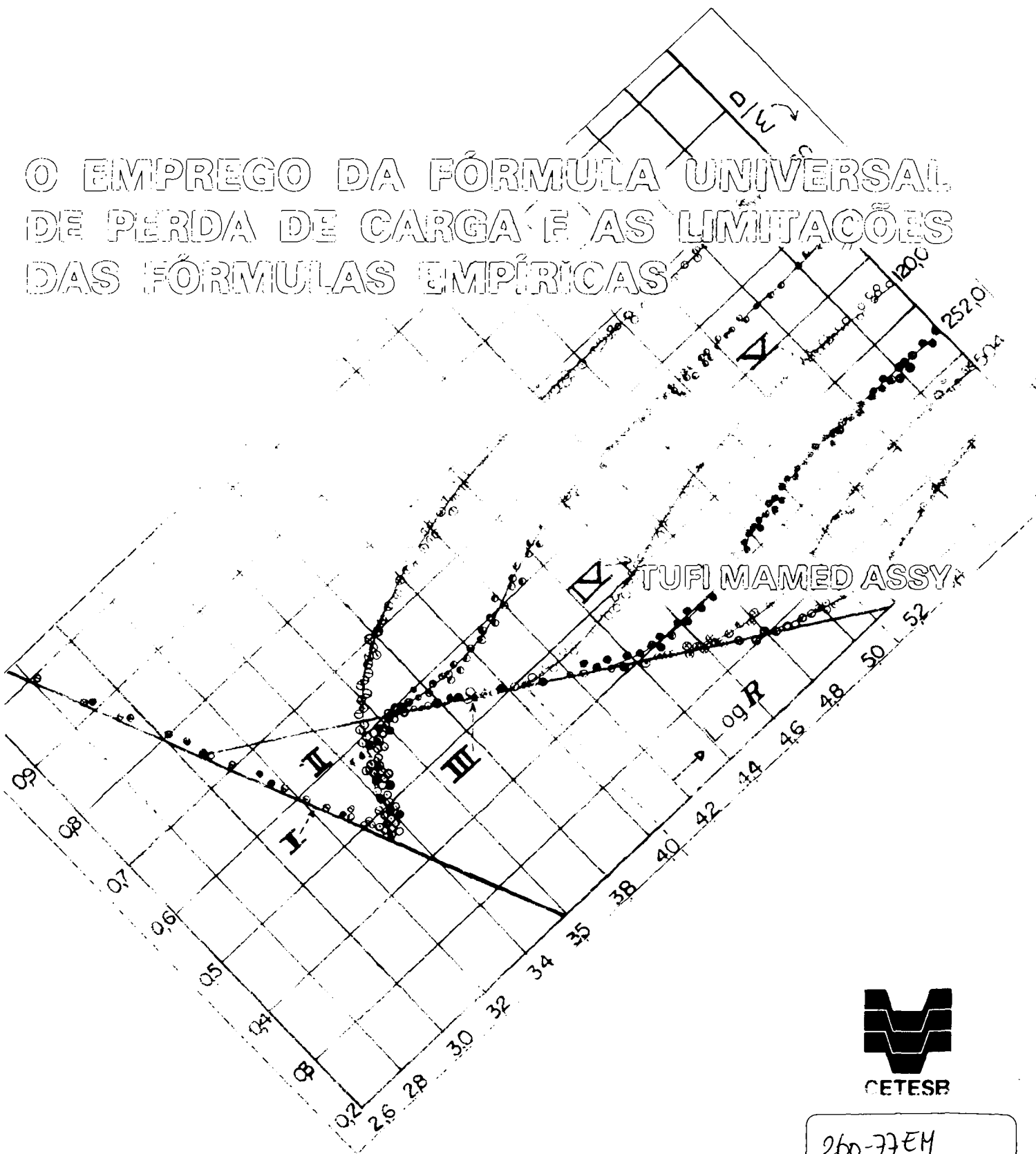


O EMPREGO DA FÓRMULA UNIVERSAL DE PERDA DE CARGA E AS LIMITAÇÕES DAS FÓRMULAS EMPÍRICAS



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O EMPREGO DA FÓRMULA UNIVERSAL DE PERDA DE CARGA E AS LIMITAÇÕES DAS FÓRMULAS EMPÍRICAS

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APRESENTAÇÃO

O processo de desenvolvimento dos países dependentes de tecnologia estrangeira caracteriza-se pela inevitável aculturação, representada pela absorção das técnicas cujo conteúdo está condicionado aos recursos e à realidade dos países que as originaram.

A assim chamada transferência de tecnologia prende-se ao não menos propalado conceito de "know-how"; porém, aqueles que têm a responsabilidade de adaptar essa tecnologia a condições e realidades específicas defrontam-se, invariavelmente, com a necessidade de conhecer tais especificidades e os seus "porquês", para poder encontrar o melhor compromisso entre a orientação externa e as possibilidades daquelas realidades.

Em outras palavras, cremos ser fundamental para uma real adaptação tecnológica o desenvolvimento de um espírito de "know-why".

Este trabalho pretende divulgar o porquê das diretrizes estabelecidas no projeto de norma brasileira P-NB-591/77-ABNT, sob a perspectiva acima considerada.

A posição assumida nessa norma, no tocante ao cálculo de perda de carga em tubulações, constitui uma modificação nos procedimentos tradicionais cuja origem é bem conhecida pelos sanitaristas brasileiros.

Este trabalho pode ser considerado como um instrumento de aceleração do inevitável processo de assimilação desse novo conteúdo.

Ao publicar esta obra, a CETESB, como empresa de tecnologia, julga poder trazer ao meio técnico nacional mais um documento orientado para o cumprimento de sua missão.

LUIZ AUGUSTO DE LIMA PONTES

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NOTA DO AUTOR

Este trabalho tem por finalidade divulgar as noções principais da teoria do escoamento em condutos forçados; mostrar o manuseio da fórmula universal de perda de carga, por via numérica e/ou através do uso de diagramas ou das Tabelas especialmente confeccionadas para este fim; evidenciar as incorreções das fórmulas empíricas de perda de carga, de emprego mais frequente na Engenharia Sanitária.

Espero ter atingido esses objetivos. Aguardo porém, com interesse, as críticas e sugestões que o trabalho venha a merecer.

TUFI MAMED ASSY

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1. INTRODUÇÃO

A Gerência de Normalização Técnica da CETESB, Companhia Estadual de Tecnologia de Saneamento Básico e de Defesa do Meio Ambiente, tem por escopo a elaboração de Normas Técnicas nas diversas áreas da Engenharia Sanitária e Ambiental. Uma dessas normas, já em nível de Projeto de Norma da Associação Brasileira de Normas Técnicas, refere-se ao projeto de adutoras em conduto forçado e em conduto livre (P-NB-591/76). Nesta Norma, assume particular complexidade o assunto relativo à perda de carga, ao se pretender indicar o formulário que rege o escoamento nos condutos forçados com os correspondentes campos de aplicação e graus de precisão.

Como se sabe, entre nós, estão consagradas pelo uso diversas fórmulas empíricas para a análise dos escoamentos em redes hidráulicas (redes de distribuição e condutos de adução). De uma maneira geral, as fórmulas empíricas são recomendadas por seus autores para aplicação em domínios restritos de diâmetros e nelas figuram coeficientes numéricos que dependem da rugosidade do conduto e não dependem, pelo menos explicitamente, do tipo de escoamento que se estabelece no conduto.

Por essa razão, o emprego das fórmulas empíricas pode induzir o engenheiro a dois erros essenciais: o primeiro, devido à escolha inadequada do coeficiente numérico que nem sempre corresponde aos materiais de que são feitos os tubos e aos demais dados em jogo. Com efeito, as tabelas que normalmente acompanham as fórmulas empíricas, embora detalhadas, são quase sempre genéricas demais para uma escolha judiciosa dos coeficientes numéricos. O segundo erro é mais grave porque de natureza conceitual: os coeficientes numéricos nem sempre são compatíveis com o regime de escoamento que está se estabelecendo no conduto.

A fim de elucidar este último aspecto da questão relativamente a algumas das principais fórmulas empíricas de maior emprego na Engenharia Sanitária, a CETESB houve por bem solicitar o presente estudo. A elucidação se fará com base em alguns tópicos da teoria que rege o escoamento nos condutos forçados e na fórmula universal de perda de carga. Objetiva-se, também, mostrar neste trabalho a manipulação dos principais resultados dessa teoria, e da fórmula universal de perda de carga, por via numérica, tendo em vista o emprego das atuais máquinas digitais de calcular, e através do uso de diagramas e de tabelas. Serão ainda, recomendadas as rugosidades uniformes equivalentes para as aplicações em projetos de redes de distribuição e de linhas de adução. As tabelas anexas, preparadas com tais parâmetros, serão bastante úteis e expeditas nos problemas práticos.

2. FÓRMULAS EMPÍRICAS DE PERDA DE CARGA

As fórmulas empíricas de maior uso na Engenharia Sanitária e que serão objeto do presente trabalho, são as seguintes:

a) Fórmulas de Flamant (*)

$$DJ = b \sqrt{V^7/D} \quad (1)$$

onde $b = 0,00052$ para tubos de vidro ou de chumbo, $b = 0,00074$ para tubos de ferro fundido novo e $b = 0,00092$ para tubos de ferro fundido usado

O uso desta fórmula tem sido frequente nas instalações domiciliares.

b) Fórmula de Hazen-Williams

$$J = 6,81 \frac{V^{1,85}}{C^{1,85} D^{1,17}} \quad (2a)$$

* O significado das letras que comparecem nas fórmulas está indicado no nº 8.

ou

$$J = 10,65 \frac{Q^{1,85}}{C^{1,85} D^{4,87}} \quad (2b)$$

Onde C é um coeficiente cujo valor depende unicamente da natureza das paredes dos condutos.

Esta fórmula tem sido recomendada para instalações com condutos de diâmetros não inferiores a 50 mm [7]*.

c) Fórmula de Manning-Strickler.

$$V = \frac{1}{n} R_H^{2/3} J^{1/2}$$

Onde n é o coeficiente que traduz a rugosidade, é tanto maior quanto mais "liso" for o tubo. O inverso do coeficiente n é o coeficiente de Strickler.

3. PRINCIPAIS RESULTADOS DA TEORIA DOS ESCOAMENTOS EM CONDUTOS FORÇADOS

Um conduto é dito cilíndrico longo quando a sua forma é a de uma superfície cilíndrica fechada, de comprimento muito maior que a máxima dimensão da seção transversal e a parede é idêntica do ponto de vista da rugosidade em toda a sua extensão. O regime do escoamento em um tal conduto será admitido dinamicamente estabelecido, i. é, no sentido de que o movimento se realiza em regime estacionário (ou estatisticamente estacionário) e as velocidades em uma seção transversal não dependem da abscissa "x" que fixa a posição da seção no conduto. Sob estas hipóteses e admitindo que o conduto é de seção circular, os principais resultados da teoria que regem o escoamento nos condutos forçados podem ser resumidos como segue:

a) As trajetórias médias são paralelas às geratrizes do conduto, a repartição das pressões médias é hidrostática em uma mesma seção, os coeficientes da energia cinética α e da quantidade de movimento β são os mesmos ao longo de toda a extensão do conduto, de tal sorte que a perda de carga h_f entre duas seções, distantes de L, é igual à diferença das cargas piezométricas $z + p/\gamma$ nas duas seções e é dada por:

$$h_f = \frac{4\tau_0}{\gamma} \frac{D}{L}$$

Introduzindo nesta equação a expressão da tensão tangencial na parede dada por $\tau_0 = C_f \gamma V^2/2g$ obtém-se a fórmula universal de perda de carga:

$$h_f = 4C_f \frac{L}{D} \frac{V^2}{2g} = f \frac{L}{D} \frac{V^2}{2g} \quad (4)$$

onde $f = 4 C_f$ é o coeficiente de perda de carga distribuída, função do número de Reynolds R e da rugosidade relativa K/D:

$$f = f\left(R, \frac{K}{D}\right) \quad (5)$$

b) As equações (4) e (5) são aplicáveis aos escoamentos laminares e turbulentos. Quando o movimento é turbulento, condições especiais reinam nas vizinhanças imediatas da parede do conduto. Nesta região, a presença de um contorno sólido impede o movimento transversal dos elementos fluidos, tornando impossível, também, a flutuação das velocidades. Forma-se, assim, dentro da camada limite turbulenta, uma sub-região, justaposta à parede do conduto, extremamente delgada, onde o movimento é necessariamente laminar (Fig. 1). Dá-se a esta sub-região o nome de filme laminar. Demonstra-se que para um conduto de diâmetro e de rugosidade dados, a espessura do filme laminar δ é uma função decrescente do número de Reynolds R. Então, quando R é suficientemente pequeno, δ é grande e cobre todas as asperezas da parede o conduto se diz hidráulicamente liso. Quando R aumenta, a espessura relativa do filme diminui e para um dado R, as irregularidades da parede emergem do filme laminar e contactam diretamente com a parte do fluido em escoamento turbulento. Uma superfície inicialmente "lisa" torna-se "rugosa" (Fig. 2).

c) Quando as asperezas da parede do conduto são de dimensões uniformes e uniformemente distribuídas, a função $f(R, \epsilon/D)$ admite a representação da Fig. 3 (Experiências de Nikuradse). Para um valor dado de ϵ/D podemos distinguir as seguintes regiões quando R varia desde $R = 0$ até o valor mais alto permitido pela experiência:

Região I : $0 < R < 2000$; o movimento do fluido é laminar:

$$f = \frac{64}{R} \quad (6)$$

(*) Os números entre colchetes indicam bibliografia citada no final deste trabalho.

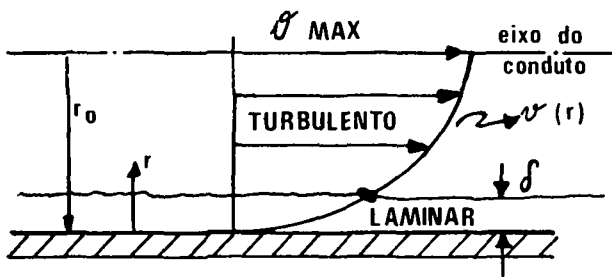


Fig. 1 - Diagrama da velocidade no escoamento turbulento.

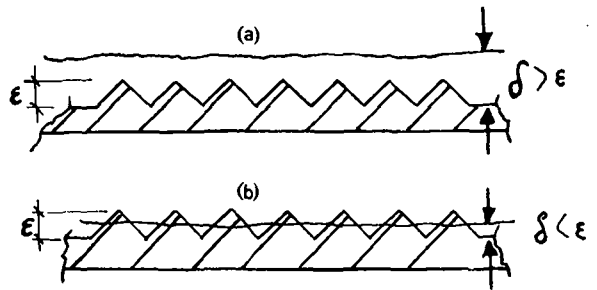


Fig. 2 - Posição relativa do filme laminar e das irregularidades da parede dos condutos:
a) hidraulicamente lisos;
b) hidraulicamente rugosos.

Região II: $2\,000 < R < 2\,400$; o movimento é de transição do movimento laminar ao turbulento. A função f não é conhecida, analiticamente, nesta região.

Região III: $2\,000 < R < R_1$; o conduto é hidraulicamente liso e f é função de R independente de ϵ/D :

$$\frac{1}{\sqrt{f}} = 2 \log R \sqrt{f} - 0,8 \quad (7a)$$

válida para $R > 10^5$. Para $R < 10^5$, a função $f(R)$ é corretamente representada pela fórmula de Blasius:

$$f = 0,316 R^{-1/4} \quad (7b)$$

Para uma forma dada da rugosidade e um valor dado de ϵ/D o número de Reynolds R_1 é raiz da equação

$$\frac{\epsilon}{D} = \frac{N}{R} \sqrt{8/f}$$

onde N é uma constante adimensional que depende da forma das rugosidades e da escolha do parâmetro linear ϵ que caracteriza a dimensão das rugosidades (Nas experiências de Nikuradzé $N = 11,6$).

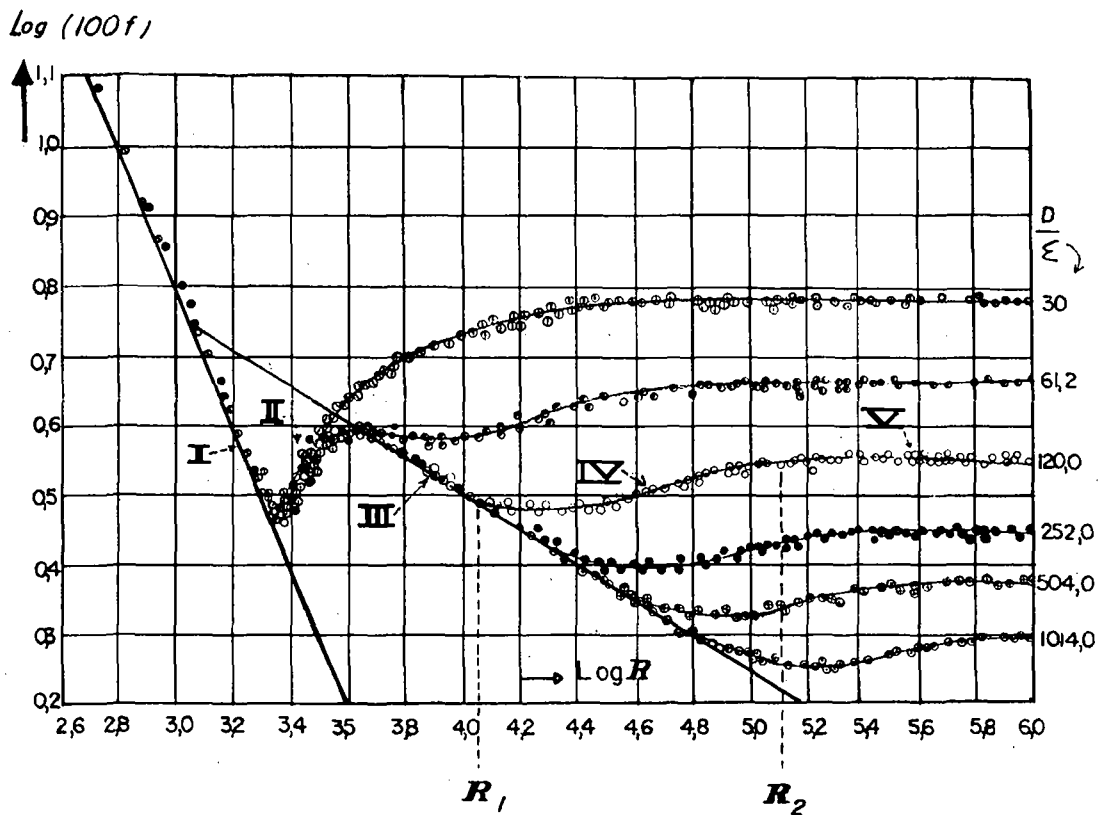


Fig. 3 - Diagrama de Nikuradzé

Região IV: $R_1 < R < R_2$; f é função de R e de ϵ/D mas a sua expressão analítica não é conhecida nesta região, e R_2 é a raiz da equação:

$$\frac{\epsilon}{D} = \frac{N'}{R} \sqrt{8/f}$$

onde N' tem o mesmo significado de N e vale $N' = 70$ nas experiências de Nikuradzé.

Região V: $R > R_2$. O conduto é hidraulicamente rugoso e f é função somente de ϵ/D :

$$\frac{1}{\sqrt{f}} = A + 2 \log \frac{D}{2\epsilon} \quad (8)$$

onde A é uma constante numérica que depende da forma das rugosidades e da escolha de ϵ . (Nas experiências de Nikuradzé $A = 1,74$).

É possível representar por uma curva única as variações de f em função de ϵ/D e de R . Com efeito, as Eqs. (7) e (8) podem ser rearranjadas, respectivamente, como segue:

$$\frac{1}{\sqrt{f}} - 2 \log \frac{D}{2\epsilon} = 2 \log \frac{R\sqrt{f}}{D/2\epsilon} - 0,8 \quad (9a)$$

$$\frac{1}{\sqrt{f}} - 2 \log \frac{D}{2\epsilon} = A \quad (9b)$$

O primeiro membro destas equações colocado em função de $2 \log [R\sqrt{f}/(D/2\epsilon)]$ fornece, para pequenos valores de $R\sqrt{f}/(D/2\epsilon)$, uma reta inclinada de 45° e, para grandes valores de $R\sqrt{f}/(D/2\epsilon)$, uma reta paralela ao eixo das abscissas. Segundo Prandtl, a curva única assim obtida representa a "função geral da rugosidade" (Fig. 4).

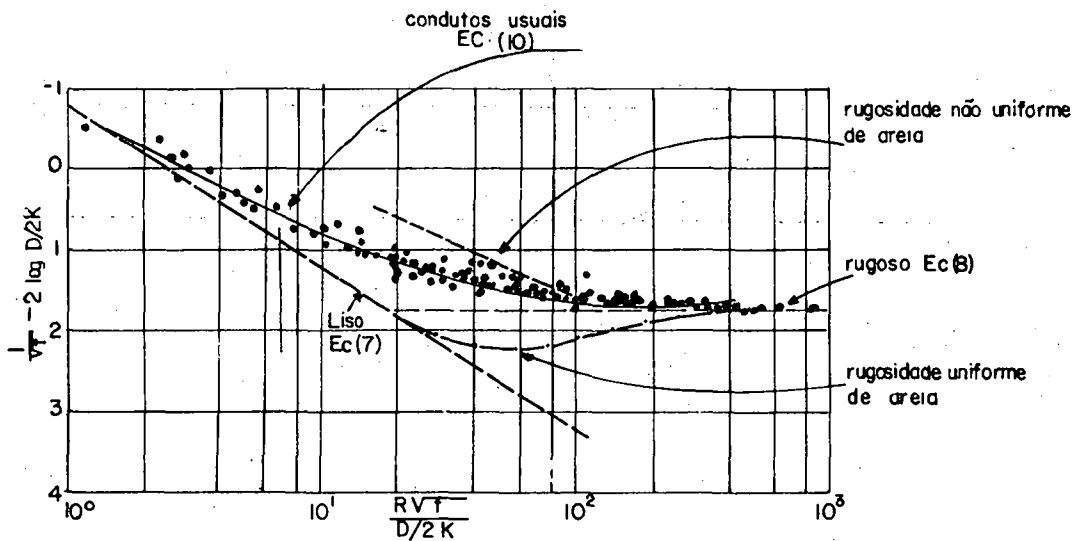


Fig. 4 - Função geral da rugosidade

d) Os resultados de Nikuradzé são qualitativamente aplicáveis aos condutos em que as asperezas de suas paredes não são de dimensões uniformes e nem uniformemente distribuídos (condutos industriais). Para um conduto dado, existem os dois números de Reynolds R_1 e R_2 tais que para $R < R_1$, o conduto é hidraulicamente liso, o coeficiente de perda de carga é corretamente representado em função de R pela fórmula (7) e para $R > R_2$, o conduto é hidraulicamente rugoso, o coeficiente de perda de carga é independente de R e para uma rugosidade dada, f depende apenas do diâmetro. A fim de caracterizar as asperezas com uma dimensão linear, Colebrook cria a noção de rugosidade uniforme equivalente L . É a raiz $\epsilon = k$ da seguinte equação, obtida da Eq. 8 com $A = 1,74$

$$\frac{1}{\sqrt{f}} = 1,74 + 2 \log \frac{D}{2k}$$

onde f é medido, para um diâmetro D dado, na região em que $R > R_2$.

Sendo possível então, caracterizar cada tipo de aspereza por uma rugosidade uniforme equivalente k , pode-se construir para os condutos industriais uma função geral da rugosidade do tipo (Fig. 4):

$$\frac{1}{\sqrt{f}} - 2 \log_{10} \frac{D}{2k} = 1,74 - 2 \log_{10} \left| 1 + 18,7 \frac{D/2k}{R\sqrt{f}} \right|$$

Para as aplicações, esta fórmula é convertida em

$$\frac{1}{\sqrt{f}} = -2 \log_{10} \left(0,27 \frac{K}{D} + \frac{2,51}{R\sqrt{f}} \right) \quad (10a)$$

conhecida como fórmula de Colebrook, (ou Colebrook-White). A Eq. (10) conduz à Eq. (7a) dos condutos hidráulicamente lisos para os quais $(K/D) = 0$ e conduz à Eq. (8) dos condutos hidráulicamente rugosos quando $R \Rightarrow \infty$.

Até há pouco tempo em que não existiam ainda as modernas máquinas digitais de calcular, a Eq. (10) era resolvida com o auxílio dos diagramas de Moody ou Moody-Rouse, (anexo), conforme será visto mais adiante.

Na prática, o valor da rugosidade uniforme equivalente depende do processo de fabricação dos tubos, da natureza do líquido que escoar nos condutos e do tempo em serviço dos condutos. Os tubos fabricados por um mesmo processo apresentam, em geral, o mesmo valor da rugosidade uniforme equivalente, o qual é independente do diâmetro do tubo.

TABELA I

Resumo dos dados experimentais obtidos nos ensaios de condutos industriais novos (Cf. Ref. 8).

Tipo do tubo	Nº de ensaios	Intervalo de variação fixado nos ensaios			Rugosidade uniforme equivalente - K (mm)		
		Diâmetro (mm)	Velocidade (m/s)	Número de Reynolds	Intervalo de variação	Valor médio	Valor recomendado
Ferro fundido não revestido	3	83 à 500	0,35 à 4,85	$2,43 \times 10^4$ à $7,66 \times 10^5$	0,15 à 0,33	0,23	0,25
Ferro fundido revestido	14	98 à 1.550	0,12 à 10,14	$2,88 \times 10^4$ à $6,48 \times 10^6$	0,02 à 0,22	0,10	0,13
Ferro galvanizado	9	9 à 105	0,17 a 6,15	$3,40 \times 10^2$ a $5,15 \times 10^5$	0,04 à 0,28	0,10	0,13
Ferro forjado	18	10 à 205	0,06 a 6,75	$8,02 \times 10^2$ a $9,11 \times 10^5$	0,01 à 0,10	0,05	0,05
Aço revestido	4	12 à 257	0,07 a 3,32	$7,57 \times 10^2$ à $4,09 \times 10^5$	0,02 à 0,13	0,05	0,05
Aço não revestido	10	16 à 307	0,23 a 13,80	$3,75 \times 10^3$ a $1,28 \times 10^6$	0,01 à 0,08	0,03	0,04
Cimento amianto	3	75 à 147	0,22 a 1,70	$1,90 \times 10^4$ a $1,80 \times 10^5$	Tubo Liso	Tubo Liso	Liso
Revest. interno com concreto centrifugado	6	92 à 1524	0,16 a 4,70	$2,67 \times 10^4$ a $1,18 \times 10^6$	Liso à 0,03	Tubo Liso	Liso
Revest. interno com betume centrifugado	7	254 à 1175	0,19 a 2,83	$1,41 \times 10^5$ a $1,24 \times 10^6$	Tubo Liso	Tubo Liso	Liso
Tubo liso	16	6 à 102	0,04 a 9,69	$6,30 \times 10^2$ a $8,74 \times 10^5$	Tubo Liso	Tubo Liso	Liso

e) a concordância entre os resultados experimentais e a representação gráfica da Eq. 10 podem ser vistas nas Figs. 5 e 6. Os ensaios foram realizados em laboratório e no campo, e os tubos utilizados foram novos e velhos, de pequenos e de grandes diâmetros.

As Figs. 5 e 6 e as tabelas 1 e 2 confirmam que os escoamentos em condutos, quando internamente bastante lisos, são corretamente regidos pela Eq. 7a, com a variação da velocidade em relação à média inferior a 2,5%, precisão esta que é da maioria dos aparelhos de medida. Portanto, a menos que ocorra a modificação da superfície interna do conduto (por corrosão ou por outras causas) com o tempo, os escoamentos em condutos hidráulicamente lisos podem ser avaliadas com elevado grau de precisão a partir da Eqs. 7 ou 10. Entretanto, os resultados experimentais mostram que o mesmo já não ocorre com os condutos hidráulicamente rugosos. Com efeito, por simples inspeção da Tab. 1 vê-se que é elevada a variação da rugosidade uniforme equivalente dentro de cada classe particular de tubos novos, sendo até de 9 para 1 a relação entre o maior valor e o menor valor. Na realidade essas variações deveriam resultar menores de vez que em parte são devidas provavelmente, às discrepâncias experimentais cometidas nas medidas dos diâmetros, das velocidades e das demais variáveis intervenientes e em parte, são devidas possivelmente, aos efeitos da idade que em certos casos começa a se manifestar nos condutos ao cabo de alguns meses de operação. Neste caso, foi recomendado adotar-se para cada classe de tubos um valor médio para a rugosidade uniforme equivalente. Os erros resultantes na velocidade e na perda de carga, devido às variações da rugosidade uniforme equivalente em relação ao valor médio, serão bastante reduzidos e limitados a valores perfeitamente toleráveis em termos práticos.

f) O interesse das fórmulas de resistência na Engenharia Sanitária destaca-se, sobretudo, na análise hidráulica das redes de distribuição e das linhas de adução. Para estes fins, a fórmula universal de perda de carga parece ser a mais recomendável, (V. nº 6), pois é corretamente válida em todas as regiões do escoamento, incluindo a região de transição, e é de fácil manipulação, por via numérica, com as atuais máquinas de calcular (V. nº 4). Contudo, para que os resultados obtidos por essa fórmula sejam confiáveis, é indispensável que se faça uma correta avaliação do coeficiente k. Esse coeficiente depende, de uma maneira geral, da composição da água, do material e do processo de fabricação dos tubos, do acabamento interno do tubo e da idade em serviço do conduto. Conhecendo esses elementos e ajuizando um coeficiente de segurança, o Engenheiro está em condições de fixar o valor de k a adotar. Por exemplo, para os condutos de ferro fundido há bastante tempo em serviço e considerando o tipo de revestimento interno então executados nos tubos antigos, o valor de k a adotar é da ordem de 10^{-3} m. Mas para os condutos novos de qualquer material (ferro fundido, aço, concreto armado, cimento amianto, plástico), em que os revestimentos internos são particularmente lisos, e os preservam de incrustações, a literatura especializada indica um valor de k da ordem de 5×10^{-5} m.

Entretanto, a fixação de k deve compreender ainda, o tipo da rede hidráulica, onde as perdas de carga singulares de difícil avaliação não são consideradas, em geral. Nas redes de distribuição estas perdas são devidas ao elevado número de juntas, conexões, válvulas e registros enquanto que nas adutoras, ainda que bem assentadas, ocorrem perdas devidas à falta de alinhamento preciso e à presença de juntas. Por essa razão, Dupont, [6], na França, tem recomendado adotar, para as redes de distribuição, o valor $K = 10^{-3}$ m, para as adutoras de comprimento inferior a 1000 m, o valor $K = 10^{-4}$ m, e para as adutoras de comprimentos maiores que 1000 m, o valor $K = 4 \times 10^{-4}$ m. Ainda, nas redes de distribuição, quando se quer levar em conta os eventuais acréscimos nos consumos, a formação de possíveis depósitos de materiais e a incerteza quanto ao sentido do escoamento nos condutos, Dupont recomenda elevar o valor de K para 2×10^{-3} m.

Entre nós, essa orientação foi seguida na redação das Normas Técnicas P-NB-591 "Elaboração de Projetos de Sistemas de Adução de Água para Abastecimento Público" e P-NB-594. "Elaboração de Projetos Hidráulicos de Redes de Distribuição de Água Potável para Abastecimento Público". A Tab. 3 é uma reprodução dos valores adotados pelas citadas Normas Técnicas, valores esses extraídos de diversos autores e entidades [5], [10].

g) A menos de um erro relativamente pequeno (excepcionalmente da ordem de 6%, V. Tab. 4), o coeficiente de perda de carga f pode ser calculado também pela fórmula ajustada de Wood àquela de Colebrook-White:

$$f = a + bR^{-c} \quad (10b)$$

onde

$$a = 0,53 \frac{K}{D} + 0,094 \left(\frac{K}{D} \right)^{0,225}$$

$$b = 88 \left(\frac{K}{D} \right)^{0,44}$$

$$c = 1,62 \left(\frac{K}{D} \right)^{0,134}$$

Esta fórmula é muito útil para a análise de um dado escoamento em que a vazão e o diâmetro são conhecidos a priori (V. nº 4, CASO I).

