9.69
1 J-K	-10527E+02	-22374E+01	0.		-10651E+02	-20832E+01	7.18	9.79
1 I-J	-10395E+02	-17284E+01	0.		-10399E+02	-17197E+01	1.81	9.65
1 K-L	-21302E+01	-11195E+02	0.		-11258E+02	-21217E+01	-85.41	10.36
	-17655E+01	-97181E+01	0.		-97645E+01	-17190E+01	-85.64	9.03
ELEMENTO (139)								
CRGIO. LOC				T33				
1 CEN	T11	T22			T-MAX	T-MIN	ANGULO	T. EQUIV.
1 L-I	-94378E+01	-27350E+01	0.		-94727E+01	-25998E+01	4.13	8.45
1 J-K	-94732E+01	-29337E+01	0.		-95507E+01	-28362E+01	6.90	8.53
1 I-J	-93320E+01	-25362E+01	0.		-93669E+01	-25322E+01	1.39	8.41
1 K-L	-29026E+01	-10037E+02	0.		-10076E+02	-23628E+01	-85.74	8.99
	-25673E+01	-88387E+01	0.		-88691E+01	-25369E+01	-86.03	7.91
ELEMENTO (140)								
CRGIO. LOC				T33				
1 CEN	T11	T22			T-MAX	T-MIN	ANGULO	T. EQUIV.
1 L-I	-86801E+01	-32298E+01	0.		-86550E+01	-32147E+01	2.99	7.61
1 J-K	-87168E+01	-35698E+01	0.		-87603E+01	-33172E+01	5.13	7.66
1 I-J	-86434E+01	-30584E+01	0.		-86447E+01	-30971E+01	0.89	7.59
1 K-L	-33341E+01	-90534E+01	0.		-90710E+01	-33166E+01	-86.23	7.95
	-31251E+01	-83067E+01	0.		-83191E+01	-31127E+01	-87.20	7.28
ELEMENTO (141)								
CRGIO. LOC				T33				
1 CEN	T11	T22			T-MAX	T-MIN	ANGULO	T. EQUIV.
1 L-I	-82371E+01	-34000E+01	0.		-82890E+01	-34781E+01	1.15	7.21
1 J-K	-83195E+01	-35924E+01	0.		-83243E+01	-35866E+01	2.00	7.23
1 I-J	-82561E+01	-33677E+01	0.		-82557E+01	-33675E+01	0.32	7.19
1 K-L	-35162E+01	-84162E+01	0.		-84194E+01	-35131E+01	-88.56	7.32
	-34439E+01	-81573E+01	0.		-81589E+01	-34429E+01	-89.16	7.99

** T E M P C U T I L I Z A D O N A S O L U C A C E S T A T I C A

SOLUCAO DAS EQUACOES....= 12.13
SAIDA DE DESLOCAMENTOS...= 1.75
CALCULO DE TENSOES.....= 19.57

CALCULO DA RIGIDEZ DE ELEMENTOS...	=	45.17
LEITURA DE CARGAS/MASSAS NODAIS...	=	0.17
CALCULO DA MATRIZ RIGIDEZ GLOBAL...	=	9.30
ANALISE ESTATICA.....	=	33.52
CALCULO DE AUTO-VALORES.....	=	0.00
ANALISE DE RESPOSTA FORCADA.....	=	0.00
ANALISE DO ESPECTRO DE RESPOSTA...	=	0.00
INTEGRACAO PASSO-A-PASSO.....	=	0.00
TEMPO TOTAL DE RESOLUCAO.....	=	52.10