TABELA 2

Coeficientes obtidos em ensaios de condutos e túneis (Cf. Ref. 9)

Curva Símbolo Nº	Nome do Projeto	Trecho ensaiado			Ensaio			Dados obtidos			
		Superfície	Diam. (m)	L/D	Ano	Anos	Nº	Velocidade (m/s)	R	f	10 ⁵ K(m)
○	1 Fort Randall Penstock 1, Missouri River, S.D.	Coal-tar (*)	6,6	22	.....	.....	20	3,15 4,41	1,25 × 10 ⁷ 1,75 × 10 ⁷	0,01053 0,01045	0,28
○	2 Fort Randall Penstock 8, Missouri River, S.D.	Tinta de vinil sobre aço	6,6	22	1956	.....	29	1,92 4,38	8,11 × 10 ⁶ 1,84 × 10 ⁷	0,00833 0,00739	zero
Δ	3 Fort Randall Tunnel 10, Missouri River, S.D.	Coal-tar (*)	6,6	29	1959	.....	5	6,0 19,74	4,67 × 10 ⁷ 1,46 × 10 ⁸	0,00881 0,00869	0,1
○	4 Denison Dam Tunnel, Red-River, Okla. and Tex.	Concreto	6,0	32	47-57	...	3	19,59 21,48	1,20 × 10 ⁸ 1,40 × 10 ⁸	0,00764 0,00762	4,0
Δ	5 Pine Flat Dam Conduit, Kings River, Calif.	Concreto	Rect. 1,5 × 2,7	54	1952	.....	7	18,45 20,52	2,80 × 10 ⁷ 3,43 × 10 ⁷	0,01318 0,01317	0,31
○	6 Pine Flat Dam Conduit, Kings River, Calif.	Concreto	Rect. 1,5 × 2,7	54	54-58	...	6	24,15 27,45	3,54 × 10 ⁷ 4,49 × 10 ⁷	0,01750 0,01750	0,012
Δ	7 Ontario Power Co. Tunnel, Niagara Falls, Canada	Concreto	5,4	361	.....	8	5	1,2 6,0	5,88 × 10 ⁶ 2,94 × 10 ⁷	0,00889 0,00733	90,0
○	8 Umatilla River Siphon, Umatilla Project, Ore.	Concreto	1,149 1,149	2,550 2,565	.....	5	5	0,42 - 0,96 1,2 - 1,26	3,80 × 10 ⁵ 1,14 × 10 ⁶	0,01481 0,01310	0,1
Δ	9 Umatilla Dam Siphon, Umatilla Project, Ore.	Concreto	0,75	2,011	.....	novo	3	1,02 1,08	6,00 × 10 ⁵ 6,40 × 10 ⁵	0,01406 0,01396	7,1
	10 Prosser-Pressure Pipe, Yakima, Wash.	Concreto	0,762	896	.....	4	7	1,37 1,74	1,01 × 10 ⁶ 1,20 × 10 ⁶	0,01768 0,01761	0,437
∇	11 Deer Flat Conduit Boise Project, Idaho	Concreto	0,9	2,427	.....	6	5	1,62 2,73	1,32 × 10 ⁶ 2,20 × 10 ⁶	0,01368 0,01333	0,123
Δ	12 Chelan Station Conduit, State of Washington	Concreto	4,2	659	.....	novo	17	0,36 4,44	3,40 × 10 ⁶ 1,69 × 10 ⁷	0,01123 0,01056	0,19
○	13 Enid Dam Tunnel, Yocona River.	Concreto	3,3	5	1958	6	8	11,1 11,67	2,58 × 10 ⁷ 2,71 × 10 ⁷	0,01290 0,01290	0,47
	14 Oahe Dam Tunnel, Missouri River, S.D.	Concreto	5,475	36	60-62	.....	4	11,01 13,32	7,37 × 10 ⁷ 9,17 × 10 ⁷	0,00690 0,00682	1,1
	15 San Gabriel Penstock, Los Angeles County, Calif.	Enamel em aço (*)	1,269	118	1953	.....	30	18,0 10,8	1,82 × 10 ⁶ 1,17 × 10 ⁷	0,01162 0,01037	4,8
∇	16 San Gabriel, Penstock, Los Angeles County, Calif.	Enamel em aço (*)	3,069	49	1953	.....	26	2,19 14,97	5,57 × 10 ⁶ 3,81 × 10 ⁷	0,00880 0,00653	zero
	17 Garrison Dam Penstock, Missouri River, N.D.	Tinta Vinil sobre aço	7,2	32	1956	novo	26	2,4 4,65	1,54 × 10 ⁷ 2,96 × 10 ⁷	0,00761 0,00698	zero
○	18 Niagara Sir Adam Beek Tunnel, Canada	Concreto	13,5	624	1954	novo	6	2,52 4,53	3,25 × 10 ⁷ 5,66 × 10 ⁷	0,00769 0,00747	5,5
○	18 Louisville Sewer Model	Plástico	1,47 0,099	508 762	1949	novo	16	0,354 1,245	4,80 × 10 ⁴ 1,13 × 10 ⁵	0,0206 0,0168	zero zero

(*) Tubo de aço revestido internamente com alcatrão da hulha, por centrifugação.

TABELA 3

Valores adotados na PNB 591 da rugosidade uniforme equivalente K (em mm) para tubos usuais.

I. <i>TUBO DE AÇO: JUNTAS SOLDADAS E INTERIOR CONTÍNUO</i>		
1.1. Grandes incrustações ou tuberculizações		2,4 a 12,0
1.2. Tuberculização geral de 1 a 3 mm		0,9 a 2,4
1.3. Pintura à brocha, com asfalto, esmalte ou betume em camada espessa		0,6
1.4. Leve enferrujamento		0,25
1.5. Revestimento obtido por imersão em asfalto quente		0,1
1.6. Revestimento com argamassa de cimento obtido por centrifugação		0,1
1.7. Tubo novo previamente alisado internamente e posterior revestimento de esmalte, vinyl ou epoxi obtido por centrifugação		0,06
II. <i>TUBO DE CONCRETO</i>		
2.1. Acabamento bastante rugoso: executado com formas de madeira muito rugosas: concreto pobre com desgastes por erosão; juntas mal alinhadas		2,0
2.2. Acabamento rugoso: marcas visíveis de formas		0,5
2.3. Superfície interna alisada a desempenadeira; juntas bem feitas		0,3
2.4. Superfície obtida por centrifugação		0,33
2.5. Tubo de superfície lisa, executado com formas metálicas, acabamento médio com juntas bem cuidadas		0,12
2.6. Tubo de superfície interna bastante lisa, executado com formas metálicas, acabamento esmerado, e juntas cuidadas		0,06
III. <i>TUBO DE CIMENTO AMIANTO</i>		0,10
IV. <i>TUBO DE FERRO FUNDIDO</i>		
4.1. Revestimento interno com argamassa de cimento e areia obtida por centrifugação com ou sem proteção de tinta a base de betume		0,1
4.2. Não revestido		0,15 a 0,6
4.3. Leve enferrujado		0,30
V. <i>TUBO DE PLÁSTICO</i>		0,06
VI. <i>TUBOS USADOS</i>		
6.1. Com camada de lodo inferior a 5,0 mm		
6.2. Com incrustações de lodo ou de gorduras inferiores a 25 mm		6,0 a 30,0
6.3. Com material sólido arenoso depositado de forma irregular		60,0 a 30,0

NOTA: - Valores mínimos a adotar com tubos novos (cf. item 5. 8.1.9 da PNB 591):

- Para adutoras medindo mais de 1 000 m de comprimento: 2,0 vezes o valor encontrado na tabela acima para o tubo e acabamento escolhidos.
- Para adutoras medindo menos de 1 000 m de comprimento: 1,4 vezes o valor encontrado na tabela para o tubo e acabamento escolhidos.

TABELA 4

Valores de f segundo as Eqs. 10 a (indicado por f_c) e 10 b (indicado por f_w)

R K/D	Valores de f							Variáveis
	5×10^3	10^4	5×10^4	10^5	5×10^5	10^6	5×10^6	
2×10^3	0,0396	0,0338	0,0265	0,0251	0,0238	0,0235	0,0235	f_c
	0,0394	0,0329	0,0271	0,0250	0,0348	0,0246	0,0244	f_w
	2,90	0,45	2,18	3,57	4,34	4,32	3,78	erro %
2×10^{-4}	0,0381	0,0318	0,0229	0,0207	0,0183	0,0178	-	f_c
	0,0387	0,0318	0,0234	0,0214	0,0193	0,0189	-	f_w
	1,54	0,54	2,29	3,44	5,57	6,07	-	erro %
2×10^{-4}	0,0376	0,0312	0,0216	0,0190	0,0154	0,0147	0,0139	f_c
	0,0392	0,0316	0,0216	0,0193	0,0163	0,0156	0,0146	f_w
	4,34	1,3	0,11	1,62	5,67	5,93	5,39	erro %

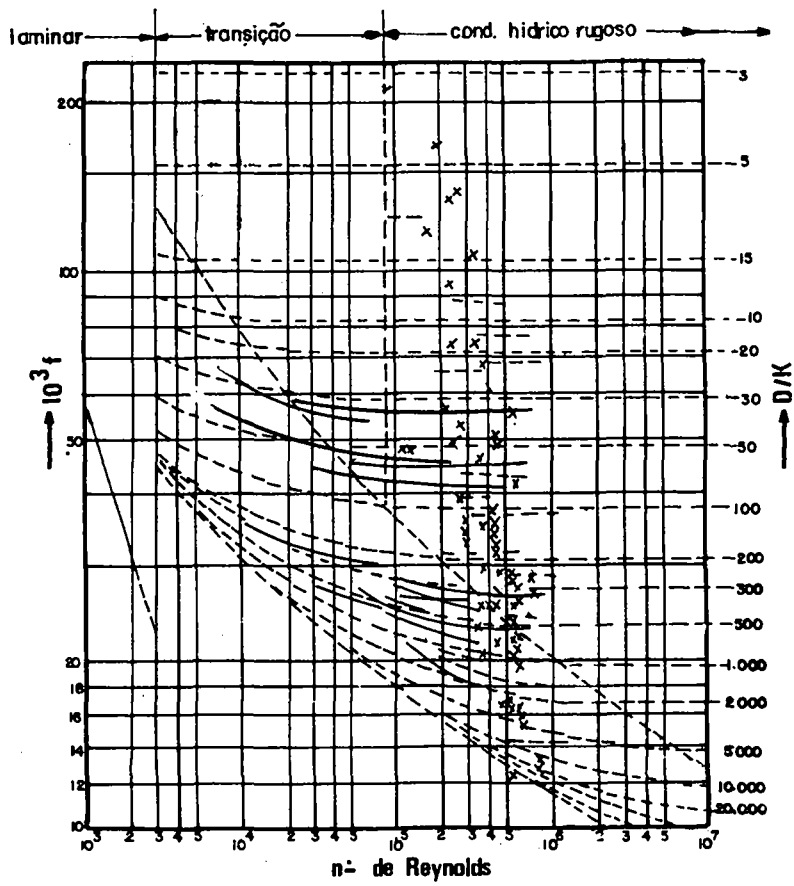
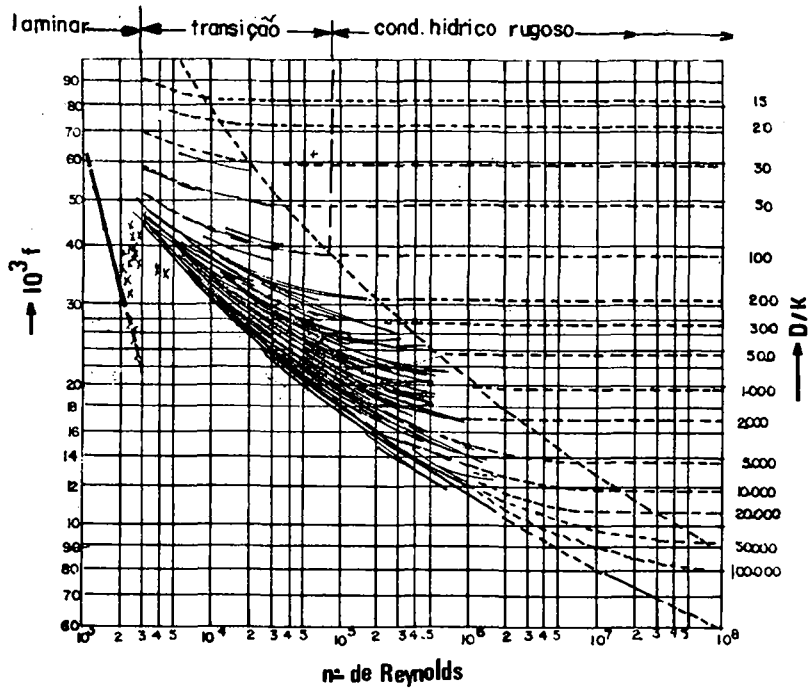


Fig. 5 Representação da Eq. 5 com dados obtidos em tubos industriais de todos os tipos (V. Ref. 8) a) tubos novos, b) tubos usados, V. também Tab. 1.

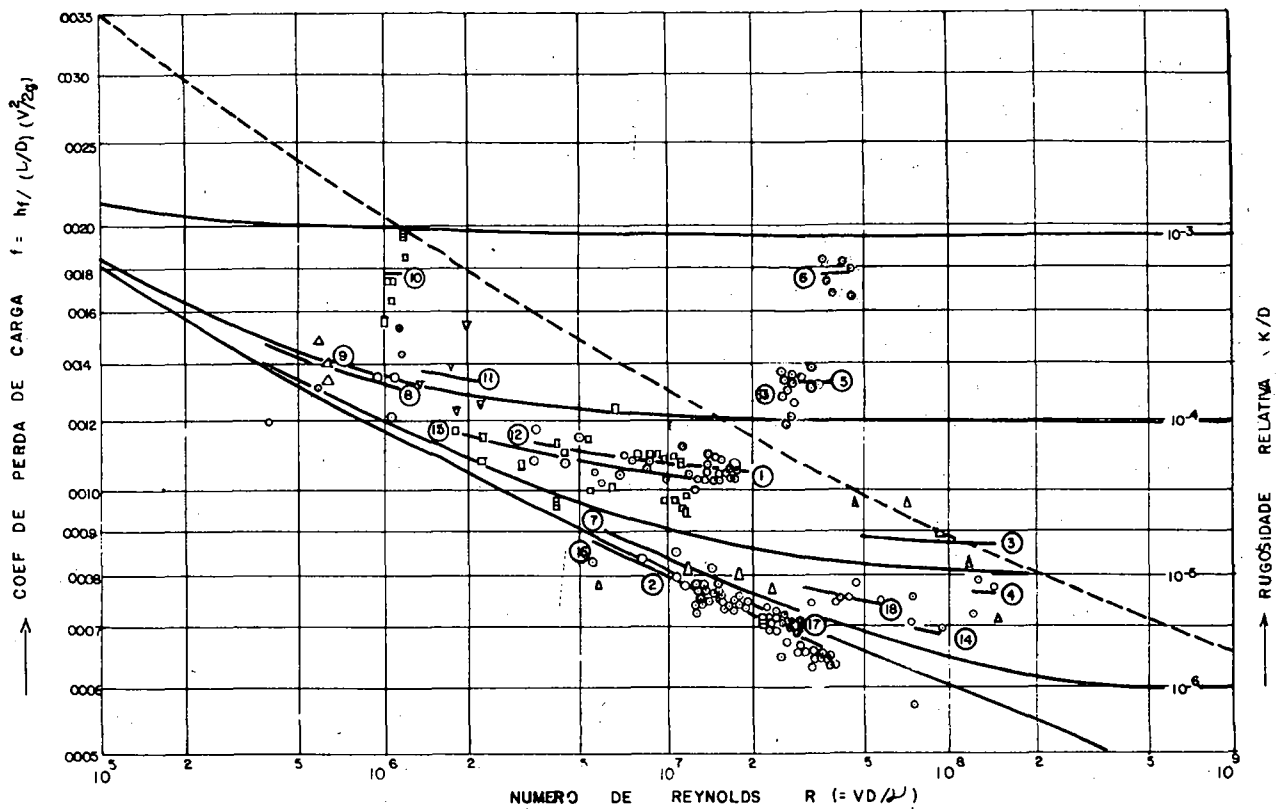


Fig. 6 - Localização de pontos (f, R) no diagrama de MOODY, obtidos em testes de condutos e túneis (cf. ref. 9). V. Tab. 2

4. ANÁLISE DOS ESCOAMENTOS EM CONDUTOS FORÇADOS.

O método de cálculo, que a seguir se expõe, supõe o escoamento isotérmico, realizando-se em um conduto forçado cilíndrico, longo, de seção circular e sendo conhecidos o comprimento L e a rugosidade uniforme equivalente K. O fluido é também conhecido através de ν . As equações que regem um tal escoamento são da forma:

a) Equação de Colebrook

$$\frac{1}{\sqrt{f}} = -2 \log_{10} \left(0,27 \frac{K}{D} + \frac{2,51}{R\sqrt{f}} \right) \quad (10a)$$

b) Equação da Continuidade

$$Q = \frac{\pi D^2}{4} V = \text{Cte.} \quad (11)$$

c) Número de Reynolds

$$R = \frac{VD}{\nu} \quad (12)$$

d) Fórmula universal de perda de carga distribuída

$$h_f = f \frac{L}{D} \frac{V^2}{2g} \quad (13)$$

São, portanto, quatro equações a seis incógnitas, a saber, f, D, V, Q, R, h_f . Quando duas dessas variáveis são dadas, as demais variáveis resultam, e o problema admite solução e é única. Na prática, os pares de variáveis dados são em geral, da forma: (D, Q), (h_f , D) e (h_f , Q). Com os recursos do cálculo numérico e/ou com o emprego dos diagramas em anexo, as soluções, para cada um desses casos, podem ser obtidas como segue:

CASO I: Dados (D, Q).

Vejamos, preliminarmente, o método de resolução através do emprego dos diagramas anexos. Como D e Q são dados, a Eq. 11 fornece V com o que a Eq. 12 fornece R. Como K é, também, conhecido, calcula-se K/D ou D/K. Com o par (K/D, R) os diagramas anexos fornecem f, com o que a Eq. 13 fornece h_f .

O método de resolução por via numérica empregando a fórmula de Wood, não traz nenhuma dificuldade de cálculo. Mas, a resolução com a fórmula de Colebrook exige um processo numérico iterativo, que então passamos a descrever. Fazemos $x = 1/\sqrt{f}$. A Eq. 10a se converte em:

$$F(x) = x + 2 \log\left(0,27 \frac{K}{D} + \frac{2,51}{R} x\right) = 0$$

Seja x_0 uma raiz aproximada de $F(x) = 0$ e suponhamos que a raiz exata é $x_0 + h$, onde h é uma quantidade pequena. Então $F(x_0 + h) = 0$ e desenvolvendo pela fórmula de Taylor, temos:

$$F(x_0 + h) = 0 = F(x_0) + hF'(x_0) + \frac{1}{2} h^2 F''(x_0) + \dots$$

Como h é pequeno e $F(x)$ é uma função com propriedades normais nas vizinhanças da raiz procurada, os termos em h^2 , h^3 , ... podem ser desprezados, de modo que:

$$h \cong -F(x_0)/F'(x_0)$$

A fórmula iterativa de Newton-Raphson é obtida escrevendo este último resultado como um processo iterativo, a saber:

$$x_{r+1} = x_r - \frac{F(x_r)}{F'(x_r)} \quad (14b)$$

Aplicando esta fórmula de recorrência à Eq. (14a) obtém-se:

$$x_{r+1} = x_r - \frac{x_r + 2 \log\left(0,27 \frac{K}{D} + \frac{2,51}{R} x_r\right)}{1 + \frac{5,02}{(0,27 \frac{K}{D} R + 2,51 x_r) \lg_e 10}} \quad (14c)$$

Adotando, preliminarmente, um valor x_0 , a fórmula de recorrência (14c) fornece sucessivamente x_1, x_2, \dots . O valor de x a adotar como solução será o que diferir do anterior de um valor inferior a um erro prefixado. Com uma máquina de calcular do tipo digital o cálculo será simples e rápido. O valor de x assim obtido fornece

$$f = \frac{1}{x^2} \quad (15)$$

com o que se calcula a variável remanescente h_f pela Eq. 13.

CASO II: Dados (h_f , D).

Neste caso a solução por via numérica requer apenas uma ligeira modificação na Eq. 10. A expressão de

$$R \sqrt{f} = \frac{D}{v} \sqrt{2gDJ} \quad (16)$$

(onde $J = h_f/L =$ perda de carga unitária) é função só dos dados do problema, converte a Eq. 10 em uma expressão que permite calcular diretamente o valor de f, com o que se obtém, pela Eq. 13, o valor de V e pelas Eqs. 11 e 12, os valores de Q e R respectivamente.

Com o emprego do diagrama de Moody-Rouse a solução é também direta e imediata: Depois de obtido $R\sqrt{f}$ pela Eq. 16 se deduz do diagrama $f(R\sqrt{f}, D/K)$. Os procedimentos seguintes são os acima descritos.

CASO III: Dados (h_f , Q).

Neste caso a solução por via numérica requer também uma ligeira modificação da Eq. 10 e é obtida por aproximações sucessivas. As expressões de (com $J = h_f/L$ e $a = g\pi^2/8$):

$$\frac{1}{\sqrt{f}} = \frac{Q}{\sqrt{aJ}} \left(\frac{1}{\sqrt{D}}\right)^5, \quad R\sqrt{f} = \frac{\sqrt{2gJ}}{v} (\sqrt{D})^3 \quad (17)$$

tiradas respectivamente das Eqs. 11 e 13 e das Eqs. 10 e 16, convertem a Eq. 10 em

$$\left[\frac{1}{\sqrt{D}}\right]^5 = -\frac{2\sqrt{aJ}}{Q} \log_{10} \left[0,27K\left(\frac{1}{\sqrt{D}}\right)^2 + \frac{2,51 v}{\sqrt{2gJ}} \left(\frac{1}{\sqrt{D}}\right)^3\right]$$

a saber, em uma equação da forma

$$F(x) = x^5 + p \log(qx^2 + rx^3) = 0 \quad (18)$$

com

$$x = \frac{1}{\sqrt{D}}, \quad p = \frac{2\sqrt{aJ}}{Q}, \quad q = 0,27K, \quad r = \frac{2,5v}{\sqrt{2gJ}} \text{ e } a = 12,1$$

A Eq. 18 é resolvida por aproximações sucessivas, utilizando o mesmo procedimento de Newton-Raphson, donde a fórmula de recorrência:

$$x = x_0 - \frac{x_0^5 + p \log(qx_0^2 + rx_0^3)}{5x_0^4 + \frac{p(2q + 3rx_0)}{x_0(q + rx_0)} \lg_e 10} \quad (19)$$

O valor de x assim determinado fornece

$$D = \frac{1}{x^2} \quad (20)$$

com o que se calculam as demais variáveis remanescentes R e V. Quando o tubo é fornecido no comércio com diâmetros discretos encomenda-se, na prática, tubos de diâmetros igual ou imediatamente superior ao valor encontrado por (20).

Com o emprego dos diagramas, a solução é obtida por tentativas:

- Adota-se um valor de D
- Calculam-se R (Eq. 12) e D/K ou K/D
- Do diagrama acha-se f(R, D/K ou K/D)
- Calcula-se V pela Eq. 11
- Verifica-se o diâmetro adotado resolvendo a Eq. 13 em relação a D. Se o diâmetro assim obtido coincidir com o adotado, o problema está resolvido. Caso contrário, adota-se o diâmetro que acaba de ser calculado e repetem-se as operações acima citadas para uma nova verificação. Esse procedimento continua até a convergência.

EXEMPLO 1:

Num conduto cilíndrico, longo, de comprimento $L = 100\text{m}$, de seção circular, de diâmetro $D = 0,2\text{m}$ e de rugosidade uniforme equivalente $K = 10^{-4}\text{m}$ está escoando água à temperatura de 20°C ($\nu \cong 10^{-6}\text{m}^2/\text{s}$) com a vazão de $62,8\text{ lts/s}$. Pede-se a perda de carga (CASO I).

Solução:

$$\text{Cf. Eq. 11: } V = \frac{4Q}{\pi D^2} = \frac{4 \times 0,0628}{3,14 \times 0,2^2} = 2,0 \text{ m/s}$$

$$\text{Cf. Eq. 12: } R = \frac{VD}{\nu} = 10^6 \times 2 \times 0,2 = 4 \times 10^5$$

$$\text{Rugosidade relativa: } \frac{K}{D} = \frac{10^{-4}}{0,2} = 5 \times 10^{-4}$$

$$\text{Cf. Eq. 14: } x = x_0 - \frac{x_0 - 8 + 2 \log(1,35 + 0,063 x_0)}{1 + \frac{5,02}{124,34 + 5,779 x_0}}$$

$$1^{\text{a}} \text{ tentativa: } x_0 = 5,0 \quad x_1 = 7,477$$

$$2^{\text{a}} \text{ tentativa: } x_1 = 7,477 \quad x_2 = 7,480$$

$$3^{\text{a}} \text{ tentativa: } x_2 = 7,480 \quad x_3 = 7,480 \text{ (Erro inferior a 0,5\%)}$$

$$\text{Cf. Eq. 15: } f = \frac{1}{x_3^2} = \frac{1}{7,48^2} = 0,0179$$

$$\text{Cf. Eq. 13: } h_f = f \frac{L}{D} \frac{V^2}{2g} = 0,0179 \times \frac{100}{0,2} \times \frac{2^2}{2 \times 9,8} = 1,826 \text{ m}$$

Note-se a extrema convergência do processo para a obtenção de f. Este número pode ser cotejado com o valor lido no diagrama de Moody-Rouse para R e D/K acima calculados. Também, pode ser comparado com o que se obteria aplicando a fórmula de Wood, a saber (V. Eq. 10b):

$$a = 0,094(5 \times 10^{-4})^{0,225} + 0,53(5 \times 10^{-4}) = 0,011726$$

$$b = 88(5 \times 10^{-4})^{0,44} = 3,10477$$

$$c = 1,62(5 \times 10^{-4})^{0,134} = 0,585$$

$$f = 0,01726 + 3,10477(4 \times 10^5)^{-0,585} = 0,01890$$

Este valor difere do anterior em menos de 6%.

EXEMPLO 2:

Num conduto cilíndrico longo de ferro fundido de seção circular, de diâmetro $D = 0,10$ m e de rugosidade uniforme equivalente $2,5 \times 10^{-4}$ m, está escoando água à temperatura de 37°C ($\nu = 7,0 \times 10^{-7} \text{ m}^2/\text{s}$) com perda de carga unitária $J = (H_f/L) = 0,0115$ m/m. Pede-se a vazão (CASO II).

$$\text{Cf. Eq. 16: } R\sqrt{f} = \frac{0,1 \times 10^7}{7} \sqrt{2 \times 9,8 \times 0,1 \times 0,0115} = 2,1 \times 10^4$$

$$\frac{K}{D} = \frac{2,5 \times 10^{-4}}{0,1} = 2,5 \times 10^{-3}$$

$$\text{Cf. Eq. 10: } \frac{1}{\sqrt{f}} = -2 \log(0,27 \times 2,5 \times 10^{-3} + \frac{2,51}{2,1 \times 10^4}) = 6,2 \therefore f = 0,026$$

$$\text{Cf. Eq. 13: } V^2 = \frac{2gDJ}{f} = \frac{2 \times 9,8 \times 0,1 \times 0,0115}{0,026} = 0,87 \therefore V = 0,93 \text{ m/s.}$$

$$\text{Cf. Eq. 11: } Q = \frac{\pi \times 0,1^2}{4} \times 0,93 = 0,0073 \text{ m}^3/\text{s} \text{ ou } 7,3 \text{ l/s.}$$

Com o emprego do diagrama de Moody-Rouse se deduz $f(R\sqrt{f} = 2,1 \times 10^4; D/K = 400) = 0,026$. Os procedimentos seguintes são os mesmos acima indicados.

EXEMPLO 3:

Calcular o diâmetro de um conduto cilíndrico longo, de aço, de comprimento 360 m, de rugosidade uniforme equivalente 10^{-4} m, para a adução de água à temperatura de 20°C ($\nu = 10^{-6} \text{ m}^2/\text{s}$) com a vazão de $12,0 \text{ m}^3/\text{s}$ e sob a diferença de carga piezométrica nas seções extremas de 3,9 m.

Solução: Preliminarmente, calculam-se:

$$J = \frac{h_f}{L} = \frac{3,9}{360} = 0,0108 \text{ m/m}$$

$$p = \frac{2 \sqrt{12,1 \times 0,0108}}{12,0} = 0,06$$

$$q = 0,27 \times K = 0,27 \times 10^{-4}$$

$$r = \frac{2,5 \times 10^{-6}}{\sqrt{2 \times 9,8 \times 0,0108}} = 5,43 \times 10^{-6}$$

$$\text{Cf. Eq. 19: } x = x_0 - \frac{x_0^5 - 0,24 + 0,06 \log(0,27 x_0^2 + 0,054 x_0^3)}{5x_0^4 + \frac{0,0324 + 0,00098 x_0}{x_0(0,6217 + 0,12503 x_0)}}$$

$$1^{\text{a}} \text{ tentativa: } x_0 = 0,60 \quad x_1 = 0,90$$

$$2^{\text{a}} \text{ tentativa: } x_1 = 0,90 \quad x_2 = 0,806$$

$$3^{\text{a}} \text{ tentativa: } x_2 = 0,81 \quad x_3 = 0,779$$

$$4^{\text{a}} \text{ tentativa: } x_3 = 0,779 \quad x_4 = 0,777 \text{ (erro } < 0,3\%)$$

O diâmetro procurado será: (Eq. 20):

$$D = \frac{1}{x_4^2} = \frac{1}{0,777^2} = 1,648 \text{ m ou } 1648 \text{ mm.}$$

Note-se que o primeiro valor adotado para $x_0 (\cong 0,60)$ corresponde a um diâmetro 2777 mm. A convergência é então rápida levando-se ainda em consideração a precisão imposta ($< 0,3\%$).

Os valores de V e f serão, conforme respectivamente Eqs. 11 e 13:

$$V = 5,62 \text{ m/s}, \quad f = 0,011$$

5. CASO PARTICULAR DAS REDES DE DISTRIBUIÇÃO E DE CONDUTOS DE ADUÇÃO DE ÁGUA

A importância das fórmulas de resistência na Engenharia Sanitária destaca-se, sobretudo, na análise hidráulica das instalações prediais, das redes de distribuição e das linhas de adução de água. Para estes fins, a fórmula universal de perda de carga é perfeitamente recomendável e seu emprego pode ser enormemente facilitado por meio das tabelas anexas. Estas tabelas foram preparadas, admitindo-se a água à temperatura de 20°C ($\nu = 10^{-6} \text{ m}^2/\text{s}$), e praticamente, para qualquer valor da rugosidade uniforme equivalente do intervalo (0,05 mm; 2,0 mm) e da velocidade variável no intervalo (0,3 m/s; 3,0 m/s). A distribuição adotada para os diâmetros dos tubos permite cobrir a maioria dos diâmetros normalmente oferecidos no comércio. A vazão (em ℓ/s), quando é dada e não se encontra na tabela, pode ser interpolada sem prejuízo da precisão.

O uso das tabelas é muito simples e isto pode ser avaliado rapidamente com a resolução dos seguintes exemplos:

EXEMPLO 4:

Sendo dados $D = 0,2 \text{ m}$, $K = 0,1 \text{ mm}$, $Q = 62,8 \ell/\text{s}$ (V. Ex. 1) $L = 100,0 \text{ m}$, pedem-se a perda de carga e a velocidade.

Com os dados de entrada $Q = 62,8 \ell/\text{s}$ e $K = 0,1 \text{ mm}$ na folha correspondente ao diâmetro $D = 0,2 \text{ m}$, encontra-se $J = 0,1824 \text{ m/m}$, donde $h_f = JL = 0,1824 \times 100 = 1,824 \text{ m}$, e $V = 2,0 \text{ m/s}$.

EXEMPLO 5:

Sendo dados $D = 0,10 \text{ m}$, $K = 0,25 \text{ mm}$ e $J = 0,0115 \text{ m/m}$, pede-se a vazão e conseqüentemente, a velocidade (Cf. Ex. 2).

Na folha correspondente a $D = 0,1 \text{ m}$, temos por interpolação, os valores de J para $K = 0,25 \text{ mm}$ e entre as velocidades $0,9 \text{ m/s}$ e $0,95 \text{ m/s}$. Como $J(0,9 \text{ m/s}) = 0,01093 \text{ m/m}$ e $J(0,95 \text{ m/s}) = 0,01214 \text{ m/m}$, a velocidade para a qual $J = 0,0115 \text{ m/m}$ é $V = 0,92 \text{ m/s}$. Em termos de vazão, sendo $S = 0,0079 \text{ m}^2$, temos:

$$Q = 0,92 \times 0,0079 = 0,0073 \text{ m}^3/\text{s} = 7,3 \ell/\text{s}.$$

EXEMPLO 6:

Calcular a pressão disponível em cada uma das seções da instalação predial representada na Fig. 7 sendo dado $K = 0,2 \text{ mm}$

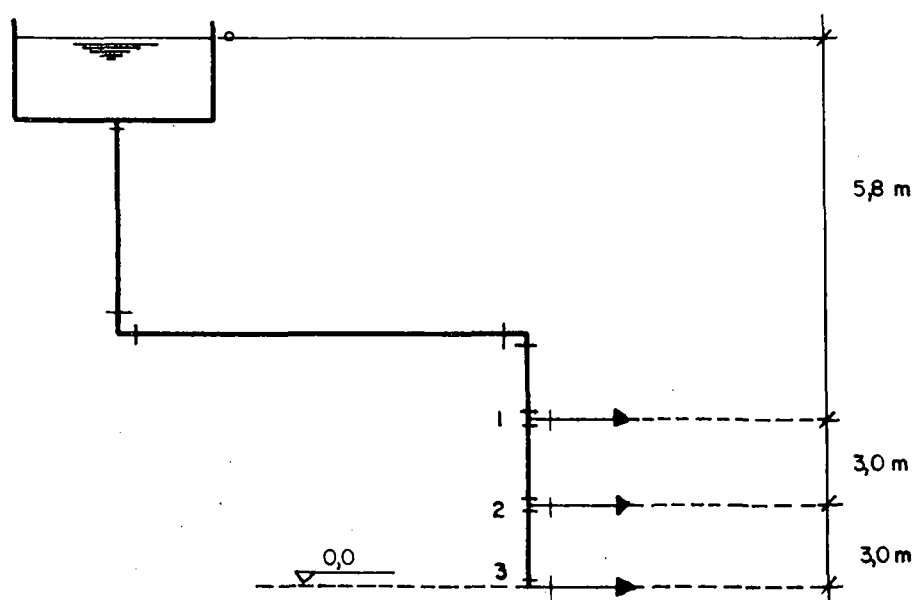


Fig. 7 – Esquema da instalação predial referida no Ex. 6.

Os resultados obtidos estão resumidos nas tabelas seguintes. Na coluna (1), estão indicados os trechos em que a instalação foi subdividida. Nas colunas (2), (3) e (4) encontram-se o comprimento, o diâmetro e a vazão de cada trecho. Nas colunas (5), (6) e (7) estão as variáveis avaliadas de acordo com o procedimento indicado no Ex. 4. Nas colunas (8), (9) estão citadas a soma dos coeficientes de perda de carga singular e a perda de carga singular é dada por $h_s = K_s V^2/2g$. A soma $h_s + h_f$ é a perda de carga total no trecho (Coluna 10). A tabela seguinte é por si só esclarecedora quanto ao cálculo da pressão disponível.

Trecho (1)	L(m) (2)	D(mm) (3)	Q(4) (l/s)	V(5) (m/s)	Perda distr.		Perda sing.		Perda Total (10)
					J(m/m) (6)	h_f (m) (7)	K_s (8)	h_s (9)	
0 - 1	10,0	63,0	5,0	1,6	0,0595	0,595	3,5	0,46	1,05
1 - 2	3,0	50,0	4,0	2,05	0,1264	0,379	1,3	0,28	0,66
2 - 3	3,0	38,0	2,0	1,76	0,1323	0,397	1,3	0,21	0,606

Seção	Carga piezom. (m c a)	Cota geom. (m c a)	Pressão disponível (m c a)
0	11,8	11,80	zero
1	10,75	6,0	4,75
2	10,09	3,0	7,09
3	9,48	0,0	9,48

6. LIMITAÇÕES DAS FÓRMULAS EMPÍRICAS DE PERDA DE CARGA.

Com exceção talvez da fórmula de resistência devida a Flamant (Eq. 1) que é, para $b = 0,0052$ e $R < 10^5$, admiravelmente, exata, as demais fórmulas são mais ou menos incorretas. A incorreção dessas fórmulas é tanto maior quanto mais amplo é o domínio de aplicação pretendido pelos seus autores. Entre as fórmulas consideradas com domínios de aplicação bastante amplos destaca-se a de Hazen-Williams (Eq. 2) e entre as fórmulas de domínio de aplicação mais restritos destaca-se a de Manning-Strickler (Eq. 3). As incorreções destas duas fórmulas são a seguir evidenciadas à luz da fórmula universal (Eq. 4) com o coeficiente de perda de carga dado pela fórmula de Colebrook (Eq. 10).

6.1 Fórmula de Flamant

Mediante pequenas transformações algébricas, a Eq. 1 assume a forma:

$$J = \frac{2bg}{\nu^{1/4}} \cdot \frac{1}{R^{1/4}} \frac{1}{D} \frac{V^2}{2g}$$

Por comparação com a Eq. 4 se deduz imediatamente a relação

$$f = \frac{A}{R^{1/4}} \quad (21)$$

com $A = 3bg/\nu^{1/4}$.

A Eq. (21) é do tipo daquela de Blasius (Eq. 7.b). A constante A para o líquido água à temperatura de 20°C ($\nu \cong 10^{-6} \text{ m}^2/\text{s}$) e para $b = 0,00052$ (tubo de vidro ou de chumbo, que são tubos internamente lisos) vale

$$A = \frac{2 \times 0,00052 \times 9,8}{10^{-6/4}} \cong 0,322$$

que difere da constante de Blasius (0,316) em menos de 2%.

Assim, a fórmula de Flamant com $b = 0,00052$ é teoricamente correta para condutos *hidraulicamente lisos* e para $5 \cdot 10^3 < R < 10^5$.

6.2 Fórmula de Manning-Strickler

Igualando as perdas de carga unitária dadas pelas Eqs. 3 e 4 obtém-se

$$11,16 \frac{n}{\sqrt{f}} = D^{1/6} \quad (22)$$

Na fórmula de Manning-Strickler, n é um coeficiente numérico que depende apenas da rugosidade do conduto. Neste caso, f deverá corresponder à região do escoamento em que o conduto é hidraulicamente rugoso. A lei de variação de f é, então, dada pela Eq. 8 com $\epsilon = K$ e $A = 1,74$, ou, o que é o mesmo, pela Eq. 10:

$$\frac{1}{\sqrt{f}} = 2 \log 3,71 \frac{D}{K}$$

Levando a expressão de \sqrt{f} na Eq. (22) e simplificando o resultado obtido, chega-se à seguinte relação

$$n = \frac{K^{1/6}}{22,32} \left(\frac{D}{K}\right)^{1/6} \frac{1}{\log 3,71 \frac{D}{K}} \quad (23)$$

Para que n dependa unicamente da rugosidade do conduto, é preciso que a quantidade

$$Y\left(\frac{D}{K}\right) = \left(\frac{D}{K}\right) \frac{1}{\log 3,71 \frac{D}{K}}$$

se mantenha constante, para qualquer que seja o valor de D/K . A Tab. 5 põe em evidência que para uma grande variação de D/K , as variações de $Y(D/K)$ são pequenas. Em primeira aproximação, $Y(D/K)$ pode ser considerado sensivelmente constante. E, neste caso, a fórmula (3) é aplicável aos condutos hidraulicamente rugosos.

É também, interessante observar a utilidade da Eq. (23) como um meio de se determinar n sendo conhecido o coeficiente K e vice-versa (dentro do intervalo de variação D/K para o qual $Y(D/K) = Cte$).

TABELA 5 – Valores de $Y(D/K)$

$\frac{D}{K}$	20	40	100	200	400	1000	2000	4000	10000	20000	40000
$Y\left(\frac{D}{K}\right)$	0,881	0,852	0,838	0,842	0,855	0,886	0,917	0,955	1,016	1,069	1,131

6.3 Fórmula de Hazen-Williams

Igualando as expressões das perdas de carga J tiradas das Eqs. 2 e 4, se deduz a seguinte relação entre as diversas variáveis em jogo:

$$f = \frac{13,26 g}{v^{0,15} K^{0,02}} \cdot \frac{1}{C^{1,852} R^{0,15} (D/K)^{0,02}} \quad (24)$$

donde, também, a relação:

$$C = \frac{14,06}{v^{0,08} K^{0,01}} \cdot \frac{1}{f^{0,54} R^{0,08} (D/K)^{0,01}} \quad (25)$$

Segundo as tabelas que acompanham a fórmula de Hazen-Williams, C é um número que depende apenas da rugosidade do conduto. Para avaliar a consistência desta propriedade calcularam-se os valores de $f(R, K/D)$ pela Eq. 10 e os valores de C pela Eq. 25. Estes valores que se encontram na Tab. 6, admitem a representação gráfica mostrada na Fig. 8. Para facilidade de construção desse gráfico e sem prejuízo da precisão, as potências de K e de D/K foram suprimidas, pois são da ordem da unidade, para K e D/K variáveis dentro de intervalos relativamente extensos. O comportamento de C pode ser avaliado nos dois exemplos seguintes:

EXEMPLO 7

Neste exemplo (V. Tab. 7) imaginaram-se condutos formados por tubos de mesmo material e de mesmo revestimento interno, com o valor de K igual a 10^{-3} m. O líquido é água escoando à temperatura de 20°C ($\nu = 10^{-6}$ m²/s).

TABELA 6
Valores de f(R, K/D) e de C(f, R).

	$5 \cdot 10^3$		10^4		$5 \cdot 10^4$		10^5		$5 \cdot 10^5$		10^6		$5 \cdot 10^6$		10^7		$5 \cdot 10^7$		10^8	
	f	C	f	C	f	C	f	C	f	C	f	C	f	C	f	C	f	C	f	C
05	0,0759	87,6	0,0738	84,1	0,0720	75,0	0,0717	71,1	0,0716	62,5	0,0715	59,2	0,0715	52,1	0,0715	49,3	0,0715	43,3	0,0715	41,0
04	0,0695	91,9	0,0672	88,5	0,0652	79,1	0,0649	75,0	0,0647	66,1	0,0647	62,5*	0,0646	55,0	0,0646	52,0	0,0646	45,7	0,0646	43,3
03	0,0628	97,0	0,0601	94,0	0,0578	84,4	0,0575	80,1	0,0572	70,6	0,0572	66,8*	0,0571	58,0	0,0571	54,9	0,0571	48,3	0,0571	46,3
02	0,0555	103,7	0,0522	101,4	0,0494	91,9	0,0490	87,3	0,0487	77,0	0,0487	72,9*	0,0486	63,3	0,0486	59,9	0,0486	52,6	0,0486	50,5
015	0,0515	108,0	0,0479	106,3	0,0446	97,1	0,0441	92,4	0,0438	81,6	0,0437	77,3*	0,0437	67,0	0,0437	63,4	0,0437	55,7	0,0437	53,4
01	0,0473	113,1	0,0431	112,5	0,0391	104,2	0,0385	99,5	0,0380	88,1	0,0380	83,3*	0,0379	73,3	0,0379	69,4	0,0379	61,0	0,0379	57,7
006	0,0436	118,2	0,0388	119,1	0,0337	113,0	0,0329	108,3	0,0323	96,1	0,0322	91,1*	0,0321	79,2	0,0321	74,9	0,0321	65,9	0,0321	63,1
004	0,0416	121,2	0,0364	123,2	0,0305	119,2	0,0295	114,8	0,0286	102,7	0,0285	97,3*	0,0284	84,6	0,0284	80,0	0,0284	70,4	0,0284	67,4
002	0,0396	124,5	0,0338	128,3	0,0265	128,6	0,0251	125,3	0,0238	113,4	0,0236	107,7*	0,0235	94,9	0,0234	90,0	0,0234	79,2	0,0234	74,9
001	0,0385	126,4	0,0324	131,2	0,0240	135,7	0,0222	133,9	0,0202	123,9	0,0199	118,1	0,0196	103,3	0,0196	97,8	0,0196	85,9	0,0196	82,4
0006	0,0381	127,1	0,0318	132,6	0,0229	139,2	0,0207	139,0	0,0183	130,7	0,0178	125,5	0,0174	110,2	0,0174	104,3	0,0174	91,7	0,0174	87,9
0004	0,0378	127,6	0,0315	129,7	0,0222	141,5	0,0199	142,0	0,0170	136,0	0,0165	130,7	0,0160	116,8*	0,0159	110,9	0,0159	97,5	0,0159	92,3
0002	0,0376	128,0	0,0312	133,9	0,0216	143,6	0,0190	145,6	0,0154	143,4	0,0147	139,1	0,0139	126,1	0,0138	119,7*	0,0137	105,7	0,0137	100,0
0001	0,0375	128,2	0,0310	134,4	0,0212	145,1	0,0185	147,7	0,0144	148,7	0,0134	146,3	0,0134	128,6	0,0134	121,7*	0,0120	113,5	0,0120	107,4
ERO	0,0374	128,4	0,0309	134,6	0,0209	146,2	0,0180	149,9	0,0132	155,9	0,0116	158,1	0,0090	159,7	0,0081	159,7	0,0065	158,1	0,0059	157,6

DIAGRAMA DE MOODY

Para
determinação do coeficiente de perdas de carga f em condutos

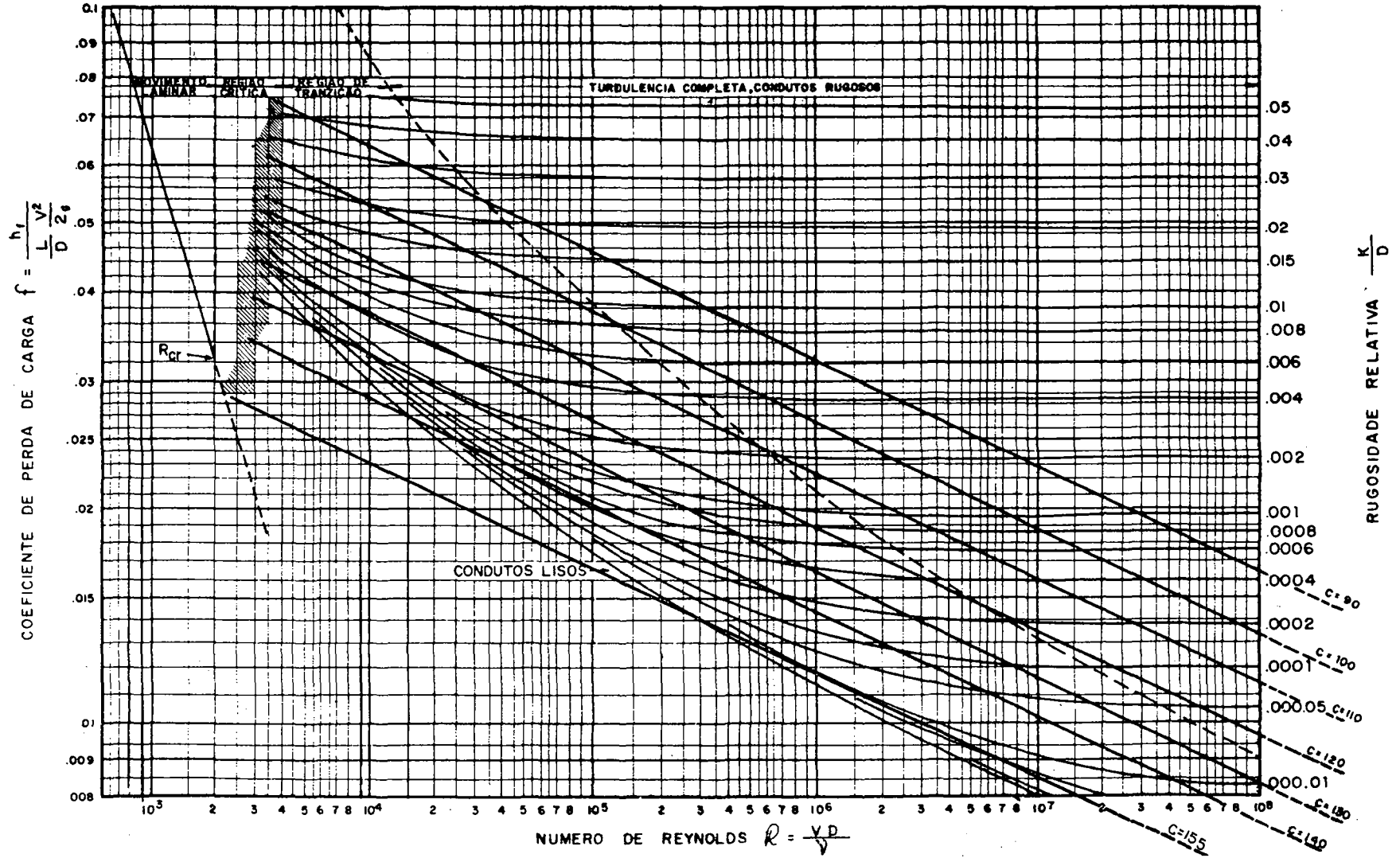


Fig. 8 - Valores de $f(R, K/D)$ e $C(f, \kappa)$

A velocidade foi admitida constante e compatível com os valores normalmente admitidos na prática (coluna 3). Para os diversos valores adotados para K/D (coluna 1) calcularam-se os diâmetros (coluna 2) e, conseqüentemente, os números de Reynolds (coluna 4). O coeficiente de perda de carga foi obtido pelo processo descrito no Ex. 1 ou da Tab. 6 (coluna 5). Os resultados obtidos para C , calculados segundo a Eq. 25, (ou Tab. 6), encontram-se na coluna 6. Consta-se que C é um número que varia com o diâmetro.

TABELA 7
Valores de C para $K = 10^{-3}$ m e diâmetro variável.

(1) K/D	(2) $D(m)$	(3) $V(m/s)$	(4) R	(5) f	(6) C
0,01	0,10	1,0	$1,0 \times 10^5$	0,0385	99,5
0,004	0,25	1,0	$2,5 \times 10^5$	0,0285	107,3
0,002	0,50	1,0	$5,0 \times 10^5$	0,0238	113,4
0,001	1,00	1,0	$1,0 \times 10^6$	0,0199	118,1

EXEMPLO 8

O exemplo, agora, considerado, é um conduto de rugosidade uniforme $K = 10^{-4}$ m, de diâmetro $D = 1,0$ m, em que a água, à temperatura de 20°C ($\nu = 10^{-6}$ m²/s), pode escoar com as seguintes velocidades (em m/s): 0,5; 1,0; 1,5; 2,0; 2,5; 3,0; 3,5; 4,0 e 5,0. Deseja-se verificar para este conduto os correspondentes valores de C . Os resultados encontram-se na Tab. 8. As variações verificadas no coeficiente C são, neste caso, devidas unicamente às variações produzidas na velocidade.

TABELA 8
Valores de C para um conduto de diâmetro $D = 1,0$ m e rugosidade relativa ($K/D = 10^{-4}$).

$V(m/s)$	R	f	C
0,5	$0,5 \times 10^6$	0,0144	146,88
1,0	$1,0 \times 10^6$	0,0134	144,59
1,5	$1,5 \times 10^6$	0,0134	139,79
2,0	$2,0 \times 10^6$	0,0134	136,61
2,5	$2,5 \times 10^6$	0,0134	134,19
3,0	$3,0 \times 10^6$	0,0134	132,25
3,5	$3,5 \times 10^6$	0,0134	130,63
4,0	$4,0 \times 10^6$	0,0134	129,24
5,0	$5,0 \times 10^6$	0,0134	126,81

À vista do exposto, pode-se afirmar que é notória a imprecisão da fórmula de Hazen-Williams, sobretudo, nas redes hidráulicas, formadas de condutos de diferentes diâmetros, ainda que de mesmo material e de mesmo revestimento interno. Essa imprecisão é ainda maior quando as vazões são avaliadas a partir de estimativas iniciais, como se acontecer nos projetos de redes de distribuição e de linhas de adução (já que um erro em C acarreta um erro igual na vazão, para h_f e D fixados) e em que as velocidades podem resultar muito diferente dos valores iniciais.

Em outras palavras, o coeficiente C é um número variável com a rugosidade do conduto, com a rugosidade relativa e com o número de Reynolds. Todavia, por inspeção da Tab. 6 (última linha) ou do gráfico da Fig. 6, conclui-se que, para valores de C da ordem de 158 e número de Reynolds acima de 5×10^5 , a fórmula de Hazen-Williams se ajusta bem aos condutos hidráulicamente lisos. Para valores de C compreendidos entre 110 e 140 e condutos de pequena rugosidade relativa, o escoamento com baixo número de Reynolds, o ajuste se faz na zona de transição mas aproximadamente. Para $C < 110$ e para condutos hidráulicos rugosos, a fórmula de Hazen-Williams não é adequada.

7. CONCLUSÕES

Neste trabalho, foi feita uma exposição sumária da teoria racional do escoamento em condutos forçados, a apresentação e a análise de algumas fórmulas empíricas de perda de carga distribuída de uso mais freqüente na Engenharia Sanitária.

A teoria racional do escoamento em condutos forçados se caracteriza por um formulário admiravelmente conciso e absolutamente geral. Com as atuais máquinas matemáticas de calcular, e com os recursos do cálculo numérico, as fórmulas permitem soluções simples e extremamente convergentes de qualquer problema em que os dados são da forma (Q, D) , (h_f, D) e (h_f, Q) . As tabelas apresentadas em anexo permitem a solução direta, sem nenhum cálculo auxiliar, para um grande número de problemas práticos.

As fórmulas empíricas abordadas neste trabalho foram analisadas à luz da teoria racional do escoamento nos condutos forçados, levando às seguintes conclusões básicas:

- a) A fórmula de Flamant com $b = 0,0052$ se revelou particularmente exata para condutos hidráulicamente lisos e para número de Reynolds não superior a 10^5 ;
- b) A fórmula de Manning Strickler é também, correta, mas para condutos hidráulicamente rugosos e para um intervalo restrito de rugosidades relativas;
- c) A fórmula de Hazen-Williams se apresenta correta apenas para condutos hidráulicamente lisos e para números de Reynolds acima de 5×10^5 . Na região de transição onde são pequenos os valores de K/D , ela é apenas aproximada, mas para condutos hidráulicamente rugosos a fórmula é, simplesmente, inadequada. Quando o conduto é hidráulicamente liso e o número de Reynolds é superior a 5×10^5 , o coeficiente C assume um valor sensivelmente constante e é da ordem de 158. Mas este valor se situa fora das tabelas que normalmente acompanham a fórmula de Hazen-Williams. Nos demais casos, o valor de C é uma função do número de Reynolds e da rugosidade relativa. Então, nas redes de distribuição e nos condutos de adução onde há uma grande variedade de diâmetros, a adoção de um único valor de C para todos os condutos tendo em vista apenas a rugosidade, pode acarretar erros relativamente importantes. Estes erros serão mais imprevisíveis ainda quando nas análises de redes hidráulicas a distribuição final das vazões se diferencia bastante das distribuições inicialmente adotadas. Os erros poderão tornar-se ainda maiores se a rede hidráulica é formada por condutos novos e por condutos existentes com longo tempo em serviço, cujo comportamento se assemelha muito ao de um conduto rugoso mesmo para pequenos números de Reynolds.

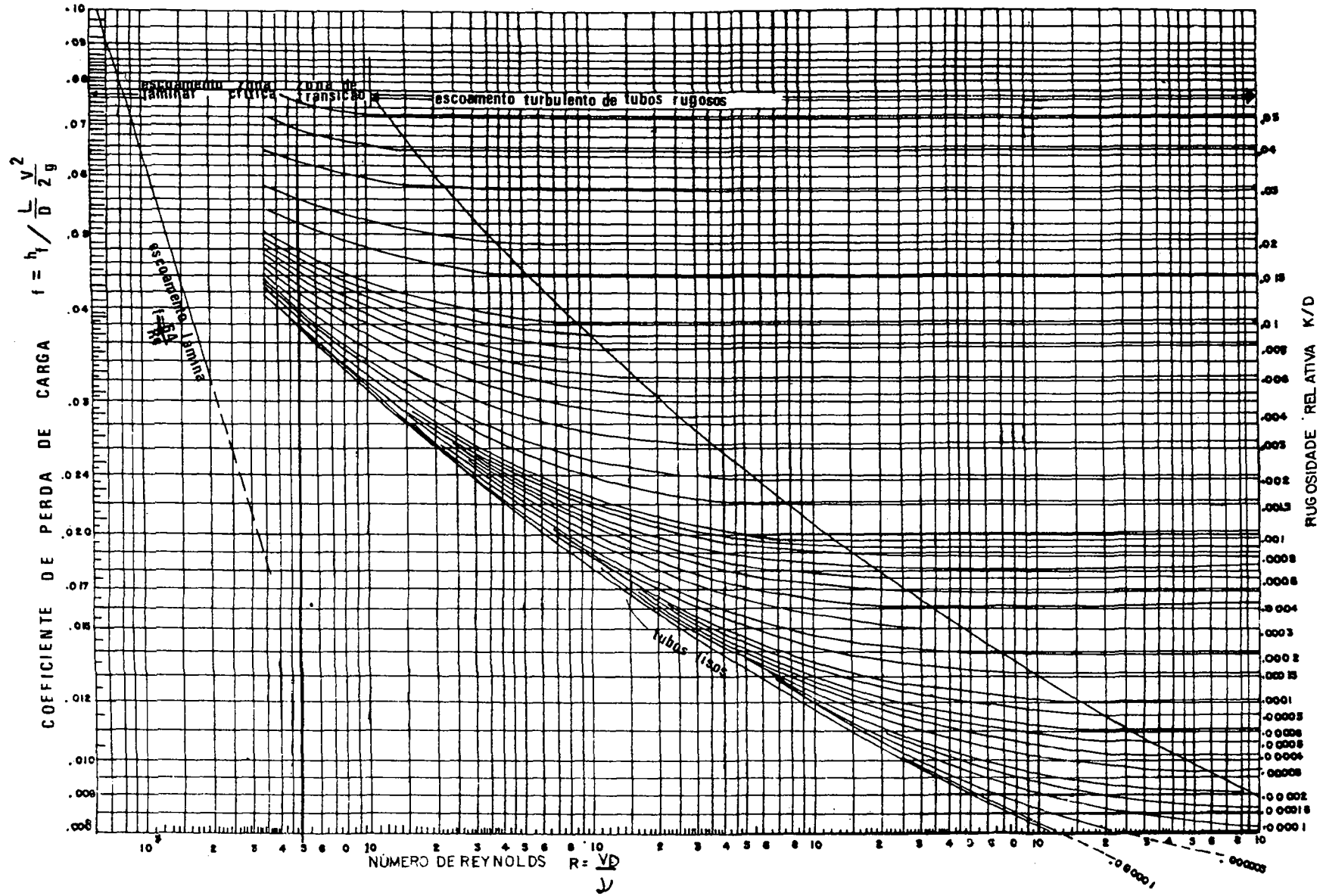
8. NOTAÇÕES

p = pressão	L = comprimento da canalização
D = diâmetro do conduto	γ = peso específico do líquido
J = perda de carga unitária	h_f = perda de carga distribuída
b = coeficiente de Flamant	R = número de Reynolds
C = coeficiente de Williams-Hazen	ν = viscosidade cinemática
n = coeficiente de Manning	K/D = rugosidade relativa (ou D/K)
Q = vazão	δ = espessura do filme laminar
V = velocidade média	K = rugosidade uniforme equivalente
f = coeficiente de perda de carga distribuída	ϵ = rugosidade uniforme (ou homogênea)
R_H = raio hidráulico	z = variável cota
C_f = coeficiente de atrito	K_s = coeficiente de perda de carga singular
τ_0 = tensão tangencial na parede do conduto	h_s = perda de carga singular

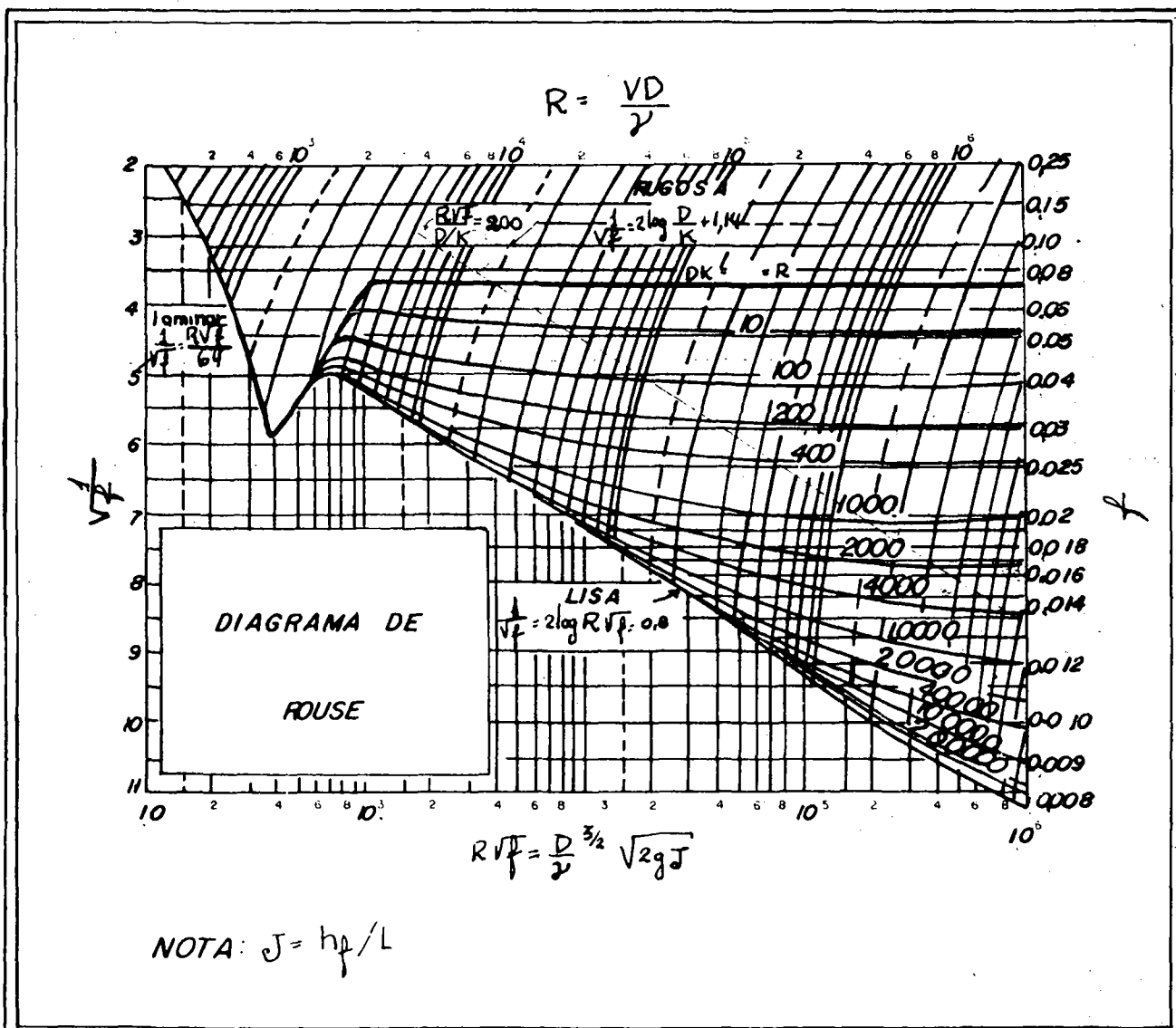
BIBLIOGRAFIA

1. COLEBROOK, C.F. "Turbulent flow in pipes, with particular reference to the transition region between the smooth and rough pipe laws" Proceeding of the Institution of Civil Engineers, nº 11, 1939.
2. BAKHMETEFF, B.A. "The mechanics of Turbulent Flow", Princeton University Press. 1936.
3. FORTIER, A. - Mécanique des Fluides - Techniques de l'Ingenieur. Volume Generalité.
4. BARLOW, J.F. e MARKLAND, E. "Converting the Hazen-Williams equation to the Colebrook function" - Water Power e Dam Construction, Setembro 1975.
5. LENCASTRE, A. "Manual de Hidraulica Geral" Tecnica-Lisboa, 1957.
6. DUPONT, A. "Hydraulique Urbaine" Tomo II. Eyrolles 1974.
7. AZEVEDO NETO, J.M. de "Manual de Hidraulica" - ed. E. Blucher S. Paulo - 1972
8. LAMONT, P.A. "A review of pipe friction data and formulae, with a proposed set of exponential formulae based on the theory of roughness". Proceeding of the Institution of Civil Engineers, nº 3, 1954.
9. DAVIS, C.V. e KENNETH, E.S. - Applied Hydraulics. MacGraw Hill Inc. 1969.
10. American Water Works Association (AWWA). Manual M.11.

ANEXO I - DIAGRAMA DE MOODY



ANEXO II



APÊNDICE

TABELAS
DA
FÓRMULA UNIVERSAL
DE
PERDA DE CARGA
PARA
CONDUTOS DE DIÂMETROS ENTRE
13mm e 2.000mm

DIAMETRO DO CONDUTO D= 13, (MM) (1/2")

AREA DA SECAO DO CONDUTO S= ,000133 M2

CEBES

* VELO- * * C/DADE * * (M/S) *		PENHA DE CARGA UNITARIA EM M/M																Obs: K EM MILIMETROS	* VAZAO * (L/S)
		K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	*	
* ,30	,01551	,01576	,01601	,01625	,01649	,01672	,01895	,02098	,02287	,02467	,02640	,02807	,02969	,03127	,03283	,04752	,0398	*	
* ,35	,02036	,02072	,02107	,02142	,02176	,02210	,02523	,02806	,03069	,03318	,03556	,03785	,04007	,04225	,04437	,06445	,0465	*	
* ,40	,02582	,02630	,02678	,02725	,02771	,02817	,03238	,03616	,03955	,04293	,04607	,04909	,05201	,05486	,05766	,08394	,0531	*	
* ,45	,03186	,03250	,03313	,03374	,03435	,03494	,04041	,04527	,04974	,05394	,05793	,06178	,06550	,06912	,07267	,10601	,0597	*	
* ,50	,03849	,03931	,04011	,04089	,04166	,04241	,04930	,05539	,06096	,06619	,07115	,07592	,08053	,08503	,08942	,13065	,0664	*	
* ,55	,04570	,04672	,04772	,04869	,04964	,05057	,05906	,06652	,07332	,07968	,08572	,09152	,09712	,10257	,10791	,15786	,0730	*	
* ,60	,05349	,05474	,05595	,05714	,05830	,05943	,06969	,07865	,08681	,09443	,10165	,10857	,11526	,12177	,12812	,18765	,0796	*	
* ,65	,06185	,06335	,06481	,06623	,06762	,06897	,08119	,09180	,10144	,11042	,11893	,12707	,13495	,14260	,15007	,22000	,0863	*	
* ,70	,07079	,07257	,07429	,07597	,07761	,07921	,09355	,10596	,11720	,12766	,13756	,14703	,15618	,16508	,17376	,25493	,0929	*	
* ,75	,08030	,08238	,08440	,08636	,08827	,09013	,10679	,12113	,13410	,14615	,15754	,16845	,17897	,18919	,19918	,29243	,0995	*	
* ,80	,09037	,09278	,09512	,09739	,09959	,10174	,12088	,13731	,15213	,16589	,17888	,19131	,20331	,21496	,22633	,33250	,1062	*	
* ,85	,10101	,10378	,10646	,10906	,11158	,11404	,13585	,15450	,17129	,18687	,20157	,21563	,22920	,24236	,25522	,37515	,1128	*	
* ,90	,11221	,11537	,11842	,12137	,12423	,12702	,15168	,17269	,19159	,20910	,22562	,24141	,25663	,27141	,28584	,42036	,1195	*	
* ,95	,12398	,12755	,13099	,13432	,13755	,14069	,16838	,19190	,21302	,23258	,25102	,26864	,28562	,30211	,31819	,46815	,1261	*	
* 1,00	,13631	,14032	,14419	,14792	,15153	,15504	,18594	,21211	,23559	,25730	,27777	,29732	,31616	,33444	,35228	,51851	,1327	*	
* 1,05	,14921	,15368	,15799	,16215	,16618	,17008	,20437	,23334	,25929	,28327	,30588	,32745	,34824	,36842	,38810	,57144	,1394	*	
* 1,10	,16266	,16763	,17242	,17702	,18148	,18580	,22366	,25557	,28412	,31049	,33533	,35904	,38188	,40404	,42565	,62694	,1460	*	
* 1,15	,17667	,18217	,18745	,19254	,19745	,20221	,24382	,27881	,31009	,33896	,36615	,39208	,41707	,44131	,46494	,68502	,1526	*	
* 1,20	,19125	,19730	,20310	,20869	,21408	,21930	,26485	,30307	,33719	,36868	,39831	,42658	,45381	,48021	,50597	,74566	,1593	*	
* 1,25	,20638	,21301	,21937	,22548	,23137	,23708	,28674	,32833	,36543	,39964	,43183	,46253	,49209	,52077	,54872	,80888	,1659	*	
* 1,30	,22207	,22931	,23624	,24291	,24933	,25554	,30950	,35460	,39480	,43185	,46670	,49994	,53193	,56296	,59321	,87467	,1726	*	
* 1,35	,23832	,24620	,25373	,26097	,26794	,27468	,33312	,38188	,42530	,46530	,50293	,53879	,57332	,60680	,63944	,94303	,1792	*	
* 1,40	,25512	,26367	,27184	,27967	,28722	,29451	,35761	,41016	,45694	,50001	,54051	,57910	,61626	,65228	,68739	,1013	,1858	*	
* 1,45	,27249	,28173	,29055	,29901	,30716	,31502	,38296	,43946	,48971	,53596	,57944	,62087	,66075	,69940	,73709	,1087	,1925	*	
* 1,50	,29041	,30037	,30988	,31899	,32775	,33621	,40918	,46977	,52361	,57316	,61972	,66409	,70678	,74817	,78851	,1163	,1991	*	
* 1,55	,30888	,31960	,32982	,33961	,34901	,35809	,43627	,50108	,55865	,61161	,66136	,70876	,75437	,79858	,84167	,1242	,2057	*	
* 1,60	,32791	,33942	,35037	,36086	,37093	,38065	,46422	,53341	,59482	,65130	,70435	,75489	,80351	,85063	,89656	,1323	,2124	*	
* 1,65	,34750	,35982	,37154	,38275	,39351	,40389	,49303	,56674	,63213	,69224	,74870	,80247	,85420	,90433	,95319	,1407	,2190	*	
* 1,70	,36764	,38080	,39331	,40527	,41676	,42781	,52271	,60108	,67057	,73443	,79439	,85150	,90643	,95967	,1011	,1493	,2256	*	
* 1,75	,38834	,40237	,41570	,42844	,44068	,45242	,55326	,63644	,71014	,77787	,84145	,90199	,96022	,1016	,1071	,1582	,2323	*	
* 1,80	,40959	,42452	,43870	,45224	,46522	,47771	,58467	,67280	,75085	,82255	,88985	,95393	,1015	,1075	,1133	,1674	,2389	*	
* 1,85	,43140	,44726	,46231	,47667	,49044	,50369	,61695	,71017	,79270	,86848	,93961	,1007	,1072	,1135	,1197	,1768	,2456	*	
* 1,90	,45376	,47058	,48653	,50175	,51632	,53034	,65009	,74855	,83567	,91566	,99072	,1062	,1130	,1197	,1262	,1864	,2522	*	
* 1,95	,47668	,49448	,51136	,52745	,54287	,55768	,68410	,78793	,87978	,96408	,1043	,1118	,1190	,1261	,1329	,1963	,2588	*	
* 2,00	,50015	,51897	,53681	,55380	,57007	,58570	,71898	,82833	,92502	,1013	,1097	,1176	,1252	,1326	,1398	,2065	,2655	*	
* 2,05	,52417	,54404	,56286	,58078	,59793	,61441	,75471	,86974	,97140	,1064	,1152	,1235	,1315	,1393	,1468	,2170	,2721	*	
* 2,10	,54875	,56970	,58952	,60840	,62645	,64379	,79132	,91215	,1018	,1116	,1208	,1296	,1380	,1461	,1540	,2277	,2787	*	
* 2,15	,57388	,59594	,61680	,63665	,65564	,67386	,82879	,95557	,1067	,1170	,1266	,1358	,1446	,1531	,1614	,2386	,2854	*	
* 2,20	,59957	,62276	,64468	,66554	,68548	,70462	,86712	,1000	,1117	,1224	,1325	,1421	,1514	,1603	,1690	,2498	,2920	*	
* 2,25	,62581	,65016	,67318	,69507	,71598	,73603	,90633	,1045	,1168	,1280	,1386	,1486	,1583	,1676	,1767	,2613	,2986	*	
* 2,30	,65260	,67815	,70229	,72523	,74714	,76817	,94639	,1091	,1220	,1337	,1448	,1553	,1654	,1751	,1847	,2730	,3053	*	
* 2,35	,67995	,70673	,73201	,75603	,77896	,80097	,98732	,1139	,1273	,1396	,1511	,1621	,1726	,1828	,1928	,2850	,3119	*	
* 2,40	,70785	,73588	,76234	,78746	,81145	,83445	,1029	,1187	,1327	,1456	,1576	,1690	,1800	,1906	,2010	,2972	,3186	*	
* 2,45	,73630	,76562	,79327	,81953	,84459	,86861	,1071	,1237	,1383	,1516	,1642	,1761	,1876	,1986	,2095	,3097	,3252	*	
* 2,50	,76531	,79594	,82482	,85223	,87839	,90346	,1115	,1287	,1439	,1579	,1709	,1833	,1953	,2068	,2181	,3225	,3318	*	
* 2,55	,79487	,82684	,85698	,88557	,91285	,93898	,1159	,1339	,1497	,1642	,1778	,1907	,2031	,2151	,2268	,3355	,3385	*	
* 2,60	,82498	,85833	,88975	,91955	,94797	,97520	,1204	,1391	,1556	,1707	,1848	,1982	,2111	,2236	,2358	,3487	,3451	*	
* 2,65	,85564	,89040	,92313	,95416	,98375	,1012	,1251	,1445	,1616	,1773	,1919	,2059	,2193	,2323	,2449	,3623	,3517	*	
* 2,70	,88686	,92305	,95712	,98941	,1020	,1049	,1298	,1499	,1677	,1840	,1992	,2137	,2276	,2411	,2542	,3761	,3584	*	
* 2,75	,91863	,95629	,99172	,1025	,1057	,1087	,1345	,1555	,1739	,1908	,2066	,2217	,2361	,2501	,2637	,3901	,3650	*	
* 2,80	,95095	,99011	,1026	,1061	,1095	,1126	,1394	,1611	,1803	,1978	,2142	,2298	,2447	,2592	,2734	,4044	,3717	*	
* 2,85	,98383	,1024	,1062	,1098	,1133	,1166	,1444	,1669	,1887	,2049	,2218	,2380	,2535	,2685	,2832	,4189	,3783	*	
* 2,90	,1017	,1059	,1099	,1136	,1172	,1208	,1494	,1728	,1933	,2121	,2297	,2464	,2625	,2780	,2932	,4337	,3849	*	
* 2,95	,1081	,1095	,1136	,1175	,1212	,1247	,1545	,1787	,2000	,2194	,2376	,2549	,2716	,2877	,3034	,4486	,3916	*	
* 3,00	,1085	,1131	,1173	,1214	,1252	,1289	,1598	,1848	,2068	,2269	,2457	,2636	,2808	,2975	,3137	,4641	,3982	*	

***** CETESB **																	
DIAMETRO DO CONDUTO D= 19, (MM) (3/4") AREA DA SECAO DO CONDUTO S= ,000284 M2																	

VELU	PERDA DE CARGA UNITARIA EM M/M																*VAZAO*
CIDADE	UBS: K EM MILIMETROS																(L/S)
(M/S)	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	*
* ,30	.00943	.00957	.00970	.00983	.00997	.01009	.01131	.01241	.01342	.01438	.01529	.01616	.01701	.01783	.01863	.02595	.0851
* ,35	.01239	.01259	.01279	.01298	.01316	.01335	.01506	.01660	.01802	.01934	.02060	.02180	.02296	.02409	.02518	.03519	.0992
* ,40	.01573	.01600	.01627	.01653	.01678	.01703	.01934	.02140	.02328	.02503	.02669	.02828	.02980	.03128	.03272	.04584	.1134
* ,45	.01943	.01979	.02014	.02048	.02081	.02114	.02414	.02679	.02920	.03145	.03357	.03559	.03753	.03941	.04124	.05789	.1276
* ,50	.02349	.02395	.02439	.02483	.02525	.02567	.02947	.03278	.03580	.03859	.04123	.04374	.04615	.04848	.05075	.07135	.1418
* ,55	.02791	.02848	.02903	.02958	.03010	.03062	.03531	.03938	.04306	.04646	.04967	.05272	.05565	.05849	.06124	.08621	.1559
* ,60	.03266	.03338	.03406	.03472	.03536	.03599	.04167	.04657	.05098	.05506	.05890	.06255	.06605	.06943	.07271	.10247	.1701
* ,65	.03781	.03865	.03947	.04026	.04103	.04179	.04855	.05435	.05957	.06439	.06891	.07321	.07733	.08131	.08517	.12014	.1843
* ,70	.04329	.04429	.04525	.04619	.04711	.04800	.05595	.06274	.06883	.07435	.07917	.08471	.08950	.09413	.09861	.13922	.1985
* ,75	.04912	.05029	.05142	.05252	.05359	.05463	.06386	.07173	.07876	.08523	.09129	.09705	.10256	.10786	.11304	.15969	.2126
* ,80	.05530	.05666	.05797	.05924	.06047	.06167	.07230	.08131	.08935	.09674	.10366	.11022	.11651	.12257	.12845	.18158	.2268
* ,85	.06183	.06339	.06489	.06635	.06777	.06914	.08126	.09149	.10061	.10899	.11681	.12424	.13135	.13820	.14484	.20487	.2410
* ,90	.06870	.07048	.07220	.07386	.07546	.07702	.09073	.10227	.11253	.12194	.13075	.13909	.14707	.15477	.16222	.22956	.2552
* ,95	.07593	.07794	.07988	.08175	.08356	.08532	.10072	.11364	.12512	.13564	.14546	.15478	.16368	.17227	.18058	.25565	.2694
* 1,00	.08350	.08576	.08793	.09003	.09206	.09403	.11223	.12562	.13837	.15066	.16097	.17130	.18119	.19071	.19993	.28316	.2835
* 1,05	.09141	.09394	.09637	.09871	.10097	.10316	.12226	.13819	.15230	.16520	.17726	.18857	.19958	.21008	.22026	.31206	.2977
* 1,10	.09967	.10248	.10518	.10777	.11028	.11271	.13381	.15136	.16688	.18108	.19433	.20687	.21885	.23040	.24158	.34237	.3119
* 1,15	.10827	.11138	.11436	.11723	.12000	.12267	.14587	.16513	.18214	.19768	.21219	.22591	.23902	.25165	.26387	.37409	.3261
* 1,20	.11722	.12064	.12392	.12707	.13011	.13305	.15846	.17949	.19806	.21501	.23083	.24578	.26007	.27383	.28716	.40720	.3402
* 1,25	.12651	.13027	.13386	.13731	.14063	.14384	.17156	.19446	.21465	.23307	.25025	.26650	.28202	.29696	.31142	.44173	.3544
* 1,30	.13614	.14025	.14417	.14793	.15155	.15505	.18516	.21002	.23190	.25186	.27046	.28805	.30485	.32102	.33667	.47766	.3686
* 1,35	.14612	.15059	.15486	.15895	.16288	.16667	.19932	.22618	.24982	.27137	.29146	.31044	.32857	.34602	.36291	.51499	.3828
* 1,40	.15644	.16129	.16592	.17035	.17461	.17871	.21397	.24293	.26840	.29161	.31323	.33367	.35318	.37195	.39013	.55373	.3969
* 1,45	.16710	.17235	.17735	.18214	.18673	.19117	.22915	.26029	.28765	.31258	.33580	.35773	.37867	.39882	.41833	.59387	.4111
* 1,50	.17811	.18377	.18916	.19432	.19927	.20403	.24484	.27824	.30757	.33428	.35914	.38263	.40506	.42663	.44751	.63542	.4253
* 1,55	.18946	.19555	.20134	.20688	.21220	.21732	.26105	.29679	.32815	.35670	.38327	.40837	.43233	.45538	.47769	.67837	.4395
* 1,60	.20114	.20768	.21390	.21984	.22554	.23102	.27778	.31594	.34940	.37985	.40819	.43495	.46049	.48506	.50884	.72272	.4536
* 1,65	.21317	.22018	.22683	.23318	.23927	.24513	.29502	.33568	.37132	.40373	.43389	.46236	.48954	.51568	.54098	.76848	.4678
* 1,70	.22554	.23303	.24014	.24692	.25341	.25966	.31279	.35602	.39390	.42834	.46037	.49062	.51948	.54724	.57410	.81565	.4820
* 1,75	.23826	.24624	.25382	.26104	.26796	.27460	.33107	.37696	.41714	.45367	.48764	.51971	.55030	.57973	.60821	.86422	.4962
* 1,80	.25131	.25981	.26787	.27555	.28290	.28996	.34987	.39850	.44106	.47973	.51569	.54963	.58202	.61316	.64330	.91419	.5104
* 1,85	.26471	.27374	.28230	.29045	.29824	.30573	.36919	.42084	.46564	.50852	.54453	.58040	.61462	.64753	.67937	.96557	.5245
* 1,90	.27844	.28802	.29710	.30573	.31399	.32192	.38902	.44337	.49088	.53404	.57415	.61200	.64811	.68284	.71643	.1.018*	.5387
* 1,95	.29252	.30267	.31227	.32141	.33014	.33852	.40937	.46670	.51679	.56228	.60455	.64444	.68249	.71908	.75447	.1.072*	.5529
* 2,00	.30693	.31767	.32782	.33747	.34669	.35554	.43025	.49063	.54337	.59125	.63574	.67772	.71776	.75626	.79350	.1.128*	.5671
* 2,05	.32169	.33303	.34374	.35392	.36364	.37297	.45164	.51516	.57062	.62095	.66772	.71184	.75392	.79437	.83351	.1.185*	.5812
* 2,10	.33679	.34874	.36003	.37076	.38100	.39081	.47354	.54028	.59853	.65138	.70047	.74679	.79096	.83342	.87450	.1.243*	.5954
* 2,15	.35223	.36482	.37670	.38798	.39875	.40907	.49597	.56601	.62710	.68253	.73402	.78258	.82889	.87341	.91648	.1.303*	.6096
* 2,20	.36801	.38125	.39374	.40560	.41691	.42775	.51891	.59233	.65634	.71441	.76834	.81921	.86771	.91434	.95944	.1.364*	.6238
* 2,25	.38413	.39804	.41115	.42360	.43547	.44684	.54237	.61924	.68625	.74702	.80345	.85668	.90742	.95620	.1.003*	.1.427*	.6379
* 2,30	.40059	.41518	.42894	.44199	.45443	.46634	.56635	.64676	.71683	.78036	.83935	.89498	.94802	.99901	.1.048*	.1.491*	.6521
* 2,35	.41739	.43269	.44710	.46077	.47379	.48626	.59085	.67487	.74807	.81442	.87603	.93412	.98951	.1.042*	.1.094*	.1.556*	.6663
* 2,40	.43452	.45055	.46563	.47993	.49355	.50659	.61588	.70358	.77997	.84921	.91349	.97410	.1.031*	.1.087*	.1.141*	.1.623*	.6805
* 2,45	.45200	.46876	.48454	.49948	.51372	.52733	.64140	.73289	.81254	.88473	.95174	.1.014*	.1.075*	.1.133*	.1.189*	.1.691*	.6945
* 2,50	.46982	.48734	.50382	.51942	.53428	.54850	.66745	.76280	.84578	.92098	.99077	.1.056*	.1.119*	.1.179*	.1.237*	.1.761*	.7088
* 2,55	.48798	.50627	.52347	.53975	.55525	.57007	.69402	.79330	.87969	.95795	.1.030*	.1.099*	.1.164*	.1.227*	.1.287*	.1.832*	.7230
* 2,60	.50648	.52556	.54350	.56047	.57662	.59206	.72110	.82440	.91426	.99565	.1.071*	.1.142*	.1.210*	.1.275*	.1.338*	.1.904*	.7372
* 2,65	.52532	.54521	.56390	.58157	.59839	.61446	.74871	.85610	.94949	.1.034*	.1.112*	.1.186*	.1.257*	.1.324*	.1.390*	.1.978*	.7514
* 2,70	.54450	.56521	.58467	.60306	.62056	.63728	.77683	.88840	.98540	.1.073*	.1.154*	.1.231*	.1.304*	.1.375*	.1.443*	.2.053*	.7655
* 2,75	.56401	.58557	.60581	.62494	.64313	.66051	.80547	.92129	.1.021*	.1.113*	.1.197*	.1.277*	.1.353*	.1.426*	.1.496*	.2.130*	.7797
* 2,80	.58387	.60629	.62733	.64721	.66611	.68416	.83463	.95479	.1.059*	.1.153*	.1.241*	.1.324*	.1.402*	.1.478*	.1.551*	.2.208*	.7939
* 2,85	.60407	.62737	.64922	.66986	.68948	.70822	.86430	.98888	.1.097*	.1.195*	.1.285*	.1.371*	.1.453*	.1.531*	.1.607*	.2.288*	.8081
* 2,90	.62461	.64880	.67148	.69291	.71326	.73270	.89450	.1.023*	.1.135*	.1.237*	.1.331*	.1.419*	.1.504*	.1.585*	.1.664*	.2.368*	.8222
* 2,95	.64546	.67059	.69412	.71634	.73744	.75759	.92521	.1.058*	.1.174*	.1.279*	.1.377*	.1.469*	.1.556*	.1.640*	.1.721*	.2.451*	.8364
* 3,00	.66670	.69273	.71713	.74015	.76202	.78289	.95644	.1.094*	.1.214*	.1.323*	.1.424*	.1.519*	.1.609*	.1.696*	.1.780*	.2.534*	.8506

***** CETESB *****																			
DIAMETRO DO CONDUITO D= 25, (MM) (1") AREA DA SECAO DO CONDUITO S= ,000491 M2																			

VELD- *	PERDA DE CARGA UNITARIA EM M/M															VAZAO *			
CIDADE *	OBS: K EM MILIMETROS															(L/S) *			
(M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	*		
* ,30	,00660	,00669	,00678	,00687	,00695	,00704	,00783	,00854	,00919	,00980	,01039	,01094	,01147	,01199	,01249	,01700	,1473		
* ,35	,00869	,00882	,00894	,00907	,00919	,00931	,01043	,01143	,01234	,01319	,01399	,01476	,01549	,01620	,01689	,02305	,1718		
* ,40	,01103	,01121	,01139	,01156	,01172	,01189	,01340	,01473	,01594	,01707	,01813	,01914	,02011	,02104	,02194	,03003	,1963		
* ,45	,01364	,01387	,01410	,01433	,01455	,01476	,01673	,01845	,02000	,02145	,02280	,02409	,02532	,02651	,02766	,03792	,2209		
* ,50	,01650	,01680	,01709	,01738	,01766	,01793	,02042	,02258	,02452	,02632	,02801	,02961	,03113	,03261	,03403	,04674	,2454		
* ,55	,01961	,01998	,02035	,02071	,02106	,02140	,02447	,02712	,02950	,03169	,03374	,03569	,03755	,03934	,04107	,05647	,2700		
* ,60	,02297	,02343	,02388	,02431	,02474	,02516	,02888	,03207	,03493	,03756	,04001	,04234	,04456	,04670	,04876	,06713	,2945		
* ,65	,02658	,02714	,02768	,02820	,02871	,02921	,03365	,03744	,04082	,04392	,04682	,04956	,05217	,05469	,05712	,07870	,3191		
* ,70	,03044	,03110	,03174	,03236	,03297	,03356	,03878	,04321	,04716	,05078	,05416	,05734	,06039	,06331	,06614	,09120	,3436		
* ,75	,03455	,03533	,03608	,03680	,03751	,03819	,04427	,04940	,05396	,05814	,06202	,06570	,06920	,07256	,07581	,10461	,3682		
* ,80	,03891	,03981	,04068	,04152	,04233	,04313	,05012	,05601	,06122	,06599	,07043	,07462	,07861	,08244	,08614	,11895	,3927		
* ,85	,04351	,04454	,04554	,04651	,04744	,04835	,05633	,06302	,06894	,07434	,07936	,08410	,08862	,09295	,09714	,13421	,4172		
* ,90	,04836	,04954	,05067	,05177	,05284	,05387	,06290	,07044	,07711	,08318	,08883	,09416	,09923	,10410	,10879	,15038	,4418		
* ,95	,05345	,05478	,05607	,05731	,05851	,05968	,06983	,07828	,08574	,09252	,09883	,10478	,11044	,11587	,12111	,16748	,4663		
* 1,00	,05878	,06029	,06173	,06313	,06447	,06578	,07712	,08653	,09482	,10236	,10937	,11597	,12225	,12827	,13408	,18549	,4909		
* 1,05	,06436	,06604	,06766	,06921	,07072	,07217	,08477	,09519	,10436	,11269	,12043	,12772	,13465	,14130	,14772	,20443	,5154		
* 1,10	,07019	,07206	,07385	,07556	,07724	,07885	,09278	,10427	,11436	,12353	,13203	,14004	,14766	,15497	,16201	,22428	,5400		
* 1,15	,07625	,07832	,08031	,08221	,08405	,08582	,10115	,11375	,12481	,13485	,14417	,15293	,16127	,16926	,17697	,24506	,5645		
* 1,20	,08256	,08484	,08703	,08912	,09114	,09309	,10987	,12365	,13572	,14667	,15663	,16639	,17547	,18418	,19258	,26676	,5890		
* 1,25	,08911	,09162	,09401	,09631	,09851	,10064	,11896	,13396	,14709	,15899	,17003	,18041	,19028	,19974	,20885	,28937	,6136		
* 1,30	,09591	,09864	,10126	,10376	,10617	,10849	,12840	,14468	,15691	,17181	,18376	,19500	,20568	,21592	,22579	,31291	,6381		
* 1,35	,10294	,10592	,10877	,11149	,11411	,11663	,13821	,15581	,17119	,18512	,19803	,21016	,22169	,23273	,24338	,33737	,6627		
* 1,40	,11022	,11346	,11654	,11949	,12233	,12506	,14837	,16736	,18393	,19893	,21282	,22588	,23829	,25018	,26164	,36274	,6872		
* 1,45	,11774	,12124	,12458	,12777	,13083	,13378	,15890	,17931	,19712	,21323	,22815	,24217	,25550	,26825	,28055	,38904	,7118		
* 1,50	,12550	,12926	,13288	,13632	,13961	,14278	,16978	,19168	,21077	,22804	,24402	,25903	,27330	,28696	,30012	,41626	,7363		
* 1,55	,13351	,13758	,14145	,14514	,14868	,15208	,18102	,20446	,22487	,24333	,26041	,27646	,29170	,30629	,32036	,44439	,7609		
* 1,60	,14175	,14612	,15027	,15423	,15803	,16168	,19262	,21765	,23944	,25913	,27734	,29445	,31070	,32626	,34125	,47345	,7854		
* 1,65	,15023	,15492	,15936	,16360	,16766	,17156	,20458	,23126	,25445	,27542	,29480	,31301	,33030	,34685	,36280	,50343	,8099		
* 1,70	,15895	,16397	,16872	,17324	,17757	,18173	,21690	,24527	,26993	,29220	,31280	,33214	,35050	,36808	,38502	,53432	,8345		
* 1,75	,16793	,17327	,17833	,18315	,18776	,19219	,22958	,25970	,28586	,30949	,33132	,35183	,37130	,38994	,40789	,56614	,8590		
* 1,80	,17714	,18282	,18821	,19334	,19824	,20294	,24262	,27454	,30225	,32726	,35038	,37209	,39270	,41242	,43143	,59888	,8836		
* 1,85	,18658	,19263	,19835	,20379	,20900	,21398	,25602	,28979	,31909	,34554	,36998	,39292	,41470	,43554	,45562	,63254	,9081		
* 1,90	,19627	,20269	,20876	,21452	,22003	,22532	,26978	,30545	,33639	,36431	,39010	,41431	,43729	,45929	,48047	,66711	,9327		
* 1,95	,20620	,21306	,21942	,22553	,23135	,23694	,28389	,32152	,35415	,38358	,41076	,43628	,46049	,48366	,50599	,70261	,9572		
* 2,00	,21637	,22356	,23035	,23680	,24296	,24885	,29837	,33801	,37236	,40334	,43195	,45880	,48429	,50867	,53216	,73903	,9818		
* 2,05	,22678	,23438	,24154	,24835	,25484	,26106	,31320	,35491	,39103	,42360	,45368	,48190	,50868	,53431	,55899	,77637	,1,0063		
* 2,10	,23743	,24544	,25300	,26017	,26701	,27355	,32840	,37222	,41016	,44436	,47594	,50556	,53368	,56058	,58648	,81463	,1,0308		
* 2,15	,24832	,25676	,26472	,27226	,27945	,28633	,34395	,38994	,42974	,46561	,49873	,52979	,55927	,58747	,61464	,85380	,1,0554		
* 2,20	,25946	,26833	,27670	,28463	,29218	,29941	,35986	,40807	,44978	,48736	,52205	,55459	,58546	,61500	,64345	,89390	,1,0799		
* 2,25	,27063	,28015	,28894	,29726	,30519	,31277	,37613	,42682	,47028	,50961	,54591	,57996	,61226	,64316	,67292	,93492	,1,1045		
* 2,30	,28244	,29223	,30144	,31017	,31848	,32643	,39276	,44558	,49123	,53235	,57030	,60589	,63965	,67195	,70305	,97686	,1,1290		
* 2,35	,29429	,30455	,31421	,32335	,33205	,34037	,40975	,46494	,51264	,55559	,59522	,63238	,66764	,70137	,73385	,1,019*	,1,1536		
* 2,40	,30638	,31713	,32724	,33681	,34591	,35461	,42710	,48472	,53431	,57932	,62067	,65945	,69623	,73142	,76530	,1,063*	,1,1781		
* 2,45	,31871	,32996	,34053	,35053	,36004	,36913	,44481	,50492	,55683	,60355	,64666	,68708	,72542	,76210	,79741	,1,108*	,1,2026		
* 2,50	,33128	,34304	,35408	,36453	,37446	,38395	,46288	,52552	,57960	,62828	,67318	,71528	,75521	,79341	,83018	,1,153*	,1,2272		
* 2,55	,34409	,35637	,36790	,37880	,38916	,39905	,48130	,54654	,60284	,65350	,70023	,74405	,78560	,82535	,86362	,1,200*	,1,2517		
* 2,60	,35714	,36995	,38198	,39334	,40414	,41445	,50009	,56796	,62653	,67922	,72782	,77338	,81659	,85792	,89771	,1,247*	,1,2763		
* 2,65	,37043	,38379	,39632	,40816	,41940	,43014	,51923	,58980	,65008	,70544	,75594	,80328	,84818	,89112	,93246	,1,296*	,1,3008		
* 2,70	,38396	,39787	,41092	,42324	,43494	,44611	,53674	,60205	,65728	,70315	,74959	,79375	,83575	,87536	,92495	,96787	,1,345*	,1,3254	
* 2,75	,39773	,41221	,42579	,43860	,45077	,46238	,55860	,62472	,67034	,70935	,75356	,79378	,83115	,86591	,90841	,1,003*	,1,395*	,1,3499	
* 2,80	,41174	,42650	,44091	,45423	,46687	,47893	,57882	,64579	,68586	,72586	,76570	,80339	,83963	,87450	,90800	,1,040*	,1,446*	,1,3745	
* 2,85	,42599	,44104	,45630	,47013	,48326	,49578	,59940	,66128	,70183	,74187	,78137	,81928	,85556	,89022	,92322	,1,030*	,1,078*	,1,498*	,1,3990
* 2,90	,44048	,45674	,47196	,48631	,49993	,51292	,62034	,70518	,77826	,84356	,90453	,96129	,1,015*	,1,066*	,1,116*	,1,551*	,1,4235	,1,4481	
* 2,95	,45521	,47208	,48787	,50276	,51688	,53034	,64164	,72949	,80515	,87516	,93565	,99459	,1,050*	,1,103*	,1,154*	,1,605*	,1,4726	,1,4481	
* 3,00	,47018	,48767	,50405	,51948	,53411	,54806	,66330	,75421	,83249	,90285	,96770	,1,026*	,1,086*	,1,141*	,1,194*	,1,680*	,1,4726	,1,4481	

***** CETESB *****

DIAMETRO DO CONDUITO D= 32, (MM) 1(1/4") AREA DA SECAO DO CONDUITO S= ,000804 M2

VELO- CIDADE (M/S)	PERDA DE CARGA UNITARIA EM M/M																OBS: K EM MILIMETROS	VAZAO (L/S)
K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0			
* ,30	.00480	.00487	.00493	.00499	.00504	.00510	.00564	.00612	.00657	.00698	.00737	.00774	.00810	.00844	.00877	.01172	.2413	
* ,35	.00633	.00642	.00650	.00659	.00667	.00676	.00752	.00820	.00882	.00939	.00993	.01044	.01093	.01141	.01186	.01590	.2815	
* ,40	.00804	.00816	.00828	.00840	.00852	.00863	.00966	.01057	.01139	.01215	.01287	.01355	.01419	.01481	.01541	.02071	.3217	
* ,45	.00994	.01011	.01026	.01042	.01057	.01072	.01206	.01324	.01430	.01527	.01619	.01705	.01787	.01866	.01943	.02615	.3619	
* ,50	.01203	.01224	.01244	.01264	.01283	.01302	.01473	.01620	.01753	.01874	.01988	.02095	.02198	.02296	.02391	.03223	.4021	
* ,55	.01431	.01457	.01482	.01507	.01531	.01554	.01765	.01946	.02108	.02257	.02395	.02526	.02651	.02770	.02885	.03894	.4423	
* ,60	.01677	.01708	.01739	.01770	.01799	.01828	.02084	.02302	.02497	.02675	.02841	.02997	.03146	.03288	.03426	.04629	.4825	
* ,65	.01941	.01979	.02017	.02053	.02088	.02122	.02428	.02687	.02918	.03128	.03324	.03508	.03683	.03851	.04013	.05427	.5228	
* ,70	.02223	.02269	.02313	.02356	.02398	.02439	.02798	.03102	.03371	.03617	.03845	.04059	.04263	.04458	.04646	.06289	.5630	
* ,75	.02524	.02578	.02629	.02680	.02729	.02776	.03195	.03547	.03858	.04141	.04403	.04650	.04885	.05110	.05326	.07214	.6032	
* ,80	.02842	.02905	.02965	.03023	.03080	.03135	.03617	.04021	.04376	.04700	.05000	.05282	.05549	.05805	.06052	.08203	.6434	
* ,85	.03179	.03251	.03320	.03387	.03452	.03515	.04066	.04524	.04928	.05295	.05634	.05953	.06256	.06546	.06824	.09255	.6836	
* ,90	.03534	.03616	.03695	.03771	.03845	.03916	.04540	.05057	.05512	.05928	.06306	.06665	.07005	.07330	.07643	.10370	.7238	
* ,95	.03906	.03999	.04089	.04175	.04258	.04339	.05040	.05620	.06129	.06590	.07016	.07417	.07796	.08159	.08508	.11549	.7640	
* 1,00	.04297	.04402	.04502	.04599	.04692	.04783	.05567	.06213	.06778	.07291	.07764	.08209	.08630	.09033	.09420	.12791	.8042	
* 1,05	.04705	.04822	.04935	.05043	.05147	.05248	.06119	.06835	.07460	.08027	.08550	.09041	.09506	.09950	.10378	.14097	.8445	
* 1,10	.05132	.05262	.05387	.05507	.05622	.05734	.06697	.07486	.08175	.08798	.09374	.09913	.10424	.10913	.11382	.15466	.8847	
* 1,15	.05576	.05720	.05858	.05990	.06118	.06241	.07301	.08167	.08923	.09605	.10235	.10826	.11385	.11919	.12432	.16899	.9249	
* 1,20	.06037	.06196	.06348	.06494	.06635	.06770	.07931	.08787	.09470	.10147	.10826	.11478	.12088	.12657	.13205	.18395	.9651	
* 1,25	.06517	.06692	.06858	.07018	.07172	.07320	.08587	.09618	.10515	.11325	.12071	.12771	.13433	.14065	.14673	.19955	1,0053	
* 1,30	.07014	.07205	.07387	.07562	.07729	.07891	.09269	.10388	.11361	.12237	.13046	.13804	.14521	.15205	.15862	.21578	1,0455	
* 1,35	.07530	.07738	.07936	.08125	.08307	.08483	.09977	.11187	.12238	.13186	.14059	.14876	.15650	.16389	.17099	.23264	1,0857	
* 1,40	.08062	.08288	.08503	.08709	.08906	.09096	.10711	.12016	.13149	.14169	.15109	.15970	.16823	.17617	.18381	.25014	1,1260	
* 1,45	.08613	.08857	.09090	.09312	.09525	.09730	.11471	.12875	.14092	.15188	.16198	.17143	.18037	.18890	.19710	.26828	1,1662	
* 1,50	.09181	.09445	.09696	.09936	.10165	.10386	.12256	.13763	.15068	.16242	.17324	.18336	.19294	.20207	.21085	.28705	1,2064	
* 1,55	.09767	.10051	.10321	.10579	.10826	.11063	.13068	.14681	.16076	.17332	.18488	.19570	.20593	.21569	.22506	.30645	1,2466	
* 1,60	.10371	.10676	.10966	.11242	.11507	.11760	.13906	.15628	.17117	.18457	.19690	.20843	.21934	.22975	.23974	.32649	1,2868	
* 1,65	.10992	.11319	.11630	.11925	.12208	.12479	.14769	.16605	.18191	.19617	.20930	.22157	.23318	.24425	.25489	.34716	1,3270	
* 1,70	.11631	.11981	.12312	.12628	.12930	.13220	.15659	.17611	.19298	.20813	.22207	.23511	.24744	.25920	.27049	.36847	1,3672	
* 1,75	.12288	.12661	.13015	.13351	.13672	.13981	.16574	.18647	.20437	.22044	.23523	.24905	.26212	.27459	.28656	.39041	1,4074	
* 1,80	.12962	.13360	.13736	.14094	.14435	.14763	.17515	.19712	.21608	.23310	.24876	.26339	.27723	.29043	.30309	.41298	1,4477	
* 1,85	.13654	.14076	.14476	.14856	.15219	.15567	.18483	.20808	.22812	.24612	.26267	.27814	.29276	.30671	.32009	.43619	1,4879	
* 1,90	.14363	.14812	.15236	.15639	.16023	.16391	.19476	.21932	.24049	.25949	.27696	.29328	.30871	.32343	.33755	.46004	1,5281	
* 1,95	.15090	.15566	.16015	.16441	.16848	.17237	.20495	.23086	.25319	.27322	.29163	.30883	.32509	.34059	.35548	.48451	1,5683	
* 2,00	.15835	.16338	.16813	.17263	.17693	.18104	.21540	.24270	.26621	.28729	.30667	.32478	.34189	.35820	.37386	.50963	1,6085	
* 2,05	.16597	.17129	.17630	.18105	.18558	.18992	.22611	.25484	.27956	.30172	.32210	.34113	.35911	.37626	.39271	.53538	1,6487	
* 2,10	.17377	.17938	.18466	.18967	.19445	.19901	.23708	.26727	.29323	.31651	.33790	.35788	.37676	.39476	.41203	.56176	1,6889	
* 2,15	.18175	.18765	.19322	.19849	.20351	.20831	.24831	.27999	.30723	.33165	.35408	.37503	.39483	.41370	.43181	.58877	1,7291	
* 2,20	.18990	.19611	.20197	.20751	.21278	.21783	.25980	.29301	.32156	.34714	.37064	.39258	.41332	.43308	.45205	.61643	1,7694	
* 2,25	.19822	.20476	.21091	.21672	.22226	.22755	.27155	.30633	.33621	.36298	.38757	.41054	.43223	.45291	.47276	.64471	1,8096	
* 2,30	.20673	.21359	.22004	.22614	.23194	.23749	.28355	.31994	.35119	.37918	.40489	.42889	.45157	.47319	.49392	.67363	1,8498	
* 2,35	.21540	.22260	.22936	.23575	.24183	.24764	.29582	.33385	.36650	.39574	.42258	.44765	.47133	.49390	.51556	.70319	1,8900	
* 2,40	.22426	.23179	.23887	.24556	.25192	.25799	.30835	.34805	.38213	.41264	.44066	.46681	.49152	.51506	.53765	.73338	1,9302	
* 2,45	.23329	.24117	.24858	.25557	.26222	.26856	.32113	.36255	.39809	.42990	.45911	.48637	.51212	.53667	.56021	.76420	1,9704	
* 2,50	.24249	.25074	.25847	.26578	.27272	.27935	.33417	.37735	.41437	.44751	.47793	.50633	.53315	.55872	.58324	.79566	2,0106	
* 2,55	.25188	.26049	.26856	.27619	.28343	.29034	.34748	.39244	.43099	.46548	.49714	.52669	.55461	.58121	.60673	.82775	2,0508	
* 2,60	.26143	.27042	.27884	.28679	.29434	.30154	.36104	.40782	.44792	.48380	.51673	.54746	.57649	.60414	.63068	.86048	2,0911	
* 2,65	.27116	.28053	.28931	.29760	.30546	.31295	.37486	.42350	.46519	.50247	.53669	.56862	.59979	.62752	.65509	.89384	2,1313	
* 2,70	.28107	.29083	.29998	.30860	.31678	.32458	.38895	.43948	.48278	.52150	.55703	.59019	.62151	.65135	.67997	.92784	2,1715	
* 2,75	.29116	.30132	.31083	.31980	.32831	.33642	.40329	.45576	.50069	.54088	.57775	.61216	.64466	.67561	.70531	.96247	2,2117	
* 2,80	.30142	.31198	.32187	.33120	.34004	.34846	.41789	.47232	.51894	.56062	.59885	.63453	.66822	.70033	.73112	.99773	2,2519	
* 2,85	.31185	.32284	.33311	.34280	.35198	.36072	.43275	.48919	.53751	.58070	.62033	.65730	.69222	.72548	.75739	.1,0334	2,2921	
* 2,90	.32246	.33387	.34454	.35459	.36412	.37319	.44787	.50635	.55640	.60114	.64218	.68048	.71663	.75108	.78412	.1,0704	2,3323	
* 2,95	.33325	.34509	.35616	.36659	.37647	.38587	.46324	.52381	.57562	.62194	.66442	.70405	.74147	.77712	.81132	.1,1074	2,3725	
* 3,00	.34421	.35649	.36797	.37878	.38902	.39876	.47888	.54156	.59517	.64309	.68703	.72803	.76673	.80361	.83898	.1,1454	2,4128	

		DIAMETRO DO CONDUTO D = 38. (MM) 1(1/2")										AREA DA SECAO DO CONDUTO S = ,001134 M2							
VELU *	PERDA DE CARGA UNITARIA EM M/M															VAZAO *			
CIDADE *	OBS: K EM MILIMETROS															(L/S) *			
(M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0			
* ,30	,00386	,00390	,00395	,00400	,00404	,00409	,00450	,00487	,00521	,00552	,00582	,00610	,00637	,00663	,00688	,00909	,3402		
* ,35	,00508	,00515	,00522	,00528	,00535	,00541	,00600	,00652	,00699	,00743	,00784	,00823	,00860	,00896	,00931	,01233	,3969		
* ,40	,00646	,00655	,00665	,00674	,00683	,00691	,00771	,00841	,00904	,00962	,01016	,01068	,01117	,01164	,01209	,01606	,4536		
* ,45	,00799	,00812	,00824	,00836	,00847	,00859	,00963	,01053	,01134	,01209	,01278	,01344	,01407	,01467	,01524	,02028	,5104		
* ,50	,00967	,00983	,00999	,01014	,01029	,01044	,01175	,01289	,01390	,01484	,01570	,01652	,01730	,01804	,01876	,02499	,5671		
* ,55	,01150	,01170	,01190	,01209	,01228	,01246	,01409	,01548	,01673	,01786	,01892	,01992	,02086	,02177	,02264	,03020	,6238		
* ,60	,01348	,01373	,01397	,01420	,01443	,01465	,01663	,01831	,01981	,02117	,02244	,02363	,02476	,02584	,02688	,03589	,6805		
* ,65	,01561	,01591	,01620	,01648	,01675	,01702	,01938	,02138	,02315	,02476	,02623	,02766	,02899	,03026	,03148	,04208	,7372		
* ,70	,01789	,01824	,01858	,01892	,01924	,01956	,02234	,02468	,02675	,02863	,03037	,03200	,03355	,03503	,03645	,04877	,7939		
* ,75	,02031	,02072	,02113	,02152	,02190	,02226	,02550	,02822	,03060	,03277	,03478	,03666	,03845	,04015	,04178	,05594	,8506		
* ,80	,02287	,02336	,02383	,02428	,02472	,02514	,02888	,03199	,03472	,03720	,03949	,04164	,04368	,04562	,04748	,06360	,9073		
* ,85	,02558	,02614	,02668	,02720	,02770	,02819	,03246	,03600	,03910	,04191	,04450	,04693	,04924	,05143	,05354	,07176	,9640		
* ,90	,02844	,02908	,02969	,03029	,03086	,03141	,03624	,04024	,04373	,04689	,04981	,05255	,05513	,05760	,05997	,08041	1,0207		
* ,95	,03144	,03217	,03286	,03353	,03418	,03481	,04024	,04472	,04863	,05216	,05542	,05847	,06136	,06411	,06675	,08955	1,0774		
* 1,00	,03459	,03540	,03619	,03694	,03766	,03837	,04444	,04943	,05378	,05771	,06133	,06472	,06792	,07098	,07391	,09919	1,1341		
* 1,05	,03788	,03879	,03967	,04051	,04132	,04210	,04885	,05438	,05919	,06353	,06754	,07128	,07482	,07819	,08142	,10931	1,1908		
* 1,10	,04131	,04233	,04330	,04423	,04513	,04600	,05347	,05956	,06486	,06964	,07404	,07815	,08204	,08575	,08930	,11993	1,2475		
* 1,15	,04489	,04602	,04709	,04812	,04912	,05007	,05829	,06498	,07079	,07603	,08084	,08535	,08960	,09366	,09754	,13104	1,3042		
* 1,20	,04861	,04985	,05104	,05217	,05326	,05432	,06332	,07064	,07698	,08269	,08795	,09286	,09750	,10191	,10615	,14264	1,3609		
* 1,25	,05248	,05384	,05514	,05638	,05758	,05873	,06856	,07653	,08343	,08964	,09535	,10068	,10572	,11052	,11512	,15473	1,4176		
* 1,30	,05649	,05797	,05939	,06075	,06205	,06331	,07401	,08265	,09014	,09686	,10305	,10883	,11428	,11948	,12446	,16732	1,4744		
* 1,35	,06064	,06226	,06380	,06528	,06670	,06806	,07966	,08901	,09710	,10437	,11105	,11729	,12317	,12878	,13415	,18040	1,5311		
* 1,40	,06493	,06669	,06837	,06997	,07151	,07298	,08552	,09561	,10433	,11216	,11935	,12606	,13240	,13843	,14422	,19397	1,5878		
* 1,45	,06937	,07128	,07309	,07482	,07648	,07808	,09159	,10244	,11181	,12022	,12795	,13515	,14196	,14844	,15464	,20803	1,6445		
* 1,50	,07395	,07601	,07796	,07983	,08162	,08334	,09786	,10951	,11955	,12857	,13684	,14456	,15185	,15879	,16543	,22258	1,7012		
* 1,55	,07867	,08089	,08299	,08500	,08692	,08877	,10434	,11681	,12756	,13719	,14604	,15429	,16207	,16948	,17658	,23763	1,7579		
* 1,60	,08353	,08592	,08818	,09033	,09239	,09437	,11103	,12435	,13582	,14610	,15553	,16433	,17263	,18053	,18810	,25316	1,8146		
* 1,65	,08854	,09110	,09352	,09582	,09803	,10014	,11793	,13212	,14434	,15528	,16532	,17489	,18352	,19193	,19998	,26919	1,8713		
* 1,70	,09369	,09642	,09901	,10147	,10382	,10608	,12503	,14013	,15311	,16474	,17541	,18536	,19475	,20367	,21223	,28572	1,9280		
* 1,75	,09898	,10190	,10466	,10728	,10979	,11219	,13234	,14837	,16215	,17449	,18580	,19635	,20630	,21577	,22484	,30273	1,9847		
* 1,80	,10441	,10752	,11046	,11325	,11592	,11847	,13986	,15685	,17145	,18451	,19649	,20766	,21819	,22821	,23781	,32023	2,0414		
* 1,85	,10999	,11329	,11642	,11938	,12221	,12492	,14758	,16556	,18100	,19482	,20748	,21928	,23041	,24100	,25114	,33823	2,0981		
* 1,90	,11571	,11922	,12253	,12567	,12867	,13154	,15551	,17451	,19082	,20540	,21977	,23322	,24297	,25414	,26484	,35672	2,1548		
* 1,95	,12157	,12528	,12879	,13212	,13529	,13833	,16365	,18369	,20089	,21626	,23035	,24348	,25586	,26763	,27891	,37570	2,2115		
* 2,00	,12757	,13150	,13521	,13873	,14208	,14528	,17200	,19311	,21122	,22741	,24224	,25605	,26908	,28147	,29333	,39518	2,2682		
* 2,05	,13371	,13787	,14178	,14550	,14903	,15241	,18055	,20277	,22181	,23883	,25442	,26894	,28264	,29566	,30812	,41514	2,3249		
* 2,10	,14000	,14438	,14851	,15242	,15615	,15971	,18931	,21266	,23266	,25053	,26690	,28215	,29652	,31019	,32328	,43560	2,3817		
* 2,15	,14643	,15105	,15540	,15951	,16343	,16718	,19827	,22278	,24377	,26252	,27968	,29567	,31074	,32507	,33880	,45655	2,4384		
* 2,20	,15300	,15786	,16243	,16676	,17088	,17481	,20745	,23314	,25514	,27478	,29276	,30951	,32530	,34031	,35468	,47799	2,4951		
* 2,25	,15971	,16482	,16982	,17417	,17849	,18262	,21683	,24374	,26677	,28732	,30614	,32367	,34018	,35589	,37092	,49992	2,5518		
* 2,30	,16656	,17193	,17697	,18173	,18627	,19059	,22642	,25457	,27865	,30014	,31982	,33814	,35540	,37182	,38753	,52235	2,6085		
* 2,35	,17355	,17918	,18447	,18946	,19421	,19874	,23621	,26564	,29080	,31325	,33380	,35293	,37096	,38810	,40451	,54527	2,6652		
* 2,40	,18069	,18659	,19212	,19735	,20231	,20705	,24621	,27694	,30320	,32663	,34807	,36803	,38684	,40473	,42184	,56868	2,7219		
* 2,45	,18797	,19414	,19993	,20539	,21058	,21553	,25642	,28848	,31586	,34029	,36265	,38346	,40306	,42170	,43955	,59258	2,7786		
* 2,50	,19539	,20184	,20789	,21360	,21902	,22419	,26684	,30025	,32878	,35423	,37752	,39919	,41961	,43903	,45761	,61697	2,8353		
* 2,55	,20295	,20969	,21600	,22196	,22762	,23301	,27746	,31226	,34196	,36845	,39269	,41525	,43650	,45670	,47604	,64186	2,8920		
* 2,60	,21065	,21768	,22427	,23049	,23638	,24200	,28829	,32450	,35540	,38295	,40816	,43162	,45372	,47472	,49483	,66723	2,9487		
* 2,65	,21850	,22583	,23270	,23917	,24531	,25116	,29933	,33698	,36910	,39774	,42393	,44831	,47127	,49310	,51399	,69310	3,0054		
* 2,70	,22648	,23412	,24127	,24802	,25441	,26049	,31058	,34969	,38306	,41280	,44000	,46531	,48915	,51182	,53351	,71946	3,0621		
* 2,75	,23461	,24256	,25001	,25702	,26366	,26999	,32203	,36264	,39728	,42814	,45637	,48263	,50737	,53088	,55339	,74632	3,1188		
* 2,80	,24288	,25115	,25889	,26618	,27309	,27966	,33369	,37582	,41175	,44376	,47303	,50027	,52592	,55030	,57364	,77366	3,1755		
* 2,85	,25129	,25989	,26793	,27550	,28268	,28950	,34555	,38924	,42648	,45966	,49000	,51822	,54480	,57007	,59425	,80150	3,2322		
* 2,90	,25984	,26878	,27713	,28499	,29243	,29951	,35763	,40290	,44148	,47584	,50726	,53649	,56402	,59018	,61522	,82983	3,2889		
* 2,95	,26854	,27781	,28647	,29463	,30234	,30969	,36991	,41679	,45673	,49230	,52482	,55508	,58357	,61065	,63666	,85865	3,3457		
* 3,00	,27737	,28699	,29598	,30443	,31243	,32004	,38239	,43091	,47224	,50904	,54268	,57398	,60345	,63146	,65826	,88797	3,4024		

***** CETESB **																
DIAMETRO DO CONDUITO D= 50. (MM) (2") AREA DA SECAO DO CONDUITO S= .001963 M2																
VELO *	PERDA DE CARGA UNITARIA EM M/M															VAZAO *
CI/DADE *	OBS: K EM MILIMETROS															(L/S)
(M/S) *	K=.05	K=.06	K=.07	K=.08	K=.09	K=.10	K=.20	K=.30	K=.40	K=.50	K=.60	K=.70	K=.80	K=.90	K=1.0	K=2.0
* .30	.00272	.00275	.00278	.00281	.00284	.00287	.00314	.00339	.00351	.00382	.00401	.00419	.00437	.00453	.00469	.00610
* .35	.00359	.00363	.00368	.00372	.00376	.00381	.00419	.00454	.00485	.00513	.00540	.00565	.00590	.00613	.00635	.00827
* .40	.00456	.00463	.00469	.00475	.00481	.00486	.00539	.00585	.00627	.00685	.00700	.00734	.00765	.00796	.00825	.01077
* .45	.00565	.00573	.00581	.00589	.00597	.00604	.00673	.00733	.00786	.00835	.00881	.00923	.00964	.01003	.01040	.01360
* .50	.00684	.00695	.00705	.00715	.00725	.00735	.00822	.00897	.00964	.01025	.01082	.01135	.01185	.01233	.01280	.01676
* .55	.00814	.00827	.00840	.00853	.00865	.00877	.00986	.01078	.01160	.01234	.01303	.01368	.01429	.01488	.01544	.02025
* .60	.00954	.00970	.00986	.01002	.01017	.01032	.01164	.01275	.01373	.01463	.01546	.01623	.01697	.01766	.01833	.02407
* .65	.01105	.01125	.01144	.01163	.01181	.01199	.01356	.01488	.01605	.01711	.01808	.01900	.01986	.02069	.02148	.02822
* .70	.01266	.01290	.01313	.01335	.01357	.01378	.01563	.01718	.01855	.01978	.02092	.02198	.02299	.02395	.02487	.03270
* .75	.01438	.01466	.01493	.01519	.01544	.01569	.01785	.01965	.02122	.02265	.02396	.02519	.02635	.02745	.02850	.03752
* .80	.01620	.01652	.01684	.01714	.01743	.01772	.02021	.02227	.02408	.02571	.02721	.02861	.02993	.03119	.03239	.04266
* .85	.01812	.01850	.01886	.01921	.01954	.01987	.02272	.02506	.02711	.02896	.03066	.03224	.03374	.03516	.03653	.04813
* .90	.02015	.02058	.02099	.02139	.02177	.02214	.02537	.02802	.03033	.03241	.03432	.03610	.03778	.03938	.04091	.05393
* .95	.02228	.02276	.02323	.02368	.02411	.02453	.02816	.03114	.03372	.03605	.03816	.04017	.04205	.04383	.04554	.06006
* 1.00	.02451	.02506	.02558	.02609	.02658	.02705	.03111	.03442	.03730	.03988	.04225	.04446	.04655	.04852	.05042	.06652
* 1.05	.02685	.02746	.02805	.02861	.02915	.02968	.03419	.03787	.04105	.04391	.04653	.04897	.05127	.05346	.05554	.07331
* 1.10	.02928	.02997	.03062	.03125	.03185	.03243	.03743	.04148	.04498	.04813	.05101	.05369	.05622	.05862	.06092	.08043
* 1.15	.03182	.03258	.03330	.03399	.03466	.03530	.04080	.04525	.04910	.05254	.05570	.05864	.06140	.06403	.06654	.08788
* 1.20	.03446	.03530	.03609	.03686	.03759	.03830	.04433	.04919	.05339	.05715	.06059	.06380	.06681	.06968	.07241	.09566
* 1.25	.03721	.03812	.03900	.03983	.04064	.04141	.04799	.05329	.05786	.06195	.06569	.06917	.07245	.07556	.07853	.10377
* 1.30	.04005	.04105	.04201	.04292	.04380	.04464	.05181	.05756	.06251	.06694	.07100	.07477	.07832	.08168	.08490	.11221
* 1.35	.04300	.04409	.04513	.04612	.04708	.04800	.05576	.06199	.06734	.07213	.07651	.08058	.08441	.08805	.09152	.12098
* 1.40	.04604	.04723	.04836	.04944	.05047	.05147	.05987	.06658	.07235	.07751	.08222	.08661	.09073	.09464	.09838	.13008
* 1.45	.04919	.05048	.05170	.05287	.05399	.05505	.06411	.07134	.07754	.08308	.08815	.09285	.09728	.10148	.10550	.13951
* 1.50	.05244	.05383	.05515	.05641	.05762	.05877	.06851	.07626	.08291	.08885	.09428	.09932	.10406	.10856	.11286	.14927
* 1.55	.05579	.05729	.05871	.06007	.06136	.06260	.07304	.08135	.08846	.09481	.10061	.10600	.11107	.11587	.12046	.15936
* 1.60	.05925	.06086	.06238	.06384	.06522	.06655	.07773	.08660	.09419	.10096	.10715	.11290	.11830	.12343	.12832	.16979
* 1.65	.06280	.06453	.06616	.06772	.06920	.07063	.08256	.09201	.10010	.10731	.11390	.12002	.12577	.13122	.13643	.18054
* 1.70	.06646	.06830	.07005	.07171	.07330	.07482	.08753	.09759	.10619	.11385	.12085	.12735	.13346	.13925	.14478	.19162
* 1.75	.07021	.07218	.07405	.07582	.07751	.07913	.09265	.10333	.11246	.12059	.12861	.13490	.14138	.14752	.15338	.20303
* 1.80	.07407	.07617	.07816	.08004	.08184	.08356	.09791	.10923	.11890	.12751	.13537	.14267	.14953	.15602	.16223	.21477
* 1.85	.07803	.08026	.08237	.08437	.08628	.08811	.10332	.11530	.12553	.13463	.14294	.15066	.15790	.16477	.17133	.22684
* 1.90	.08209	.08446	.08670	.08882	.09084	.09279	.10887	.12153	.13234	.14195	.15072	.15886	.16651	.17375	.18067	.23924
* 1.95	.08625	.08876	.09113	.09338	.09552	.09757	.11457	.12793	.13932	.14946	.15870	.16728	.17534	.18298	.19027	.25197
* 2.00	.09051	.09317	.09568	.09805	.10032	.10248	.12041	.13449	.14649	.15716	.16689	.17592	.18440	.19244	.20011	.26503
* 2.05	.09487	.09768	.10033	.10284	.10523	.10751	.12640	.14121	.15383	.16503	.17528	.18477	.19369	.20214	.21020	.27842
* 2.10	.09933	.10230	.10509	.10774	.11025	.11265	.13253	.14810	.16136	.17314	.18388	.19385	.20321	.21207	.22054	.29214
* 2.15	.10390	.10702	.10997	.11275	.11540	.11792	.13881	.15515	.16906	.18142	.19269	.20314	.21295	.22225	.23112	.30618
* 2.20	.10856	.11185	.11495	.11787	.12065	.12331	.14523	.16237	.17695	.18990	.20170	.21265	.22293	.23266	.24196	.32056
* 2.25	.11332	.11679	.12004	.12311	.12603	.12882	.15180	.16775	.18501	.19856	.21092	.22237	.23313	.24332	.25304	.33527
* 2.30	.11819	.12183	.12524	.12846	.13152	.13444	.15851	.17729	.19325	.20743	.22034	.23232	.24356	.25421	.26437	.35031
* 2.35	.12316	.12697	.13055	.13392	.13713	.14019	.16537	.18500	.20168	.21646	.22997	.24248	.25422	.26534	.27595	.36568
* 2.40	.12822	.13222	.13596	.13950	.14286	.14605	.17238	.19287	.21028	.22573	.23960	.25285	.26510	.27671	.28778	.38138
* 2.45	.13339	.13757	.14149	.14515	.14870	.15204	.17952	.20090	.21906	.23517	.24985	.26345	.27622	.28831	.29985	.39741
* 2.50	.13866	.14303	.14713	.15099	.15465	.15815	.18682	.20910	.22802	.24481	.26009	.27426	.28756	.30016	.31218	.41377
* 2.55	.14403	.14859	.15287	.15691	.16073	.16437	.19425	.21747	.23716	.25463	.27055	.28529	.29913	.31224	.32475	.43046
* 2.60	.14949	.15426	.15873	.16293	.16692	.17071	.20184	.22599	.24648	.26466	.28120	.29654	.31093	.32456	.33757	.44748
* 2.65	.15506	.16004	.16469	.16907	.17323	.17718	.20957	.23468	.25598	.27487	.29207	.30800	.32296	.33712	.35064	.46483
* 2.70	.16073	.16592	.17076	.17533	.17965	.18376	.21744	.24354	.26566	.28528	.30314	.31969	.33522	.34992	.36395	.48251
* 2.75	.16650	.17190	.17694	.18169	.18619	.19046	.22546	.25256	.27552	.29588	.31441	.33159	.34770	.36296	.37752	.50052
* 2.80	.17238	.17799	.18324	.18817	.19284	.19729	.23362	.26174	.28556	.30668	.32590	.34370	.36041	.37624	.39133	.51886
* 2.85	.17835	.18418	.18964	.19476	.19961	.20423	.24193	.27108	.29578	.31767	.33758	.35604	.37335	.38975	.40539	.53753
* 2.90	.18442	.19048	.19614	.20147	.20650	.21129	.25038	.28059	.30618	.32885	.34948	.36859	.38652	.40350	.41970	.55653
* 2.95	.19059	.19689	.20276	.20828	.21351	.21847	.25898	.29027	.31676	.34022	.36158	.38136	.39992	.41749	.43426	.57586
* 3.00	.19686	.20340	.20949	.21521	.22063	.22577	.26772	.30010	.32752	.35179	.37388	.39435	.41354	.43172	.44906	.59551

VELD	PERDA DE CARGA UNITARIA E M/M																*VAZAO*
CIDADE	OBS: K EM MILIMETROS																(L/S)
* (M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	
* ,30	.00203	.00205	.00207	.00210	.00212	.00214	.00233	.00250	.00266	.00280	.00294	.00307	.00319	.00330	.00342	.00438	,9352
* ,35	.00268	.00271	.00274	.00277	.00281	.00284	.00311	.00335	.00357	.00377	.00396	.00414	.00430	.00447	.00462	.00594	1,0910
* ,40	.00341	.00346	.00350	.00354	.00358	.00362	.00400	.00432	.00462	.00488	.00513	.00537	.00559	.00580	.00600	.00774	1,2469
* ,45	.00422	.00428	.00434	.00440	.00445	.00451	.00500	.00542	.00579	.00614	.00646	.00676	.00704	.00731	.00757	.00977	1,4028
* ,50	.00512	.00519	.00527	.00534	.00541	.00548	.00610	.00663	.00710	.00753	.00793	.00830	.00866	.00899	.00931	.01204	1,5588
* ,55	.00609	.00619	.00628	.00637	.00646	.00654	.00731	.00797	.00855	.00907	.00956	.01001	.01044	.01085	.01124	.01455	1,7145
* ,60	.00714	.00726	.00737	.00748	.00759	.00770	.00864	.00943	.01012	.01075	.01133	.01188	.01239	.01288	.01334	.01729	1,8703
* ,65	.00827	.00842	.00855	.00869	.00882	.00894	.01006	.01100	.01183	.01257	.01326	.01390	.01451	.01508	.01563	.02028	2,0262
* ,70	.00948	.00965	.00982	.00998	.01013	.01028	.01160	.01270	.01367	.01454	.01534	.01609	.01679	.01746	.01810	.02350	2,1821
* ,75	.01077	.01097	.01116	.01135	.01153	.01171	.01325	.01452	.01564	.01665	.01757	.01843	.01924	.02001	.02074	.02695	2,3379
* ,80	.01214	.01237	.01259	.01281	.01302	.01322	.01500	.01647	.01775	.01889	.01995	.02093	.02186	.02273	.02357	.03065	2,4938
* ,85	.01358	.01385	.01411	.01436	.01460	.01483	.01686	.01853	.01998	.02129	.02248	.02359	.02464	.02563	.02658	.03458	2,6497
* ,90	.01510	.01541	.01570	.01599	.01626	.01653	.01883	.02072	.02235	.02382	.02516	.02642	.02759	.02871	.02977	.03874	2,8055
* ,95	.01670	.01705	.01738	.01770	.01801	.01831	.02091	.02302	.02485	.02649	.02800	.02939	.03071	.03195	.03314	.04315	2,9614
* 1,00	.01837	.01876	.01914	.01950	.01985	.02019	.02309	.02545	.02749	.02931	.03098	.03253	.03399	.03537	.03669	.04779	3,1172
* 1,05	.02012	.02056	.02099	.02139	.02178	.02216	.02538	.02800	.03025	.03227	.03412	.03583	.03744	.03897	.04042	.05267	3,2731
* 1,10	.02195	.02244	.02291	.02336	.02380	.02421	.02778	.03067	.03315	.03537	.03740	.03929	.04106	.04274	.04434	.05778	3,4290
* 1,15	.02386	.02440	.02492	.02542	.02590	.02636	.03029	.03346	.03619	.03862	.04084	.04291	.04484	.04668	.04843	.06314	3,5848
* 1,20	.02584	.02644	.02701	.02756	.02809	.02859	.03291	.03637	.03935	.04201	.04443	.04668	.04879	.05079	.05270	.06873	3,7407
* 1,25	.02790	.02856	.02919	.02979	.03036	.03092	.03563	.03941	.04265	.04553	.04817	.05062	.05291	.05508	.05716	.07455	3,8966
* 1,30	.03003	.03075	.03144	.03210	.03273	.03333	.03846	.04256	.04607	.04920	.05206	.05471	.05720	.05955	.06179	.08062	4,0524
* 1,35	.03224	.03303	.03378	.03449	.03518	.03584	.04140	.04584	.04963	.05302	.05610	.05898	.06165	.06419	.06661	.08692	4,2083
* 1,40	.03453	.03539	.03620	.03698	.03772	.03843	.04445	.04923	.05333	.05697	.06029	.06337	.06626	.06900	.07160	.09346	4,3642
* 1,45	.03690	.03782	.03870	.03954	.04034	.04112	.04760	.05275	.05715	.06107	.06464	.06795	.07105	.07398	.07678	.10023	4,5200
* 1,50	.03933	.04034	.04129	.04219	.04306	.04389	.05086	.05639	.06111	.06531	.06913	.07268	.07600	.07914	.08213	.10724	4,6759
* 1,55	.04185	.04293	.04395	.04493	.04586	.04675	.05423	.06015	.06520	.06969	.07378	.07756	.08111	.08447	.08767	.11449	4,8317
* 1,60	.04444	.04560	.04670	.04775	.04874	.04970	.05771	.06403	.06942	.07421	.07857	.08261	.08640	.08998	.09339	.12198	4,9876
* 1,65	.04711	.04835	.04953	.05065	.05172	.05274	.06129	.06804	.07378	.07888	.08352	.08782	.09185	.09566	.09929	.12970	5,1435
* 1,70	.04985	.05118	.05244	.05364	.05478	.05587	.06499	.07216	.07827	.08369	.08862	.09319	.09747	.10151	.10537	.13766	5,2993
* 1,75	.05267	.05409	.05544	.05671	.05793	.05909	.06879	.07640	.08289	.08864	.09387	.09871	.10325	.10754	.11163	.14586	5,4552
* 1,80	.05557	.05708	.05851	.05987	.06117	.06240	.07270	.08077	.08764	.09373	.09927	.10440	.10920	.11374	.11807	.15429	5,6111
* 1,85	.05854	.06015	.06167	.06311	.06449	.06580	.07671	.08526	.09252	.09896	.10482	.11024	.11532	.12012	.12469	.16296	5,7669
* 1,90	.06159	.06330	.06491	.06644	.06790	.06929	.08083	.08987	.09754	.10434	.11052	.11624	.12160	.12667	.13149	.17187	5,9228
* 1,95	.06471	.06652	.06823	.06985	.07140	.07287	.08507	.09460	.10269	.10986	.11638	.12241	.12805	.13339	.13847	.18102	6,0786
* 2,00	.06791	.06983	.07164	.07335	.07498	.07654	.08940	.09945	.10797	.11552	.12236	.12873	.13467	.14029	.14564	.19040	6,2345
* 2,05	.07118	.07321	.07512	.07693	.07865	.08029	.09365	.10442	.11339	.12132	.12854	.13521	.14145	.14736	.15298	.20002	6,3904
* 2,10	.07453	.07668	.07869	.08060	.08241	.08414	.09840	.10952	.11893	.12727	.13484	.14185	.14840	.15460	.16050	.20988	6,5462
* 2,15	.07796	.08022	.08234	.08435	.08625	.08807	.10307	.11473	.12461	.13336	.14130	.14865	.15552	.16202	.16821	.21997	6,7021
* 2,20	.08146	.08384	.08607	.08818	.09019	.09210	.10784	.12007	.13042	.13959	.14791	.15560	.16281	.16969	.17609	.23030	6,8580
* 2,25	.08504	.08754	.08988	.09210	.09421	.09621	.11271	.12552	.13637	.14596	.15467	.16272	.17026	.17738	.18416	.24087	7,0138
* 2,30	.08869	.09131	.09378	.09610	.09831	.10042	.11770	.13110	.14244	.15247	.16158	.17000	.17787	.18532	.19241	.25168	7,1697
* 2,35	.09242	.09517	.09776	.10019	.10250	.10471	.12279	.13680	.14865	.15913	.16864	.17743	.18566	.19343	.20083	.26272	7,3256
* 2,40	.09622	.09911	.10181	.10437	.10678	.10909	.12759	.14262	.15499	.16593	.17585	.18502	.19361	.20172	.20944	.27400	7,4814
* 2,45	.10010	.10312	.10595	.10862	.11115	.11356	.13330	.14856	.16146	.17287	.18321	.19278	.20173	.21018	.21823	.28551	7,6373
* 2,50	.10405	.10722	.11017	.11296	.11561	.11812	.13871	.15463	.16807	.17995	.19073	.20069	.21001	.21882	.22720	.29727	7,7931
* 2,55	.10808	.11139	.11448	.11739	.12015	.12277	.14424	.16081	.17481	.18717	.19839	.20876	.21846	.22763	.23635	.30926	7,9490
* 2,60	.11219	.11564	.11886	.12190	.12478	.12751	.14987	.16712	.18168	.19454	.20621	.21699	.22708	.23661	.24568	.32148	8,1049
* 2,65	.11637	.11997	.12333	.12649	.12949	.13234	.15560	.17354	.18868	.20205	.21418	.22538	.23586	.24577	.25519	.33395	8,2607
* 2,70	.12063	.12436	.12788	.13117	.13429	.13726	.16145	.18009	.19592	.20970	.22229	.23393	.24481	.25510	.26488	.34665	8,4166
* 2,75	.12496	.12886	.13251	.13594	.13918	.14227	.16740	.18676	.20308	.21749	.23056	.24264	.25393	.26460	.27475	.35959	8,5725
* 2,80	.12937	.13343	.13722	.14079	.14416	.14736	.17347	.19355	.21048	.22543	.23898	.25150	.26322	.27428	.28480	.37276	8,7283
* 2,85	.13385	.13807	.14201	.14572	.14922	.15255	.17963	.20046	.21801	.23351	.24755	.26053	.27267	.28413	.29504	.38617	8,8842
* 2,90	.13841	.14280	.14689	.15074	.15437	.15782	.18591	.20749	.22568	.24173	.25628	.26971	.28228	.29416	.30545	.39982	9,0400
* 2,95	.14304	.14760	.15185	.15584	.15961	.16319	.19230	.21485	.23348	.25009	.26515	.27906	.29207	.30435	.31604	.41371	9,1959
* 3,00	.14775	.15248	.15689	.16102	.16493	.16864	.19879	.22192	.24140	.25859	.27417	.28856	.30202	.31473	.32682	.42783	9,3518

***** CETESB *****																	
DIAMETRO DO CONDUTO D= 75. (MM) (3") AREA DA SECAO DO CONDUTO S= .004416 M2																	
VELO *	PERDA DL CARGA UNITARIA EM M/M																VAZAO *
CIDADE *	UBS: K EM MILIMETROS																(L/S) *
(M/S) *	K=.05	K=.06	K=.07	K=.08	K=.09	K=.10	K=.20	K=.30	K=.40	K=.50	K=.60	K=.70	K=.80	K=.90	K=1.0	K=2.0	*
* .30	.00163	.00165	.00166	.00168	.00170	.00171	.00186	.00200	.00212	.00223	.00233	.00243	.00252	.00261	.00269	.00342	1.3254 *
* .35	.00215	.00218	.00220	.00223	.00225	.00227	.00249	.00267	.00284	.00300	.00314	.00327	.00340	.00353	.00364	.00464	1.5463 *
* .40	.00274	.00278	.00281	.00284	.00288	.00291	.00320	.00345	.00368	.00407	.00425	.00442	.00458	.00473	.00605	1.7671 *	
* .45	.00340	.00344	.00349	.00353	.00357	.00362	.00399	.00432	.00461	.00487	.00512	.00535	.00556	.00577	.00764	1.9880 *	
* .50	.00412	.00417	.00423	.00429	.00434	.00440	.00488	.00529	.00565	.00598	.00629	.00657	.00684	.00710	.00941	2.2089 *	
* .55	.00490	.00497	.00505	.00512	.00518	.00525	.00585	.00635	.00680	.00720	.00758	.00793	.00825	.00857	.01137	2.4298 *	
* .60	.00575	.00584	.00593	.00601	.00610	.00618	.00691	.00752	.00805	.00854	.00899	.00940	.00980	.01017	.01352	2.6507 *	
* .65	.00666	.00677	.00688	.00698	.00708	.00718	.00805	.00878	.00941	.00999	.01051	.01101	.01147	.01191	.01585	2.8716 *	
* .70	.00763	.00776	.00789	.00802	.00814	.00825	.00928	.01013	.01088	.01155	.01216	.01274	.01327	.01379	.01837	3.0925 *	
* .75	.00867	.00883	.00898	.00912	.00926	.00940	.01059	.01158	.01245	.01322	.01393	.01459	.01521	.01580	.02107	3.3134 *	
* .80	.00977	.00995	.01013	.01029	.01046	.01062	.01200	.01313	.01412	.01501	.01582	.01657	.01728	.01795	.02395	3.5343 *	
* .85	.01093	.01114	.01134	.01154	.01173	.01191	.01349	.01476	.01590	.01691	.01783	.01868	.01948	.02024	.02703	3.7552 *	
* .90	.01216	.01240	.01263	.01285	.01306	.01327	.01506	.01652	.01779	.01892	.01995	.02091	.02182	.02267	.03028	3.9761 *	
* .95	.01345	.01372	.01398	.01423	.01447	.01471	.01672	.01836	.01978	.02104	.02220	.02327	.02428	.02523	.03373	4.1970 *	
* 1.00	.01480	.01510	.01540	.01568	.01595	.01621	.01847	.02030	.02187	.02328	.02457	.02576	.02688	.02793	.03736	4.4179 *	
* 1.05	.01621	.01655	.01688	.01720	.01750	.01779	.02030	.02233	.02408	.02563	.02705	.02837	.02960	.03077	.04117	4.6388 *	
* 1.10	.01768	.01806	.01843	.01878	.01912	.01944	.02222	.02446	.02638	.02810	.02966	.03111	.03246	.03375	.04517	4.8597 *	
* 1.15	.01922	.01964	.02005	.02044	.02081	.02117	.02423	.02664	.02880	.03067	.03238	.03397	.03546	.03686	.04835	5.0806 *	
* 1.20	.02082	.02128	.02173	.02216	.02257	.02296	.02632	.02901	.03131	.03330	.03523	.03696	.03858	.04011	.05372	5.3014 *	
* 1.25	.02247	.02299	.02348	.02395	.02440	.02483	.02850	.03143	.03394	.03617	.03820	.04007	.04183	.04350	.05828	5.5223 *	
* 1.30	.02420	.02476	.02530	.02581	.02630	.02677	.03077	.03395	.03667	.03908	.04128	.04332	.04522	.04702	.06302	5.7432 *	
* 1.35	.02598	.02659	.02718	.02774	.02827	.02878	.03312	.03656	.03950	.04211	.04449	.04668	.04874	.05068	.06794	5.9641 *	
* 1.40	.02782	.02849	.02913	.02973	.03031	.03087	.03555	.03927	.04244	.04525	.04781	.05018	.05239	.05448	.07305	6.1850 *	
* 1.45	.02973	.03045	.03114	.03180	.03242	.03302	.03808	.04208	.04548	.04851	.05125	.05380	.05617	.05842	.07835	6.4059 *	
* 1.50	.03169	.03248	.03322	.03393	.03460	.03525	.04069	.04496	.04863	.05167	.05482	.05754	.06009	.06249	.08383	6.6268 *	
* 1.55	.03372	.03457	.03537	.03613	.03685	.03755	.04338	.04798	.05189	.05535	.05850	.06141	.06413	.06670	.08949	6.8477 *	
* 1.60	.03581	.03672	.03758	.03840	.03918	.03992	.04616	.05107	.05525	.05895	.06230	.06541	.06831	.07105	.09535	7.0686 *	
* 1.65	.03796	.03894	.03986	.04073	.04157	.04237	.04903	.05427	.05871	.06265	.06623	.06953	.07265	.07554	.10138	7.2895 *	
* 1.70	.04017	.04122	.04220	.04314	.04403	.04488	.05199	.05756	.06229	.06647	.07027	.07378	.07706	.08015	.10761	7.5104 *	
* 1.75	.04245	.04356	.04461	.04561	.04656	.04747	.05503	.06094	.06596	.07040	.07443	.07816	.08164	.08492	.11401	7.7313 *	
* 1.80	.04478	.04597	.04709	.04815	.04916	.05013	.05815	.06443	.06974	.07445	.07872	.08268	.08634	.08982	.12061	7.9522 *	
* 1.85	.04718	.04844	.04963	.05076	.05183	.05286	.06137	.06801	.07363	.07861	.08312	.08728	.09118	.09485	.12736	8.1731 *	
* 1.90	.04963	.05097	.05224	.05343	.05457	.05566	.06466	.07168	.07762	.08288	.08764	.09204	.09615	.10002	.13435	8.3940 *	
* 1.95	.05215	.05357	.05491	.05618	.05738	.05854	.06805	.07545	.08172	.08726	.09228	.09691	.10125	.10533	.13922	8.6149 *	
* 2.00	.05473	.05624	.05765	.05899	.06027	.06148	.07152	.07932	.08593	.09176	.09704	.10192	.10646	.11078	.14883	8.8358 *	
* 2.05	.05737	.05896	.06046	.06187	.06322	.06450	.07508	.08329	.09023	.09636	.10192	.10705	.11184	.11636	.15635	9.0567 *	
* 2.10	.06007	.06175	.06333	.06482	.06624	.06759	.07872	.08735	.09465	.10109	.10692	.11231	.11734	.12208	.16405	9.2775 *	
* 2.15	.06283	.06460	.06627	.06784	.06933	.07075	.08245	.09151	.09917	.10592	.11204	.11769	.12297	.12794	.17194	9.4984 *	
* 2.20	.06566	.06752	.06927	.07092	.07249	.07399	.08626	.09571	.10379	.11087	.11728	.12320	.12872	.13394	.18002	9.7193 *	
* 2.25	.06854	.07050	.07234	.07407	.07572	.07729	.09017	.10012	.10852	.11593	.12264	.12883	.13462	.14007	.18828	9.9402 *	
* 2.30	.07149	.07354	.07547	.07730	.07902	.08067	.09415	.10457	.11336	.12110	.12812	.13458	.14064	.14634	.19673	10.1611 *	
* 2.35	.07449	.07665	.07867	.08058	.08239	.08412	.09823	.10912	.11850	.12639	.13372	.14048	.14679	.15275	.20536	10.3820 *	
* 2.40	.07756	.07982	.08194	.08394	.08583	.08764	.10239	.11376	.12334	.13179	.13944	.14649	.15308	.15929	.21417	10.6029 *	
* 2.45	.08069	.08306	.08527	.08736	.08934	.09123	.10663	.11850	.12650	.13730	.14528	.15263	.15950	.16597	.22316	10.8238 *	
* 2.50	.08387	.08635	.08867	.09086	.09293	.09489	.11097	.12334	.13375	.14293	.15124	.15890	.16603	.17279	.23236	11.0447 *	
* 2.55	.08712	.08971	.09214	.09442	.09658	.09863	.11538	.12827	.13911	.14867	.15731	.16529	.17273	.17975	.24173	11.2656 *	
* 2.60	.09043	.09314	.09567	.09805	.10030	.10244	.11989	.13330	.14458	.15452	.16351	.17180	.17954	.18684	.25129	11.4865 *	
* 2.65	.09381	.09663	.09926	.10174	.10409	.10632	.12448	.13843	.15016	.16048	.16983	.17844	.18649	.19407	.26104	11.7074 *	
* 2.70	.09724	.10018	.10292	.10551	.10795	.11027	.12916	.14365	.15583	.16656	.17627	.18521	.19357	.20144	.27096	11.9283 *	
* 2.75	.10073	.10379	.10665	.10934	.11188	.11429	.13392	.14897	.16162	.17275	.18282	.19211	.20077	.20895	.28108	12.1492 *	
* 2.80	.10429	.10747	.11044	.11324	.11588	.11839	.13877	.15438	.16751	.17905	.18950	.19913	.20812	.21659	.29138	12.3701 *	
* 2.85	.10790	.11121	.11430	.11721	.11995	.12255	.14370	.15990	.17350	.18547	.19630	.20627	.21559	.22437	.30186	12.5910 *	
* 2.90	.11158	.11502	.11823	.12124	.12409	.12679	.14873	.16551	.17960	.19200	.20321	.21355	.22319	.23228	.31253	12.8119 *	
* 2.95	.11531	.11889	.12222	.12535	.12830	.13110	.15383	.17121	.18580	.19864	.21025	.22094	.23093	.24034	.32336	13.0328 *	
* 3.00	.11911	.12282	.12627	.12952	.13258	.13548	.15903	.17701	.19211	.20539	.21740	.22847	.23880	.24853	.33442	13.2537 *	

DIAMETRO DO CONDUTO D= 100. (MM)

AREA DA SECAO DO CONDUTO S= .0079 M2

LEI 1208

VELO *	PERDA DE CARGA UNITARIA EM M/M																VAZAO *
CIDADE *	OBS: K EM MILIMETROS																(L/S)
(M/S) *	K=.05	K=.06	K=.07	K=.08	K=.09	K=.10	K=.20	K=.30	K=.40	K=.50	K=.60	K=.70	K=.80	K=.90	K=1,0	K=2,0	
* .30	.00114	.00115	.00116	.00117	.00118	.00119	.00129	.00138	.00145	.00153	.00159	.00166	.00172	.00177	.00183	.00229	2,36 *
* .35	.00150	.00152	.00154	.00155	.00157	.00158	.00172	.00184	.00195	.00205	.00215	.00224	.00232	.00240	.00247	.00311	2,75 *
* .40	.00192	.00194	.00196	.00198	.00200	.00202	.00221	.00238	.00253	.00266	.00278	.00290	.00301	.00311	.00321	.00405	3,14 *
* .45	.00237	.00240	.00243	.00246	.00249	.00252	.00277	.00298	.00317	.00334	.00350	.00365	.00379	.00392	.00405	.00511	3,53 *
* .50	.00288	.00292	.00296	.00299	.00303	.00306	.00338	.00365	.00389	.00410	.00430	.00449	.00466	.00483	.00498	.00630	3,93 *
* .55	.00343	.00348	.00352	.00357	.00362	.00366	.00405	.00439	.00468	.00494	.00518	.00541	.00562	.00582	.00602	.00761	4,32 *
* .60	.00402	.00408	.00414	.00420	.00425	.00431	.00479	.00519	.00554	.00586	.00615	.00642	.00667	.00691	.00714	.00905	4,71 *
* .65	.00466	.00473	.00481	.00487	.00494	.00501	.00558	.00606	.00648	.00685	.00719	.00751	.00781	.00810	.00837	.01061	5,11 *
* .70	.00534	.00543	.00552	.00560	.00568	.00576	.00643	.00699	.00748	.00792	.00832	.00869	.00904	.00937	.00969	.01230	5,50 *
* .75	.00607	.00618	.00627	.00637	.00646	.00656	.00735	.00800	.00856	.00907	.00953	.00996	.01036	.01074	.01111	.01411	5,89 *
* .80	.00684	.00696	.00708	.00719	.00730	.00741	.00832	.00907	.00972	.01030	.01082	.01131	.01177	.01221	.01262	.01604	6,28 *
* .85	.00766	.00780	.00793	.00806	.00819	.00831	.00935	.01020	.01094	.01160	.01220	.01275	.01327	.01376	.01423	.01810	6,68 *
* .90	.00852	.00868	.00883	.00898	.00912	.00926	.01044	.01141	.01224	.01296	.01365	.01428	.01486	.01541	.01594	.02028	7,07 *
* .95	.00942	.00960	.00978	.00994	.01011	.01026	.01150	.01268	.01361	.01444	.01519	.01589	.01654	.01716	.01774	.02258	7,48 *
* 1,00	.01037	.01057	.01077	.01096	.01114	.01131	.01281	.01402	.01505	.01597	.01681	.01759	.01831	.01899	.01964	.02501	7,85 *
* 1,05	.01136	.01159	.01181	.01202	.01222	.01242	.01408	.01542	.01657	.01759	.01851	.01937	.02017	.02093	.02164	.02757	8,25 *
* 1,10	.01240	.01265	.01290	.01313	.01335	.01357	.01541	.01689	.01815	.01928	.02030	.02124	.02212	.02295	.02374	.03024	8,64 *
* 1,15	.01347	.01376	.01403	.01429	.01453	.01477	.01681	.01843	.01981	.02104	.02216	.02319	.02416	.02507	.02593	.03305	9,03 *
* 1,20	.01460	.01491	.01521	.01549	.01576	.01603	.01826	.02003	.02155	.02289	.02411	.02523	.02628	.02728	.02822	.03597	9,42 *
* 1,25	.01576	.01610	.01643	.01674	.01704	.01733	.01977	.02170	.02335	.02481	.02614	.02736	.02850	.02956	.03060	.03902	9,82 *
* 1,30	.01697	.01734	.01770	.01804	.01837	.01869	.02134	.02344	.02523	.02681	.02825	.02957	.03081	.03198	.03308	.04220	10,21 *
* 1,35	.01822	.01863	.01902	.01939	.01975	.02009	.02297	.02525	.02718	.02889	.03044	.03187	.03321	.03447	.03566	.04549	10,60 *
* 1,40	.01951	.01996	.02038	.02079	.02118	.02155	.02466	.02712	.02920	.03105	.03272	.03426	.03570	.03705	.03833	.04892	11,00 *
* 1,45	.02085	.02134	.02180	.02223	.02265	.02305	.02641	.02905	.03130	.03328	.03507	.03673	.03827	.03973	.04111	.05246	11,39 *
* 1,50	.02223	.02276	.02325	.02372	.02418	.02461	.02822	.03106	.03346	.03559	.03751	.03929	.04094	.04250	.04397	.05613	11,78 *
* 1,55	.02366	.02422	.02476	.02526	.02575	.02621	.03009	.03313	.03571	.03798	.04003	.04193	.04370	.04536	.04694	.05993	12,17 *
* 1,60	.02512	.02573	.02630	.02685	.02737	.02787	.03202	.03527	.03802	.04044	.04264	.04466	.04654	.04832	.05000	.06385	12,57 *
* 1,65	.02663	.02728	.02790	.02849	.02904	.02958	.03401	.03747	.04040	.04298	.04532	.04747	.04948	.05137	.05316	.06789	12,96 *
* 1,70	.02819	.02888	.02954	.03017	.03076	.03133	.03606	.03975	.04286	.04560	.04809	.05037	.05250	.05451	.05641	.07205	13,35 *
* 1,75	.02978	.03053	.03123	.03190	.03253	.03314	.03817	.04208	.04539	.04830	.05094	.05336	.05562	.05775	.05976	.07634	13,74 *
* 1,80	.03142	.03222	.03296	.03367	.03435	.03500	.04034	.04449	.04799	.05108	.05387	.05643	.05883	.06108	.06321	.08076	14,14 *
* 1,85	.03310	.03395	.03475	.03550	.03622	.03690	.04257	.04696	.05067	.05393	.05688	.05959	.06212	.06450	.06676	.08530	14,53 *
* 1,90	.03483	.03573	.03657	.03737	.03813	.03886	.04486	.04950	.05342	.05686	.05997	.06284	.06551	.06802	.07040	.08996	14,92 *
* 1,95	.03660	.03755	.03845	.03929	.04010	.04087	.04720	.05211	.05624	.05987	.06315	.06617	.06898	.07163	.07414	.09475	15,32 *
* 2,00	.03841	.03942	.04036	.04126	.04211	.04293	.04961	.05478	.05913	.06295	.06641	.06959	.07255	.07533	.07797	.09966	15,71 *
* 2,05	.04026	.04133	.04233	.04328	.04418	.04503	.05208	.05752	.06209	.06612	.06975	.07309	.07620	.07913	.08190	.10469	16,10 *
* 2,10	.04216	.04328	.04434	.04534	.04629	.04719	.05481	.06032	.06513	.06936	.07317	.07668	.07995	.08302	.08593	.10985	16,49 *
* 2,15	.04410	.04528	.04640	.04745	.04845	.04940	.05719	.06320	.06824	.07267	.07667	.08035	.08378	.08700	.09006	.11514	16,89 *
* 2,20	.04608	.04733	.04850	.04961	.05066	.05166	.05984	.06614	.07142	.07607	.08026	.08411	.08770	.09106	.09428	.12054	17,28 *
* 2,25	.04811	.04942	.05065	.05181	.05292	.05397	.06253	.06914	.07468	.07954	.08393	.08796	.09172	.09525	.09860	.12608	17,67 *
* 2,30	.05017	.05155	.05285	.05407	.05522	.05632	.06531	.07221	.07801	.08309	.08768	.09189	.09582	.09951	.10301	.13173	18,06 *
* 2,35	.05228	.05373	.05509	.05637	.05758	.05873	.06814	.07535	.08141	.08672	.09151	.09591	.10001	.10387	.10753	.13751	18,46 *
* 2,40	.05444	.05596	.05738	.05872	.05999	.06119	.07103	.07856	.08488	.09042	.09542	.10002	.10430	.10832	.11213	.14341	18,85 *
* 2,45	.05663	.05822	.05971	.06111	.06244	.06370	.07397	.08183	.08842	.09420	.09942	.10421	.10867	.11286	.11684	.14944	19,24 *
* 2,50	.05887	.06054	.06209	.06356	.06494	.06626	.07698	.08517	.09204	.09806	.10350	.10849	.11313	.11750	.12164	.15559	19,64 *
* 2,55	.06116	.06289	.06452	.06605	.06749	.06887	.08004	.08858	.09573	.10200	.10766	.11285	.11769	.12223	.12654	.16187	20,03 *
* 2,60	.06348	.06530	.06699	.06859	.07010	.07153	.08317	.09205	.09949	.10502	.11190	.11730	.12233	.12706	.13153	.16827	20,42 *
* 2,65	.06585	.06774	.06951	.07117	.07274	.07424	.08635	.09559	.10333	.11011	.11622	.12183	.12706	.13197	.13663	.17479	20,81 *
* 2,70	.06826	.07023	.07208	.07381	.07544	.07700	.08960	.09920	.10723	.11428	.12062	.12646	.13188	.13698	.14182	.18144	21,21 *
* 2,75	.07071	.07277	.07469	.07649	.07819	.07981	.09290	.10287	.11121	.11852	.12511	.13116	.13679	.14209	.14710	.18821	21,60 *
* 2,80	.07321	.07535	.07734	.07922	.08099	.08267	.09626	.10661	.11527	.12285	.12968	.13596	.14179	.14728	.15248	.19511	21,99 *
* 2,85	.07575	.07797	.08005	.08199	.08383	.08558	.09969	.11042	.11939	.12725	.13433	.14083	.14689	.15257	.15796	.20213	22,38 *
* 2,90	.07833	.08064	.08280	.08482	.08673	.08854	.10317	.11430	.12359	.13173	.13906	.14580	.15209	.15796	.16354	.20927	22,78 *
* 2,95	.08095	.08335	.08559	.08769	.08967	.09155	.10671	.11824	.12786	.13629	.14388	.15085	.15734	.16343	.16921	.21654	23,17 *
* 3,00	.08362	.08611	.08843	.09061	.09266	.09461	.11032	.12224	.13220	.14092	.14878	.15599	.16270	.16900	.17498	.22394	23,56 *

***** CETESB *****																	
DIAMETRO DO CONDUITO D= 125. (MM) AREA DA SECAO DO CONDUITO S= .0120 M2																	

* VELO * PERDA DE CARGA UNITARIA EM M/M OBS: K EM MILIMETROS * VAZAO *																	
* CIDADE * (L/S) *																	
* (M/S) * K=.05 K=.06 K=.07 K=.08 K=.09 K=.10 K=.20 K=.30 K=.40 K=.50 K=.60 K=.70 K=.80 K=.90 K=1.0 K=2.0 *																	
* .30	.00086	.00087	.00088	.00089	.00089	.00090	.00097	.00103	.00109	.00114	.00119	.00124	.00128	.00132	.00136	.00169	3,68
* .35	.00114	.00115	.00116	.00117	.00119	.00120	.00130	.00139	.00147	.00154	.00160	.00167	.00173	.00178	.00184	.00229	4,30
* .40	.00145	.00147	.00149	.00150	.00152	.00153	.00167	.00179	.00189	.00199	.00208	.00216	.00224	.00232	.00239	.00298	4,91
* .45	.00180	.00182	.00184	.00187	.00189	.00191	.00209	.00224	.00238	.00250	.00262	.00272	.00282	.00292	.00301	.00376	5,52
* .50	.00218	.00221	.00224	.00227	.00229	.00232	.00255	.00274	.00292	.00307	.00321	.00335	.00347	.00359	.00370	.00464	6,14
* .55	.00260	.00264	.00267	.00271	.00274	.00277	.00306	.00330	.00351	.00370	.00387	.00404	.00419	.00433	.00447	.00560	6,75
* .60	.00305	.00310	.00314	.00318	.00322	.00326	.00361	.00390	.00416	.00438	.00459	.00479	.00497	.00514	.00531	.00666	7,36
* .65	.00354	.00359	.00365	.00370	.00374	.00379	.00421	.00456	.00486	.00513	.00538	.00560	.00582	.00602	.00622	.00781	7,98
* .70	.00406	.00412	.00419	.00425	.00430	.00436	.00485	.00526	.00561	.00593	.00622	.00649	.00674	.00697	.00720	.00905	8,59
* .75	.00461	.00469	.00476	.00483	.00490	.00497	.00554	.00601	.00642	.00679	.00712	.00743	.00772	.00799	.00825	.01038	9,20
* .80	.00520	.00529	.00537	.00545	.00553	.00561	.00628	.00682	.00729	.00771	.00809	.00844	.00877	.00908	.00938	.01180	9,82
* .85	.00582	.00592	.00602	.00611	.00621	.00629	.00705	.00767	.00821	.00868	.00911	.00951	.00989	.01024	.01057	.01332	10,43
* .90	.00648	.00659	.00670	.00681	.00691	.00702	.00788	.00858	.00918	.00972	.01020	.01065	.01107	.01147	.01184	.01492	11,04
* .95	.00716	.00730	.00742	.00754	.00766	.00777	.00875	.00953	.01021	.01081	.01135	.01185	.01232	.01276	.01318	.01662	11,66
* 1.00	.00788	.00803	.00818	.00831	.00845	.00857	.00966	.01054	.01129	.01196	.01256	.01312	.01364	.01413	.01459	.01840	12,27
* 1.05	.00864	.00881	.00897	.00912	.00927	.00941	.01062	.01160	.01243	.01316	.01383	.01445	.01502	.01556	.01608	.02028	12,89
* 1.10	.00943	.00961	.00979	.00996	.01013	.01028	.01163	.01270	.01362	.01443	.01516	.01584	.01647	.01707	.01763	.02225	13,50
* 1.15	.01025	.01045	.01065	.01084	.01102	.01120	.01268	.01386	.01486	.01575	.01656	.01730	.01799	.01864	.01926	.02431	14,11
* 1.20	.01110	.01133	.01155	.01175	.01195	.01215	.01377	.01506	.01616	.01713	.01801	.01882	.01958	.02029	.02096	.02647	14,73
* 1.25	.01199	.01224	.01248	.01271	.01292	.01314	.01491	.01632	.01752	.01857	.01953	.02041	.02123	.02200	.02273	.02871	15,34
* 1.30	.01291	.01318	.01344	.01369	.01393	.01416	.01610	.01763	.01893	.02007	.02111	.02206	.02295	.02378	.02458	.03105	15,95
* 1.35	.01386	.01416	.01444	.01472	.01498	.01523	.01733	.01899	.02039	.02163	.02275	.02378	.02473	.02564	.02649	.03347	16,57
* 1.40	.01484	.01517	.01548	.01578	.01606	.01633	.01861	.02039	.02191	.02324	.02445	.02555	.02659	.02756	.02848	.03599	17,18
* 1.45	.01586	.01622	.01655	.01687	.01718	.01747	.01993	.02185	.02348	.02491	.02621	.02740	.02851	.02955	.03054	.03860	17,79
* 1.50	.01691	.01730	.01766	.01801	.01834	.01865	.02129	.02336	.02510	.02664	.02803	.02931	.03049	.03161	.03267	.04130	18,41
* 1.55	.01800	.01841	.01880	.01917	.01953	.01987	.02270	.02492	.02678	.02843	.02991	.03128	.03255	.03374	.03487	.04409	19,02
* 1.60	.01911	.01956	.01998	.02038	.02076	.02113	.02416	.02652	.02852	.03027	.03186	.03331	.03467	.03594	.03714	.04697	19,64
* 1.65	.02026	.02074	.02119	.02162	.02203	.02242	.02566	.02818	.03031	.03218	.03386	.03541	.03685	.03821	.03949	.04995	20,25
* 1.70	.02144	.02196	.02244	.02290	.02333	.02375	.02721	.02989	.03215	.03414	.03593	.03758	.03911	.04055	.04191	.05301	20,86
* 1.75	.02266	.02321	.02372	.02421	.02468	.02512	.02880	.03166	.03405	.03616	.03806	.03980	.04143	.04295	.04440	.05617	21,48
* 1.80	.02391	.02449	.02504	.02556	.02606	.02653	.03044	.03346	.03600	.03824	.04025	.04210	.04382	.04543	.04696	.05942	22,09
* 1.85	.02519	.02581	.02639	.02695	.02747	.02797	.03212	.03532	.03801	.04037	.04250	.04445	.04627	.04798	.04959	.06276	22,70
* 1.90	.02650	.02716	.02778	.02837	.02893	.02946	.03384	.03723	.04007	.04256	.04481	.04687	.04879	.05059	.05230	.06619	23,32
* 1.95	.02785	.02855	.02920	.02983	.03042	.03098	.03562	.03919	.04219	.04482	.04718	.04936	.05138	.05328	.05508	.06971	23,93
* 2.00	.02922	.02997	.03066	.03132	.03194	.03254	.03743	.04120	.04436	.04712	.04962	.05191	.05404	.05603	.05792	.07332	24,54
* 2.05	.03064	.03142	.03215	.03285	.03351	.03414	.03929	.04326	.04658	.04949	.05211	.05452	.05676	.05886	.06084	.07703	25,16
* 2.10	.03208	.03291	.03368	.03442	.03511	.03578	.04120	.04537	.04886	.05192	.05467	.05720	.05955	.06175	.06384	.08083	25,77
* 2.15	.03356	.03443	.03525	.03602	.03675	.03745	.04315	.04753	.05119	.05440	.05729	.05994	.06240	.06471	.06690	.08471	26,38
* 2.20	.03506	.03598	.03685	.03766	.03843	.03916	.04515	.04974	.05358	.05694	.05997	.06275	.06533	.06775	.07004	.08869	27,00
* 2.25	.03661	.03757	.03848	.03933	.04014	.04091	.04719	.05200	.05602	.05954	.06271	.06562	.06832	.07085	.07325	.09276	27,61
* 2.30	.03818	.03920	.04015	.04104	.04189	.04270	.04928	.05431	.05852	.06220	.06551	.06855	.07137	.07402	.07653	.09692	28,23
* 2.35	.03979	.04085	.04185	.04279	.04368	.04453	.05141	.05667	.06107	.06491	.06837	.07155	.07449	.07726	.07988	.10117	28,84
* 2.40	.04143	.04254	.04359	.04457	.04551	.04639	.05359	.05908	.06367	.06769	.07130	.07461	.07769	.08057	.08330	.10552	29,45
* 2.45	.04310	.04427	.04536	.04639	.04737	.04829	.05581	.06155	.06633	.07052	.07428	.07774	.08094	.08395	.08680	.10995	30,07
* 2.50	.04480	.04603	.04717	.04825	.04927	.05023	.05808	.06406	.06905	.07341	.07733	.08093	.08427	.08740	.09036	.11448	30,68
* 2.55	.04654	.04782	.04902	.05014	.05120	.05221	.06039	.06662	.07161	.07635	.08044	.08418	.08766	.09092	.09400	.11910	31,29
* 2.60	.04831	.04965	.05090	.05207	.05318	.05423	.06273	.06923	.07464	.07936	.08361	.08750	.09111	.09451	.09771	.12381	31,91
* 2.65	.05011	.05151	.05281	.05403	.05519	.05628	.06516	.07189	.07751	.08242	.08684	.09088	.09464	.09816	.10150	.12861	32,52
* 2.70	.05195	.05340	.05476	.05603	.05723	.05838	.06760	.07461	.08044	.08554	.09013	.09433	.09823	.10189	.10535	.13350	33,13
* 2.75	.05382	.05533	.05674	.05807	.05932	.06051	.07010	.07737	.08343	.08872	.09348	.09784	.10189	.10569	.10928	.13848	33,75
* 2.80	.05572	.05729	.05876	.06014	.06144	.06267	.07264	.08018	.08647	.09196	.09690	.10142	.10561	.10955	.11328	.14355	34,36
* 2.85	.05765	.05929	.06082	.06225	.06360	.06488	.07522	.08305	.08956	.09526	.10037	.10506	.10941	.11349	.11735	.14872	34,97
* 2.90	.05961	.06132	.06290	.06439	.06579	.06713	.07785	.08596	.09271	.09861	.10391	.10876	.11327	.11749	.12149	.15397	35,59
* 2.95	.06161	.06338	.06503	.06657	.06803	.06941	.08052	.08892	.09592	.10202	.10751	.11253	.11719	.12157	.12570	.15932	36,20
* 3.00	.06364	.06548	.06719	.06879	.07030	.07173	.08324	.09194	.09917	.10549	.11116	.11636	.12118	.12571	.12999	.16476	36,82

DIAMETRO DO CONDUITO D= 150. (MM)

AREA DA SECAU DO CONDUITO S= .0177 M2

VELO CIDADE (M/8)	PERDA DE CARGA UNITARIA EM M/M															VAZAO (L/S)	
	K=.05	K=.06	K=.07	K=.08	K=.09	K=.10	K=.20	K=.30	K=.40	K=.50	K=.60	K=.70	K=.80	K=.90	K=1,0		K=2,0
0,30	.00069	.00069	.00070	.00071	.00071	.00072	.00077	.00082	.00088	.00090	.00094	.00097	.00101	.00104	.00107	.00132	5,30
0,35	.00091	.00092	.00093	.00094	.00095	.00095	.00103	.00110	.00116	.00122	.00127	.00131	.00136	.00140	.00144	.00178	6,19
0,40	.00116	.00117	.00119	.00120	.00121	.00122	.00133	.00142	.00150	.00157	.00164	.00171	.00177	.00182	.00188	.00232	7,07
0,45	.00144	.00146	.00147	.00149	.00150	.00152	.00165	.00178	.00188	.00198	.00207	.00215	.00222	.00230	.00236	.00294	7,95
0,50	.00175	.00177	.00179	.00181	.00183	.00185	.00203	.00218	.00231	.00243	.00254	.00264	.00273	.00282	.00291	.00362	8,84
0,55	.00208	.00211	.00213	.00216	.00219	.00221	.00243	.00262	.00278	.00292	.00306	.00318	.00330	.00341	.00351	.00437	9,72
0,60	.00244	.00248	.00251	.00254	.00257	.00260	.00287	.00309	.00329	.00347	.00363	.00377	.00391	.00405	.00417	.00520	10,60
0,65	.00283	.00287	.00291	.00295	.00299	.00302	.00335	.00361	.00385	.00405	.00424	.00442	.00458	.00474	.00489	.00609	11,49
0,70	.00325	.00330	.00334	.00339	.00343	.00348	.00386	.00417	.00444	.00469	.00491	.00511	.00530	.00549	.00566	.00706	12,37
0,75	.00369	.00375	.00380	.00386	.00391	.00396	.00441	.00477	.00509	.00537	.00562	.00586	.00608	.00629	.00648	.00810	13,25
0,80	.00416	.00423	.00429	.00436	.00442	.00448	.00499	.00541	.00577	.00609	.00638	.00665	.00691	.00714	.00737	.00921	14,14
0,85	.00466	.00473	.00481	.00488	.00495	.00502	.00561	.00609	.00650	.00686	.00719	.00750	.00779	.00805	.00831	.01039	15,02
0,90	.00518	.00527	.00536	.00544	.00552	.00560	.00627	.00681	.00727	.00768	.00805	.00840	.00872	.00902	.00931	.01164	15,90
0,95	.00573	.00583	.00593	.00603	.00612	.00620	.00696	.00756	.00808	.00854	.00896	.00934	.00970	.01004	.01036	.01296	16,79
1,00	.00631	.00642	.00653	.00664	.00674	.00684	.00769	.00836	.00894	.00945	.00992	.01034	.01074	.01111	.01147	.01436	17,67
1,05	.00691	.00704	.00717	.00728	.00740	.00751	.00845	.00920	.00984	.01041	.01092	.01139	.01183	.01224	.01264	.01582	18,56
1,10	.00754	.00769	.00782	.00796	.00808	.00821	.00925	.01008	.01078	.01141	.01197	.01249	.01297	.01343	.01386	.01736	19,44
1,15	.00820	.00836	.00851	.00866	.00880	.00894	.01008	.01099	.01177	.01245	.01307	.01364	.01417	.01467	.01514	.01897	20,32
1,20	.00888	.00906	.00923	.00939	.00955	.00969	.01095	.01195	.01280	.01355	.01422	.01484	.01542	.01596	.01647	.02065	21,21
1,25	.00959	.00979	.00997	.01015	.01032	.01048	.01186	.01295	.01387	.01468	.01542	.01609	.01672	.01731	.01787	.02240	22,09
1,30	.01033	.01054	.01075	.01094	.01113	.01130	.01280	.01399	.01499	.01587	.01666	.01739	.01807	.01871	.01931	.02422	22,97
1,35	.01109	.01132	.01155	.01176	.01196	.01215	.01378	.01506	.01614	.01710	.01796	.01875	.01948	.02017	.02082	.02612	23,86
1,40	.01188	.01213	.01237	.01260	.01282	.01304	.01480	.01618	.01735	.01837	.01930	.02015	.02094	.02168	.02238	.02808	24,74
1,45	.01269	.01297	.01323	.01348	.01372	.01395	.01585	.01734	.01859	.01969	.02069	.02160	.02245	.02325	.02400	.03012	25,62
1,50	.01354	.01383	.01412	.01439	.01464	.01489	.01694	.01853	.01988	.02106	.02213	.02310	.02401	.02487	.02567	.03222	26,51
1,55	.01440	.01473	.01503	.01532	.01560	.01586	.01806	.01977	.02121	.02247	.02361	.02466	.02563	.02654	.02741	.03440	27,39
1,60	.01530	.01564	.01597	.01628	.01658	.01686	.01922	.02104	.02258	.02393	.02515	.02626	.02730	.02827	.02919	.03665	28,27
1,65	.01622	.01659	.01694	.01728	.01759	.01790	.02041	.02236	.02400	.02544	.02673	.02792	.02902	.03006	.03104	.03897	29,16
1,70	.01717	.01756	.01794	.01830	.01864	.01896	.02164	.02372	.02546	.02699	.02836	.02963	.03080	.03190	.03294	.04136	30,04
1,75	.01814	.01856	.01897	.01935	.01971	.02005	.02291	.02511	.02696	.02858	.03004	.03138	.03263	.03379	.03489	.04382	30,93
1,80	.01914	.01959	.02002	.02042	.02081	.02118	.02421	.02655	.02851	.03023	.03177	.03319	.03451	.03574	.03691	.04636	31,81
1,85	.02018	.02065	.02110	.02153	.02194	.02233	.02555	.02800	.03019	.03191	.03355	.03505	.03644	.03774	.03898	.04896	32,69
1,90	.02122	.02173	.02221	.02267	.02310	.02352	.02692	.02954	.03173	.03365	.03538	.03696	.03843	.03980	.04110	.05164	33,58
1,95	.02229	.02284	.02335	.02383	.02429	.02473	.02833	.03104	.03340	.03543	.03725	.03892	.04046	.04191	.04329	.05439	34,46
2,00	.02340	.02397	.02452	.02503	.02551	.02598	.02977	.03269	.03512	.03725	.03917	.04093	.04255	.04408	.04552	.05721	35,34
2,05	.02453	.02514	.02571	.02625	.02676	.02725	.03125	.03432	.03688	.03913	.04114	.04299	.04470	.04630	.04782	.06010	36,23
2,10	.02568	.02633	.02693	.02750	.02804	.02856	.03277	.03600	.03869	.04104	.04316	.04510	.04689	.04858	.05017	.06306	37,11
2,15	.02687	.02759	.02818	.02878	.02935	.02990	.03432	.03771	.04054	.04301	.04523	.04726	.04914	.05091	.05258	.06609	37,99
2,20	.02808	.02879	.02946	.03009	.03069	.03126	.03591	.03946	.04243	.04502	.04734	.04947	.05145	.05330	.05505	.06920	38,88
2,25	.02931	.03006	.03077	.03143	.03206	.03266	.03754	.04126	.04436	.04707	.04950	.05173	.05380	.05574	.05757	.07237	39,76
2,30	.03057	.03136	.03210	.03280	.03346	.03409	.03920	.04309	.04634	.04917	.05172	.05405	.05621	.05823	.06014	.07562	40,64
2,35	.03186	.03269	.03347	.03420	.03489	.03555	.04089	.04496	.04836	.05132	.05398	.05641	.05867	.06078	.06278	.07894	41,53
2,40	.03317	.03404	.03486	.03562	.03635	.03704	.04263	.04688	.05042	.05351	.05629	.05882	.06118	.06339	.06547	.08232	42,41
2,45	.03451	.03542	.03627	.03708	.03783	.03856	.04440	.04883	.05253	.05575	.05864	.06129	.06374	.06604	.06822	.08578	43,30
2,50	.03588	.03683	.03772	.03856	.03935	.04010	.04620	.05082	.05467	.05803	.06105	.06380	.06636	.06876	.07102	.08932	44,18
2,55	.03727	.03826	.03920	.04007	.04090	.04168	.04800	.05286	.05697	.06036	.06350	.06637	.06903	.07153	.07388	.09292	45,06
2,60	.03868	.03973	.04070	.04161	.04247	.04329	.04991	.05493	.05910	.06274	.06600	.06899	.07176	.07435	.07680	.09659	45,95
2,65	.04013	.04122	.04223	.04318	.04408	.04493	.05183	.05704	.06138	.06516	.06855	.07166	.07453	.07723	.07977	.10034	46,83
2,70	.04160	.04273	.04379	.04478	.04572	.04661	.05377	.05919	.06370	.06763	.07115	.07437	.07736	.08016	.08280	.10415	47,71
2,75	.04309	.04427	.04538	.04641	.04738	.04831	.05576	.06139	.06606	.07014	.07380	.07714	.08024	.08314	.08589	.10804	48,60
2,80	.04462	.04585	.04699	.04806	.04908	.05004	.05778	.06362	.06847	.07270	.07649	.07996	.08317	.08619	.08903	.11200	49,48
2,85	.04616	.04744	.04863	.04975	.05080	.05180	.05983	.06589	.07092	.07531	.07924	.08283	.08616	.08928	.09223	.11603	50,36
2,90	.04774	.04907	.05030	.05146	.05256	.05359	.06192	.06820	.07342	.07796	.08203	.08575	.08920	.09243	.09548	.12013	51,25
2,95	.04934	.05072	.05200	.05321	.05434	.05541	.06405	.07055	.07595	.08065	.08487	.08872	.09229	.09564	.09879	.12430	52,13
3,00	.05096	.05240	.05373	.05498	.05615	.05727	.06621	.07295	.07853	.08340	.08776	.09174	.09544	.09890	.10216	.12855	53,01

***** CETESB *****

DIAMETRO DO CONDUITO D= 200, (MM) AREA DA SECAO DO CONDUITO S= ,0314 M2

VELU-	PERDA DE CARGA UNITARIA EM M/M																*VAZAU*
	OBS: K EM MILIMETROS																
CIDADE																	(L/S)
(M/S)	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	*
* ,30	,00048	,00049	,00049	,00049	,00050	,00050	,00054	,00057	,00060	,00062	,00065	,00067	,00069	,00071	,00073	,00089	9,42
* ,35	,00064	,00064	,00065	,00066	,00066	,00067	,00072	,00076	,00080	,00084	,00087	,00091	,00094	,00096	,00099	,00121	11,00
* ,40	,00082	,00082	,00083	,00084	,00085	,00086	,00093	,00099	,00104	,00109	,00113	,00118	,00121	,00125	,00129	,00156	12,57
* ,45	,00101	,00102	,00103	,00104	,00105	,00106	,00116	,00124	,00131	,00137	,00143	,00148	,00153	,00158	,00162	,00199	14,14
* ,50	,00123	,00124	,00126	,00127	,00128	,00130	,00141	,00151	,00160	,00166	,00175	,00182	,00188	,00194	,00200	,00240	15,71
* ,55	,00146	,00148	,00150	,00152	,00153	,00155	,00170	,00182	,00193	,00202	,00211	,00219	,00227	,00234	,00241	,00297	17,28
* ,60	,00172	,00174	,00176	,00178	,00180	,00182	,00200	,00215	,00228	,00240	,00250	,00256	,00269	,00278	,00286	,00353	18,85
* ,65	,00199	,00202	,00205	,00207	,00210	,00212	,00234	,00251	,00267	,00280	,00293	,00305	,00315	,00326	,00335	,00414	20,42
* ,70	,00228	,00232	,00235	,00238	,00241	,00244	,00269	,00290	,00308	,00324	,00339	,00352	,00365	,00377	,00388	,00479	21,99
* ,75	,00260	,00264	,00267	,00271	,00274	,00278	,00308	,00332	,00353	,00371	,00388	,00404	,00418	,00432	,00445	,00550	23,56
* ,80	,00293	,00297	,00302	,00306	,00310	,00314	,00348	,00376	,00400	,00422	,00441	,00459	,00475	,00491	,00506	,00625	25,13
* ,85	,00328	,00333	,00338	,00343	,00348	,00352	,00392	,00423	,00451	,00475	,00497	,00517	,00536	,00553	,00570	,00705	26,70
* ,90	,00365	,00371	,00377	,00382	,00388	,00393	,00437	,00473	,00504	,00531	,00556	,00579	,00600	,00620	,00638	,00790	28,27
* ,95	,00404	,00410	,00417	,00423	,00429	,00435	,00486	,00526	,00561	,00591	,00619	,00644	,00668	,00690	,00711	,00880	29,85
* 1,00	,00444	,00452	,00459	,00467	,00473	,00480	,00537	,00582	,00620	,00654	,00685	,00713	,00739	,00764	,00787	,00975	31,42
* 1,05	,00487	,00496	,00504	,00512	,00520	,00527	,00590	,00640	,00683	,00720	,00754	,00785	,00814	,00841	,00867	,01074	32,99
* 1,10	,00531	,00541	,00550	,00559	,00568	,00576	,00646	,00701	,00748	,00789	,00827	,00861	,00893	,00923	,00951	,01178	34,56
* 1,15	,00578	,00588	,00599	,00609	,00618	,00627	,00704	,00765	,00816	,00862	,00903	,00940	,00975	,01008	,01039	,01288	36,13
* 1,20	,00626	,00638	,00649	,00660	,00670	,00680	,00765	,00831	,00888	,00937	,00982	,01023	,01061	,01097	,01130	,01402	37,70
* 1,25	,00676	,00689	,00702	,00713	,00725	,00736	,00828	,00901	,00962	,01016	,01065	,01109	,01150	,01189	,01226	,01521	39,27
* 1,30	,00728	,00742	,00756	,00769	,00781	,00793	,00894	,00973	,01040	,01098	,01151	,01199	,01244	,01286	,01325	,01644	40,84
* 1,35	,00782	,00797	,00812	,00827	,00840	,00853	,00962	,01046	,01120	,01183	,01240	,01292	,01340	,01386	,01428	,01773	42,41
* 1,40	,00837	,00854	,00871	,00886	,00901	,00915	,01033	,01120	,01203	,01271	,01333	,01389	,01441	,01490	,01536	,01906	43,98
* 1,45	,00895	,00913	,00931	,00948	,00964	,00979	,01107	,01205	,01290	,01363	,01429	,01489	,01545	,01597	,01647	,02044	45,55
* 1,50	,00954	,00974	,00993	,01011	,01029	,01045	,01183	,01289	,01379	,01457	,01528	,01593	,01653	,01709	,01762	,02187	47,12
* 1,55	,01015	,01037	,01058	,01077	,01096	,01113	,01261	,01375	,01471	,01555	,01631	,01700	,01764	,01824	,01880	,02335	48,69
* 1,60	,01079	,01102	,01124	,01145	,01165	,01184	,01342	,01464	,01567	,01650	,01737	,01810	,01879	,01943	,02003	,02486	50,27
* 1,65	,01143	,01169	,01192	,01215	,01236	,01256	,01425	,01556	,01665	,01760	,01846	,01925	,01997	,02065	,02129	,02645	51,84
* 1,70	,01210	,01237	,01262	,01286	,01309	,01331	,01511	,01650	,01766	,01868	,01959	,02042	,02119	,02192	,02260	,02808	53,41
* 1,75	,01279	,01308	,01335	,01360	,01385	,01408	,01600	,01747	,01870	,01978	,02075	,02163	,02245	,02322	,02394	,02975	54,98
* 1,80	,01349	,01380	,01409	,01436	,01462	,01487	,01690	,01847	,01978	,02092	,02194	,02288	,02375	,02456	,02532	,03147	56,55
* 1,85	,01422	,01454	,01485	,01514	,01542	,01568	,01784	,01950	,02088	,02209	,02317	,02416	,02508	,02593	,02674	,03324	58,12
* 1,90	,01496	,01531	,01563	,01594	,01623	,01651	,01880	,02055	,02201	,02329	,02443	,02547	,02644	,02735	,02820	,03505	59,69
* 1,95	,01572	,01609	,01643	,01678	,01707	,01737	,01978	,02163	,02317	,02452	,02572	,02682	,02784	,02880	,02970	,03692	61,26
* 2,00	,01650	,01689	,01725	,01760	,01793	,01824	,02079	,02274	,02437	,02575	,02705	,02821	,02928	,03029	,03123	,03883	62,83
* 2,05	,01730	,01771	,01810	,01846	,01881	,01914	,02183	,02388	,02559	,02708	,02841	,02963	,03076	,03181	,03281	,04079	64,40
* 2,10	,01811	,01855	,01896	,01934	,01971	,02005	,02289	,02504	,02684	,02840	,02981	,03109	,03227	,03336	,03442	,04280	65,97
* 2,15	,01895	,01941	,01984	,02024	,02063	,02099	,02397	,02524	,02682	,02840	,02976	,03123	,03256	,03382	,03498	,04480	67,54
* 2,20	,01980	,02028	,02074	,02116	,02157	,02195	,02508	,02746	,02943	,03115	,03269	,03410	,03540	,03662	,03777	,04697	69,12
* 2,25	,02067	,02118	,02166	,02211	,02253	,02293	,02621	,02870	,03077	,03257	,03419	,03566	,03702	,03830	,03950	,04913	70,69
* 2,30	,02156	,02210	,02260	,02307	,02351	,02394	,02737	,02998	,03215	,03403	,03572	,03725	,03868	,04001	,04127	,05133	72,26
* 2,35	,02247	,02303	,02356	,02405	,02452	,02496	,02856	,03128	,03355	,03551	,03728	,03888	,04037	,04176	,04307	,05356	73,83
* 2,40	,02340	,02398	,02453	,02505	,02554	,02601	,02977	,03262	,03498	,03703	,03887	,04055	,04210	,04355	,04492	,05588	75,40
* 2,45	,02434	,02493	,02553	,02608	,02659	,02707	,03100	,03397	,03644	,03858	,04050	,04225	,04387	,04538	,04680	,05823	76,97
* 2,50	,02530	,02595	,02655	,02712	,02765	,02816	,03226	,03536	,03793	,04016	,04216	,04398	,04567	,04724	,04873	,06063	78,54
* 2,55	,02629	,02696	,02759	,02818	,02874	,02927	,03355	,03678	,03945	,04177	,04385	,04575	,04750	,04914	,05069	,06307	80,11
* 2,60	,02729	,02799	,02865	,02927	,02985	,03040	,03488	,03822	,04100	,04342	,04558	,04755	,04938	,05108	,05269	,06557	81,68
* 2,65	,02830	,02904	,02973	,03037	,03098	,03155	,03619	,03969	,04258	,04509	,04734	,04939	,05129	,05300	,05473	,06811	83,25
* 2,70	,02934	,03011	,03082	,03149	,03213	,03273	,03755	,04118	,04419	,04680	,04914	,05127	,05323	,05508	,05681	,07070	84,82
* 2,75	,03040	,03120	,03194	,03264	,03330	,03392	,03894	,04271	,04583	,04854	,05096	,05317	,05522	,05713	,05893	,07334	86,39
* 2,80	,03147	,03230	,03308	,03380	,03449	,03514	,04035	,04420	,04750	,05031	,05283	,05512	,05724	,05922	,06108	,07603	87,96
* 2,85	,03256	,03343	,03423	,03499	,03570	,03638	,04178	,04584	,04920	,05211	,05472	,05710	,05929	,06134	,06328	,07876	89,54
* 2,90	,03367	,03457	,03541	,03620	,03693	,03763	,04324	,04745	,05093	,05395	,05665	,05911	,06138	,06351	,06551	,08154	91,11
* 2,95	,03480	,03574	,03661	,03742	,03819	,03893	,04473	,04909	,05269	,05582	,05861	,06110	,06351	,06571	,06778	,08438	92,68
* 3,00	,03595	,03692	,03782	,03867	,03946	,04021	,04624	,05075	,05448	,05771	,06060	,06324	,06567	,06795	,07009	,08726	94,25

		DIAMETRO DO CONDUTO D= 250. (MM)																AREA DA SECAO DO CONDUTO S= .0491 M2		LEISH
* VELO- *		PERDA DE CARGA UNITARIA EM M/M																UBSI K EM MILIMETROS		* VAZAO *
* CIDADE *																				* (L/S) *
* (M/S) *		K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0			
* ,30		.00037	.00037	.00037	.00038	.00038	.00038	.00041	.00043	.00045	.00047	.00049	.00050	.00052	.00053	.00055	.00066	14,73		
* ,35		.00049	.00049	.00049	.00050	.00050	.00051	.00054	.00058	.00061	.00063	.00066	.00068	.00070	.00072	.00074	.00090	17,18		
* ,40		.00062	.00063	.00063	.00064	.00064	.00065	.00070	.00075	.00078	.00082	.00085	.00088	.00091	.00094	.00096	.00117	19,63		
* ,45		.00077	.00078	.00079	.00079	.00080	.00081	.00088	.00093	.00098	.00103	.00107	.00111	.00115	.00118	.00121	.00148	22,09		
* ,50		.00093	.00095	.00096	.00097	.00098	.00099	.00107	.00114	.00121	.00127	.00132	.00137	.00141	.00145	.00149	.00182	24,54		
* ,55		.00111	.00113	.00114	.00115	.00117	.00118	.00129	.00138	.00145	.00152	.00159	.00165	.00170	.00175	.00180	.00220	27,00		
* ,60		.00131	.00133	.00134	.00136	.00137	.00139	.00152	.00163	.00172	.00181	.00188	.00195	.00202	.00208	.00214	.00262	29,45		
* ,65		.00152	.00154	.00156	.00158	.00160	.00161	.00177	.00190	.00201	.00211	.00220	.00229	.00237	.00244	.00251	.00307	31,91		
* ,70		.00174	.00177	.00179	.00181	.00183	.00186	.00204	.00219	.00233	.00244	.00255	.00265	.00274	.00282	.00290	.00356	34,36		
* ,75		.00198	.00201	.00204	.00206	.00209	.00211	.00233	.00251	.00266	.00280	.00292	.00303	.00314	.00324	.00333	.00408	36,82		
* ,80		.00223	.00227	.00230	.00233	.00236	.00239	.00264	.00284	.00302	.00318	.00332	.00344	.00356	.00368	.00378	.00464	39,27		
* ,85		.00250	.00254	.00258	.00261	.00265	.00268	.00297	.00320	.00340	.00358	.00374	.00388	.00402	.00415	.00427	.00524	41,72		
* ,90		.00278	.00283	.00287	.00291	.00295	.00299	.00332	.00358	.00380	.00400	.00418	.00435	.00450	.00464	.00478	.00587	44,18		
* ,95		.00308	.00313	.00318	.00322	.00327	.00331	.00368	.00398	.00423	.00445	.00465	.00484	.00501	.00517	.00532	.00654	46,63		
* 1,00		.00339	.00345	.00350	.00355	.00360	.00365	.00407	.00440	.00468	.00493	.00515	.00535	.00554	.00572	.00589	.00724	49,09		
* 1,05		.00371	.00378	.00384	.00390	.00396	.00401	.00447	.00484	.00515	.00542	.00567	.00590	.00611	.00630	.00649	.00798	51,54		
* 1,10		.00405	.00413	.00419	.00426	.00432	.00438	.00490	.00530	.00564	.00595	.00622	.00647	.00670	.00691	.00712	.00875	54,00		
* 1,15		.00441	.00449	.00456	.00464	.00471	.00477	.00534	.00578	.00616	.00649	.00679	.00706	.00731	.00755	.00777	.00957	56,45		
* 1,20		.00478	.00486	.00495	.00503	.00510	.00518	.00580	.00629	.00670	.00706	.00739	.00768	.00796	.00822	.00846	.01041	58,90		
* 1,25		.00516	.00526	.00535	.00544	.00552	.00560	.00628	.00681	.00726	.00765	.00801	.00833	.00863	.00891	.00918	.01130	61,36		
* 1,30		.00556	.00566	.00576	.00586	.00595	.00604	.00678	.00736	.00784	.00827	.00865	.00900	.00933	.00963	.00992	.01221	63,81		
* 1,35		.00597	.00608	.00619	.00630	.00640	.00649	.00730	.00792	.00845	.00891	.00933	.00970	.01006	.01036	.01069	.01317	66,27		
* 1,40		.00639	.00652	.00664	.00675	.00686	.00696	.00783	.00851	.00908	.00958	.01002	.01043	.01081	.01116	.01150	.01416	68,72		
* 1,45		.00683	.00697	.00710	.00722	.00734	.00745	.00839	.00912	.00973	.01027	.01074	.01118	.01159	.01197	.01233	.01519	71,18		
* 1,50		.00728	.00743	.00757	.00771	.00783	.00796	.00897	.00975	.01040	.01098	.01149	.01195	.01240	.01280	.01319	.01625	73,63		
* 1,55		.00775	.00791	.00806	.00821	.00834	.00846	.00956	.01040	.01110	.01171	.01226	.01277	.01323	.01367	.01406	.01735	76,09		
* 1,60		.00823	.00841	.00857	.00872	.00887	.00901	.01017	.01107	.01182	.01245	.01306	.01366	.01409	.01450	.01499	.01848	78,54		
* 1,65		.00873	.00891	.00909	.00925	.00941	.00956	.01081	.01176	.01256	.01326	.01388	.01445	.01498	.01548	.01594	.01965	80,99		
* 1,70		.00924	.00944	.00963	.00980	.00997	.01013	.01146	.01246	.01333	.01407	.01473	.01534	.01590	.01642	.01692	.02086	83,45		
* 1,75		.00976	.00998	.01018	.01037	.01055	.01072	.01213	.01321	.01411	.01490	.01560	.01625	.01684	.01740	.01792	.02210	85,90		
* 1,80		.01030	.01053	.01074	.01094	.01114	.01132	.01282	.01397	.01492	.01576	.01650	.01718	.01781	.01840	.01896	.02338	88,36		
* 1,85		.01086	.01110	.01132	.01154	.01174	.01194	.01353	.01474	.01575	.01664	.01743	.01815	.01881	.01943	.02002	.02469	90,81		
* 1,90		.01142	.01168	.01192	.01215	.01236	.01257	.01425	.01554	.01661	.01754	.01837	.01913	.01984	.02049	.02111	.02604	93,27		
* 1,95		.01200	.01228	.01253	.01277	.01300	.01322	.01500	.01636	.01749	.01847	.01933	.02015	.02089	.02158	.02223	.02743	95,72		
* 2,00		.01260	.01289	.01316	.01341	.01365	.01388	.01576	.01720	.01839	.01942	.02034	.02119	.02197	.02270	.02338	.02885	98,18		
* 2,05		.01321	.01351	.01380	.01407	.01432	.01457	.01655	.01806	.01931	.02040	.02137	.02225	.02307	.02384	.02456	.03031	100,63		
* 2,10		.01383	.01415	.01445	.01474	.01501	.01527	.01735	.01894	.02025	.02139	.02242	.02335	.02421	.02501	.02577	.03180	103,08		
* 2,15		.01447	.01481	.01513	.01543	.01571	.01598	.01817	.01984	.02122	.02242	.02349	.02447	.02537	.02621	.02701	.03333	105,54		
* 2,20		.01512	.01548	.01581	.01613	.01643	.01671	.01902	.02076	.02221	.02347	.02459	.02561	.02656	.02744	.02827	.03489	107,99		
* 2,25		.01579	.01616	.01651	.01685	.01716	.01746	.01988	.02171	.02322	.02454	.02571	.02676	.02777	.02870	.02957	.03649	110,45		
* 2,30		.01647	.01685	.01723	.01758	.01791	.01822	.02076	.02267	.02426	.02563	.02680	.02796	.02902	.02998	.03089	.03813	112,90		
* 2,35		.01716	.01757	.01796	.01833	.01867	.01900	.02165	.02366	.02531	.02675	.02804	.02921	.03029	.03129	.03224	.03980	115,36		
* 2,40		.01787	.01830	.01871	.01909	.01945	.01980	.02257	.02466	.02639	.02789	.02923	.03046	.03156	.03264	.03363	.04151	117,81		
* 2,45		.01859	.01905	.01947	.01987	.02025	.02061	.02351	.02569	.02749	.02906	.03046	.03173	.03291	.03400	.03504	.04326	120,26		
* 2,50		.01933	.01980	.02025	.02067	.02106	.02144	.02446	.02674	.02862	.03025	.03171	.03303	.03426	.03540	.03648	.04504	122,72		
* 2,55		.02006	.02057	.02104	.02148	.02189	.02228	.02544	.02781	.02977	.03147	.03298	.03436	.03564	.03683	.03795	.04686	125,17		
* 2,60		.02084	.02136	.02185	.02230	.02274	.02314	.02643	.02890	.03094	.03270	.03426	.03572	.03704	.03828	.03944	.04871	127,63		
* 2,65		.02162	.02214	.02267	.02315	.02360	.02402	.02740	.03001	.03213	.03397	.03561	.03710	.03848	.03976	.04097	.05060	130,08		
* 2,70		.02241	.02295	.02351	.02400	.02447	.02491	.02847	.03114	.03334	.03525	.03696	.03851	.03994	.04127	.04253	.05252	132,54		
* 2,75		.02322	.02381	.02436	.02488	.02536	.02582	.02952	.03230	.03458	.03656	.03833	.03994	.04142	.04281	.04411	.05448	134,99		
* 2,80		.02404	.02465	.02523	.02576	.02627	.02675	.03059	.03347	.03584	.03790	.03973	.04140	.04294	.04437	.04572	.05648	137,45		
* 2,85		.02487	.02551	.02611	.02667	.02719	.02769	.03168	.03467	.03713	.03925	.04115	.04288	.04448	.04597	.04737	.05851	139,90		
* 2,90		.02572	.02639	.02701	.02759	.02813	.02865	.03279	.03588	.03843	.04064	.04260	.04440	.04605	.04759	.04904	.06058	142,35		
* 2,95		.02658	.02728	.02792	.02852	.02909	.02962	.03391	.03712	.03976	.04204	.04405	.04595	.04764	.04924	.05074	.06268	144,81		
* 3,00		.02746	.02818	.02885	.02947	.03006	.03062	.03506	.03838	.04111	.04347	.04558	.04750	.04927	.05092	.05247	.06482	147,26		

***** CETESB **																	
* DIAMETRO DO CONDUTO D= 300, (MM) AREA DA SECAO DO CONDUTO S= ,0707 M2 *																	

* VELO= *	PERDA DE CARGA UNITARIA EM M/M															* VAZAO *	
* CIDADE *	OBS: K EM MILIMETROS															(L/S) *	
* (M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	*
* ,30	.00029	.00030	.00030	.00030	.00030	.00031	.00033	.00034	.00036	.00037	.00039	.00040	.00041	.00042	.00043	.00052	21,21 *
* ,35	.00039	.00039	.00040	.00040	.00040	.00041	.00043	.00046	.00048	.00050	.00052	.00054	.00056	.00057	.00059	.00071	24,74 *
* ,40	.00050	.00050	.00051	.00051	.00052	.00052	.00056	.00059	.00062	.00065	.00068	.00070	.00072	.00074	.00076	.00092	28,27 *
* ,45	.00062	.00062	.00063	.00064	.00064	.00065	.00070	.00074	.00078	.00082	.00085	.00088	.00091	.00094	.00096	.00116	31,81 *
* ,50	.00075	.00076	.00077	.00077	.00078	.00079	.00086	.00091	.00096	.00100	.00105	.00108	.00112	.00115	.00118	.00143	35,34 *
* ,55	.00089	.00090	.00091	.00092	.00093	.00094	.00103	.00110	.00116	.00121	.00126	.00131	.00135	.00139	.00143	.00173	38,88 *
* ,60	.00105	.00106	.00107	.00109	.00110	.00111	.00121	.00130	.00137	.00143	.00149	.00155	.00160	.00165	.00169	.00206	42,41 *
* ,65	.00122	.00123	.00125	.00126	.00128	.00129	.00141	.00151	.00160	.00168	.00175	.00181	.00187	.00193	.00198	.00241	45,95 *
* ,70	.00140	.00142	.00143	.00145	.00147	.00148	.00163	.00175	.00185	.00194	.00202	.00210	.00217	.00223	.00230	.00280	49,48 *
* ,75	.00159	.00161	.00163	.00165	.00167	.00169	.00186	.00200	.00212	.00222	.00232	.00240	.00248	.00256	.00263	.00321	53,01 *
* ,80	.00179	.00182	.00184	.00187	.00189	.00191	.00211	.00227	.00240	.00252	.00263	.00273	.00282	.00291	.00299	.00365	56,55 *
* ,85	.00201	.00204	.00206	.00209	.00212	.00215	.00237	.00255	.00271	.00284	.00296	.00308	.00318	.00328	.00337	.00412	60,08 *
* ,90	.00223	.00227	.00230	.00233	.00236	.00239	.00265	.00285	.00303	.00318	.00332	.00345	.00356	.00367	.00378	.00461	63,62 *
* ,95	.00247	.00251	.00255	.00258	.00262	.00265	.00294	.00317	.00336	.00354	.00369	.00383	.00397	.00409	.00421	.00514	67,15 *
* 1,00	.00272	.00276	.00281	.00285	.00289	.00292	.00325	.00350	.00372	.00391	.00409	.00424	.00439	.00453	.00466	.00569	70,69 *
* 1,05	.00298	.00303	.00308	.00312	.00317	.00321	.00357	.00386	.00410	.00431	.00450	.00467	.00484	.00499	.00513	.00627	74,22 *
* 1,10	.00325	.00331	.00336	.00341	.00346	.00351	.00391	.00422	.00449	.00472	.00493	.00513	.00530	.00547	.00563	.00688	77,75 *
* 1,15	.00354	.00360	.00366	.00371	.00377	.00382	.00426	.00461	.00490	.00516	.00539	.00560	.00579	.00597	.00615	.00752	81,29 *
* 1,20	.00383	.00390	.00397	.00403	.00409	.00415	.00463	.00501	.00533	.00561	.00586	.00609	.00630	.00650	.00669	.00818	84,82 *
* 1,25	.00414	.00422	.00429	.00436	.00442	.00448	.00501	.00543	.00577	.00608	.00635	.00660	.00683	.00705	.00725	.00886	88,36 *
* 1,30	.00448	.00454	.00462	.00469	.00477	.00484	.00541	.00586	.00624	.00657	.00687	.00714	.00739	.00762	.00784	.00960	91,89 *
* 1,35	.00479	.00488	.00496	.00505	.00512	.00520	.00583	.00631	.00672	.00708	.00740	.00769	.00796	.00822	.00845	.01035	95,43 *
* 1,40	.00513	.00523	.00532	.00541	.00550	.00558	.00625	.00678	.00722	.00761	.00795	.00827	.00856	.00883	.00909	.01113	98,96 *
* 1,45	.00548	.00559	.00569	.00579	.00588	.00597	.00670	.00727	.00774	.00815	.00853	.00886	.00918	.00947	.00974	.01194	102,49 *
* 1,50	.00585	.00596	.00607	.00618	.00628	.00637	.00716	.00777	.00828	.00872	.00912	.00948	.00982	.01013	.01042	.01277	106,03 *
* 1,55	.00622	.00635	.00647	.00658	.00668	.00679	.00763	.00829	.00883	.00931	.00973	.01012	.01048	.01081	.01113	.01363	109,56 *
* 1,60	.00661	.00674	.00687	.00699	.00711	.00722	.00812	.00882	.00940	.00991	.01036	.01078	.01116	.01152	.01185	.01452	113,10 *
* 1,65	.00701	.00715	.00729	.00742	.00754	.00766	.00863	.00937	.00999	.01053	.01102	.01146	.01186	.01224	.01260	.01544	116,63 *
* 1,70	.00742	.00757	.00772	.00786	.00799	.00811	.00915	.00994	.01060	.01117	.01169	.01216	.01259	.01299	.01337	.01639	120,17 *
* 1,75	.00784	.00800	.00816	.00831	.00845	.00858	.00968	.01053	.01123	.01184	.01238	.01288	.01334	.01377	.01417	.01737	123,70 *
* 1,80	.00827	.00845	.00861	.00877	.00892	.00906	.01023	.01113	.01187	.01252	.01309	.01362	.01411	.01456	.01499	.01837	127,23 *
* 1,85	.00872	.00890	.00908	.00925	.00941	.00956	.01080	.01175	.01253	.01321	.01383	.01438	.01490	.01537	.01583	.01941	130,77 *
* 1,90	.00917	.00937	.00956	.00974	.00991	.01007	.01138	.01238	.01321	.01393	.01458	.01517	.01571	.01621	.01669	.02047	134,30 *
* 1,95	.00964	.00985	.01005	.01024	.01042	.01059	.01198	.01303	.01391	.01467	.01535	.01597	.01654	.01707	.01758	.02156	137,84 *
* 2,00	.01011	.01034	.01055	.01075	.01094	.01112	.01259	.01370	.01462	.01543	.01614	.01679	.01740	.01796	.01848	.02267	141,37 *
* 2,05	.01060	.01084	.01107	.01128	.01148	.01167	.01321	.01439	.01536	.01620	.01695	.01764	.01827	.01886	.01942	.02382	144,91 *
* 2,10	.01110	.01136	.01159	.01181	.01203	.01223	.01385	.01509	.01611	.01699	.01779	.01851	.01917	.01979	.02037	.02499	148,44 *
* 2,15	.01162	.01188	.01213	.01237	.01259	.01280	.01451	.01581	.01688	.01781	.01864	.01939	.02009	.02074	.02135	.02619	151,98 *
* 2,20	.01214	.01242	.01268	.01293	.01316	.01338	.01518	.01654	.01767	.01864	.01951	.02030	.02103	.02171	.02235	.02742	155,51 *
* 2,25	.01267	.01297	.01324	.01350	.01375	.01398	.01587	.01729	.01847	.01949	.02040	.02123	.02199	.02270	.02337	.02868	159,04 *
* 2,30	.01322	.01353	.01382	.01409	.01435	.01459	.01657	.01806	.01929	.02036	.02131	.02218	.02298	.02372	.02442	.02997	162,58 *
* 2,35	.01378	.01410	.01441	.01469	.01496	.01522	.01729	.01885	.02013	.02125	.02224	.02315	.02398	.02476	.02549	.03126	166,11 *
* 2,40	.01435	.01469	.01501	.01530	.01559	.01586	.01802	.01965	.02099	.02216	.02320	.02414	.02501	.02582	.02658	.03263	169,65 *
* 2,45	.01493	.01528	.01562	.01593	.01623	.01651	.01877	.02047	.02187	.02308	.02417	.02515	.02606	.02690	.02770	.03400	173,18 *
* 2,50	.01552	.01589	.01624	.01657	.01688	.01717	.01953	.02130	.02277	.02403	.02516	.02618	.02713	.02801	.02884	.03540	176,72 *
* 2,55	.01612	.01651	.01688	.01722	.01754	.01785	.02031	.02216	.02368	.02499	.02617	.02724	.02822	.02914	.03000	.03683	180,25 *
* 2,60	.01673	.01714	.01752	.01788	.01822	.01854	.02110	.02302	.02461	.02598	.02720	.02831	.02933	.03029	.03118	.03828	183,78 *
* 2,65	.01736	.01779	.01818	.01855	.01891	.01924	.02191	.02391	.02556	.02698	.02825	.02940	.03047	.03146	.03239	.03977	187,32 *
* 2,70	.01800	.01844	.01883	.01924	.01961	.01995	.02273	.02481	.02652	.02800	.02932	.03052	.03162	.03265	.03362	.04128	190,85 *
* 2,75	.01864	.01911	.01954	.01994	.02032	.02068	.02357	.02573	.02751	.02904	.03041	.03166	.03280	.03387	.03482	.04282	194,39 *
* 2,80	.01930	.01978	.02023	.02065	.02105	.02143	.02443	.02667	.02851	.03010	.03152	.03281	.03400	.03511	.03615	.04439	197,92 *
* 2,85	.01997	.02047	.02094	.02138	.02179	.02218	.02530	.02762	.02953	.03118	.03265	.03399	.03522	.03637	.03745	.04599	201,46 *
* 2,90	.02065	.02118	.02166	.02211	.02254	.02295	.02618	.02859	.03057	.03228	.03380	.03519	.03646	.03765	.03877	.04781	204,99 *
* 2,95	.02135	.02189	.02239	.02286	.02331	.02373	.02708	.02957	.03163	.03340	.03497	.03641	.03773	.03896	.04011	.04928	208,52 *
* 3,00	.02205	.02261	.02314	.02363	.02409	.02452	.02799	.03058	.03270	.03453	.03616	.03768	.03901	.04029	.04148	.05095	212,06 *

***** CETESB *****																	
DIAMETRO DO CONDUTO D= 350. (MM) AREA DA SECAO DO CONDUTO S= ,0962 M2																	
*VELD= *	PERDA DE CARGA UNITARIA EM M/M															*VAZAO *	
*CIDADE *	GSI.K EM MILIMETROS															(L/S)	
* (M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	*
* ,30	,00024	,00025	,00025	,00025	,00025	,00025	,00027	,00028	,00030	,00031	,00032	,00033	,00034	,00035	,00036	,00043	28,86
* ,35	,00032	,00033	,00033	,00033	,00033	,00034	,00036	,00038	,00040	,00041	,00043	,00044	,00046	,00047	,00048	,00058	33,67
* ,40	,00041	,00042	,00042	,00042	,00043	,00043	,00046	,00049	,00051	,00054	,00056	,00058	,00059	,00061	,00062	,00075	38,48
* ,45	,00051	,00052	,00052	,00053	,00053	,00054	,00058	,00061	,00065	,00067	,00070	,00072	,00075	,00077	,00079	,00095	43,30
* ,50	,00062	,00063	,00063	,00064	,00065	,00065	,00071	,00075	,00079	,00083	,00086	,00089	,00092	,00094	,00097	,00117	48,11
* ,55	,00074	,00075	,00076	,00077	,00077	,00078	,00085	,00090	,00095	,00100	,00104	,00107	,00111	,00114	,00117	,00141	52,92
* ,60	,00087	,00088	,00089	,00090	,00091	,00092	,00100	,00107	,00113	,00118	,00123	,00127	,00131	,00135	,00139	,00168	57,73
* ,65	,00101	,00102	,00104	,00105	,00106	,00107	,00117	,00125	,00132	,00138	,00144	,00149	,00154	,00158	,00163	,00197	62,54
* ,70	,00116	,00117	,00119	,00120	,00122	,00123	,00135	,00144	,00153	,00160	,00166	,00173	,00178	,00183	,00188	,00229	67,35
* ,75	,00132	,00134	,00135	,00137	,00139	,00140	,00154	,00165	,00175	,00183	,00191	,00198	,00204	,00210	,00216	,00262	72,16
* ,80	,00149	,00151	,00153	,00155	,00157	,00159	,00174	,00187	,00198	,00208	,00217	,00225	,00232	,00239	,00246	,00298	76,97
* ,85	,00167	,00169	,00171	,00174	,00176	,00178	,00196	,00211	,00223	,00234	,00244	,00253	,00262	,00269	,00277	,00336	81,78
* ,90	,00185	,00186	,00191	,00193	,00196	,00198	,00219	,00235	,00250	,00262	,00273	,00283	,00293	,00302	,00310	,00377	86,59
* ,95	,00205	,00206	,00211	,00214	,00217	,00220	,00243	,00262	,00278	,00291	,00304	,00315	,00326	,00336	,00345	,00420	91,40
* 1,00	,00226	,00229	,00233	,00236	,00239	,00242	,00269	,00289	,00307	,00322	,00336	,00349	,00361	,00372	,00382	,00465	96,21
* 1,05	,00248	,00252	,00255	,00259	,00263	,00266	,00295	,00318	,00338	,00355	,00370	,00384	,00397	,00410	,00421	,00512	101,02
* 1,10	,00270	,00275	,00279	,00283	,00287	,00291	,00323	,00349	,00370	,00389	,00406	,00421	,00436	,00449	,00462	,00562	105,83
* 1,15	,00294	,00299	,00304	,00308	,00313	,00317	,00352	,00380	,00404	,00425	,00443	,00460	,00476	,00491	,00504	,00614	110,64
* 1,20	,00318	,00324	,00329	,00334	,00339	,00344	,00383	,00414	,00439	,00462	,00482	,00501	,00518	,00534	,00549	,00668	115,45
* 1,25	,00344	,00350	,00356	,00361	,00367	,00372	,00415	,00448	,00476	,00501	,00523	,00543	,00562	,00579	,00595	,00725	120,26
* 1,30	,00370	,00377	,00383	,00390	,00395	,00401	,00448	,00484	,00515	,00541	,00565	,00587	,00607	,00626	,00644	,00784	125,07
* 1,35	,00398	,00405	,00412	,00419	,00425	,00431	,00482	,00521	,00554	,00583	,00609	,00633	,00654	,00675	,00694	,00845	129,89
* 1,40	,00426	,00434	,00442	,00449	,00456	,00462	,00517	,00560	,00596	,00627	,00655	,00680	,00703	,00725	,00746	,00909	134,70
* 1,45	,00456	,00464	,00472	,00480	,00488	,00495	,00554	,00600	,00638	,00672	,00702	,00729	,00754	,00778	,00800	,00975	139,51
* 1,50	,00486	,00495	,00504	,00513	,00521	,00528	,00592	,00641	,00683	,00718	,00750	,00780	,00807	,00832	,00855	,01043	144,32
* 1,55	,00517	,00527	,00537	,00546	,00555	,00563	,00631	,00684	,00728	,00767	,00801	,00832	,00861	,00888	,00913	,01114	149,13
* 1,60	,00549	,00560	,00570	,00580	,00590	,00598	,00672	,00728	,00775	,00816	,00853	,00886	,00917	,00946	,00973	,01186	153,94
* 1,65	,00582	,00594	,00605	,00616	,00626	,00635	,00714	,00774	,00824	,00868	,00907	,00942	,00975	,01005	,01034	,01262	158,75
* 1,70	,00616	,00629	,00641	,00652	,00663	,00673	,00757	,00821	,00874	,00921	,00962	,01000	,01035	,01067	,01097	,01339	163,56
* 1,75	,00651	,00665	,00677	,00689	,00701	,00712	,00801	,00869	,00926	,00975	,01019	,01059	,01096	,01130	,01163	,01419	168,37
* 1,80	,00687	,00702	,00715	,00728	,00740	,00752	,00847	,00919	,00979	,01031	,01078	,01120	,01159	,01196	,01230	,01501	173,18
* 1,85	,00724	,00739	,00754	,00767	,00780	,00793	,00893	,00970	,01034	,01089	,01138	,01183	,01224	,01263	,01299	,01585	177,99
* 1,90	,00762	,00776	,00794	,00808	,00822	,00835	,00941	,01022	,01090	,01148	,01200	,01247	,01291	,01331	,01370	,01672	182,80
* 1,95	,00801	,00818	,00834	,00850	,00864	,00878	,00991	,01076	,01147	,01209	,01263	,01313	,01359	,01402	,01442	,01761	187,61
* 2,00	,00841	,00859	,00876	,00892	,00908	,00922	,01041	,01131	,01206	,01271	,01329	,01381	,01429	,01475	,01517	,01852	192,42
* 2,05	,00881	,00901	,00919	,00936	,00952	,00968	,01093	,01188	,01267	,01335	,01395	,01451	,01501	,01549	,01593	,01945	197,23
* 2,10	,00923	,00943	,00962	,00981	,00998	,01014	,01146	,01246	,01329	,01400	,01464	,01522	,01575	,01625	,01672	,02041	202,04
* 2,15	,00965	,00987	,01007	,01026	,01044	,01061	,01200	,01305	,01392	,01467	,01534	,01595	,01651	,01703	,01752	,02140	206,86
* 2,20	,01009	,01032	,01053	,01073	,01092	,01110	,01256	,01366	,01457	,01536	,01606	,01669	,01728	,01783	,01834	,02240	211,67
* 2,25	,01053	,01077	,01100	,01121	,01141	,01159	,01313	,01428	,01523	,01606	,01679	,01746	,01807	,01864	,01918	,02343	216,48
* 2,30	,01099	,01124	,01147	,01170	,01190	,01210	,01371	,01492	,01591	,01677	,01754	,01824	,01888	,01948	,02004	,02448	221,29
* 2,35	,01145	,01171	,01196	,01218	,01241	,01262	,01430	,01557	,01661	,01751	,01831	,01904	,01971	,02033	,02092	,02555	226,10
* 2,40	,01192	,01220	,01246	,01276	,01293	,01315	,01491	,01623	,01731	,01825	,01909	,01985	,02055	,02120	,02182	,02665	230,91
* 2,45	,01240	,01270	,01297	,01322	,01346	,01369	,01553	,01690	,01804	,01902	,01989	,02068	,02141	,02209	,02273	,02777	235,72
* 2,50	,01290	,01320	,01348	,01375	,01400	,01424	,01616	,01759	,01878	,01980	,02071	,02153	,02229	,02300	,02367	,02891	240,53
* 2,55	,01340	,01372	,01401	,01429	,01455	,01480	,01680	,01830	,01953	,02059	,02154	,02240	,02319	,02393	,02462	,03008	245,34
* 2,60	,01391	,01424	,01455	,01484	,01511	,01537	,01746	,01901	,02030	,02140	,02239	,02328	,02410	,02487	,02559	,03127	250,15
* 2,65	,01443	,01477	,01510	,01540	,01569	,01596	,01813	,01975	,02108	,02223	,02325	,02418	,02504	,02583	,02658	,03248	254,96
* 2,70	,01496	,01532	,01565	,01597	,01627	,01655	,01881	,02049	,02188	,02307	,02413	,02510	,02599	,02681	,02759	,03372	259,77
* 2,75	,01549	,01587	,01622	,01655	,01686	,01715	,01950	,02125	,02269	,02393	,02503	,02603	,02693	,02781	,02862	,03497	264,58
* 2,80	,01604	,01644	,01680	,01714	,01746	,01777	,02021	,02202	,02351	,02480	,02595	,02698	,02794	,02883	,02967	,03626	269,39
* 2,85	,01660	,01701	,01739	,01774	,01808	,01840	,02093	,02281	,02436	,02569	,02688	,02795	,02894	,02987	,03073	,03756	274,20
* 2,90	,01717	,01759	,01799	,01836	,01870	,01903	,02166	,02361	,02521	,02659	,02782	,02894	,02996	,03092	,03182	,03869	279,01
* 2,95	,01774	,01818	,01859	,01898	,01934	,01968	,02242	,02442	,02608	,02751	,02879	,02994	,03100	,03199	,03292	,04024	283,82
* 3,00	,01833	,01879	,01921	,01961	,01998	,02034	,02316	,02525	,02697	,02845	,02977	,03096	,03206	,03308	,03404	,04161	288,64

***** CETESB ****																	
DIAMETRO DO CONDUTO D= 400. (MM) AREA DA SECAO DO CONDUTO S= ,1257 M2																	

* VELO- *	PERDA DE CARGA UNITARIA EM M/M															* VAZAO *	
* CIDADE *	OBS: K EM MILIMETROS															* (L/S) *	
* (M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	
* ,30	,00021	,00021	,00021	,00021	,00021	,00021	,00023	,00024	,00025	,00026	,00027	,00028	,00029	,00029	,00030	,00036	37,70
* ,35	,00027	,00026	,00028	,00028	,00028	,00029	,00030	,00032	,00034	,00035	,00036	,00037	,00039	,00040	,00041	,00049	43,98
* ,40	,00035	,00035	,00036	,00036	,00036	,00037	,00039	,00042	,00044	,00045	,00047	,00049	,00050	,00051	,00053	,00063	50,27
* ,45	,00044	,00044	,00044	,00045	,00045	,00046	,00046	,00049	,00052	,00055	,00057	,00059	,00061	,00063	,00065	,00080	56,55
* ,50	,00053	,00053	,00054	,00055	,00055	,00056	,00060	,00064	,00067	,00070	,00073	,00075	,00078	,00080	,00082	,00098	62,83
* ,55	,00063	,00064	,00064	,00065	,00066	,00066	,00072	,00077	,00081	,00084	,00088	,00091	,00093	,00096	,00099	,00119	69,12
* ,60	,00074	,00075	,00075	,00077	,00077	,00078	,00085	,00091	,00096	,00100	,00104	,00108	,00111	,00114	,00117	,00141	75,40
* ,65	,00086	,00087	,00088	,00089	,00090	,00091	,00099	,00106	,00112	,00117	,00122	,00126	,00130	,00134	,00137	,00166	81,68
* ,70	,00099	,00106	,00101	,00102	,00104	,00105	,00114	,00122	,00129	,00135	,00141	,00146	,00150	,00155	,00159	,00192	87,96
* ,75	,00112	,00114	,00115	,00117	,00118	,00119	,00131	,00140	,00148	,00155	,00161	,00167	,00172	,00177	,00182	,00220	94,25
* ,80	,00127	,00126	,00130	,00132	,00133	,00135	,00148	,00159	,00168	,00170	,00183	,00190	,00196	,00202	,00207	,00250	100,53
* ,85	,00142	,00144	,00146	,00148	,00150	,00151	,00166	,00179	,00189	,00198	,00206	,00214	,00221	,00227	,00233	,00282	106,81
* ,90	,00158	,00160	,00162	,00165	,00167	,00169	,00186	,00200	,00211	,00222	,00231	,00239	,00247	,00255	,00261	,00317	113,10
* ,95	,00175	,00177	,00180	,00182	,00185	,00187	,00206	,00222	,00235	,00247	,00257	,00266	,00275	,00283	,00291	,00353	119,38
* 1,00	,00192	,00195	,00196	,00201	,00204	,00206	,00228	,00245	,00260	,00273	,00284	,00295	,00305	,00314	,00322	,00390	125,66
* 1,05	,00211	,00214	,00217	,00221	,00224	,00226	,00251	,00270	,00286	,00300	,00313	,00325	,00335	,00346	,00355	,00430	131,95
* 1,10	,00230	,00234	,00238	,00241	,00244	,00247	,00274	,00296	,00313	,00329	,00343	,00356	,00368	,00379	,00389	,00472	138,23
* 1,15	,00250	,00254	,00258	,00262	,00266	,00270	,00299	,00323	,00342	,00359	,00373	,00389	,00402	,00414	,00425	,00516	144,51
* 1,20	,00271	,00276	,00280	,00285	,00289	,00292	,00325	,00351	,00372	,00391	,00408	,00423	,00437	,00450	,00463	,00561	150,80
* 1,25	,00293	,00298	,00303	,00308	,00312	,00316	,00352	,00380	,00403	,00424	,00442	,00459	,00474	,00488	,00502	,00609	157,08
* 1,30	,00316	,00321	,00326	,00332	,00336	,00341	,00380	,00410	,00436	,00458	,00478	,00496	,00512	,00528	,00543	,00659	163,36
* 1,35	,00339	,00345	,00351	,00356	,00362	,00367	,00409	,00442	,00469	,00493	,00515	,00534	,00552	,00569	,00585	,00710	169,65
* 1,40	,00363	,00370	,00376	,00382	,00388	,00393	,00439	,00475	,00504	,00530	,00553	,00574	,00594	,00612	,00629	,00764	175,93
* 1,45	,00388	,00395	,00402	,00409	,00415	,00421	,00470	,00509	,00541	,00568	,00593	,00616	,00637	,00656	,00674	,00819	182,21
* 1,50	,00414	,00422	,00429	,00436	,00443	,00449	,00503	,00544	,00578	,00606	,00634	,00659	,00681	,00702	,00721	,00876	188,50
* 1,55	,00440	,00449	,00457	,00465	,00472	,00479	,00536	,00580	,00617	,00649	,00677	,00703	,00727	,00749	,00770	,00935	194,78
* 1,60	,00468	,00477	,00486	,00494	,00502	,00509	,00570	,00617	,00657	,00691	,00721	,00749	,00774	,00798	,00820	,00997	201,06
* 1,65	,00496	,00506	,00515	,00524	,00532	,00540	,00606	,00656	,00698	,00734	,00766	,00796	,00823	,00848	,00872	,01060	207,35
* 1,70	,00525	,00536	,00546	,00555	,00564	,00572	,00642	,00696	,00740	,00779	,00813	,00845	,00873	,00900	,00925	,01125	213,63
* 1,75	,00555	,00566	,00577	,00587	,00596	,00605	,00680	,00737	,00784	,00825	,00861	,00895	,00925	,00954	,00980	,01192	219,91
* 1,80	,00586	,00598	,00609	,00620	,00630	,00639	,00719	,00779	,00829	,00872	,00911	,00946	,00979	,01009	,01037	,01261	226,20
* 1,85	,00617	,00630	,00642	,00653	,00664	,00674	,00758	,00822	,00875	,00921	,00962	,00999	,01033	,01065	,01095	,01331	232,48
* 1,90	,00649	,00663	,00676	,00688	,00699	,00710	,00799	,00867	,00923	,00971	,01014	,01054	,01090	,01123	,01155	,01404	238,76
* 1,95	,00682	,00697	,00710	,00723	,00735	,00747	,00841	,00912	,00971	,01022	,01068	,01109	,01147	,01183	,01216	,01479	245,04
* 2,00	,00716	,00732	,00746	,00759	,00772	,00785	,00884	,00959	,01021	,01075	,01123	,01167	,01207	,01244	,01279	,01556	251,33
* 2,05	,00751	,00767	,00782	,00797	,00810	,00823	,00928	,01007	,01073	,01129	,01180	,01225	,01268	,01307	,01344	,01634	257,61
* 2,10	,00786	,00804	,00820	,00835	,00849	,00863	,00973	,01056	,01125	,01185	,01237	,01286	,01330	,01371	,01410	,01715	263,89
* 2,15	,00823	,00841	,00858	,00874	,00889	,00903	,01019	,01107	,01179	,01241	,01297	,01347	,01394	,01437	,01477	,01797	270,18
* 2,20	,00860	,00879	,00897	,00913	,00929	,00944	,01066	,01158	,01234	,01299	,01357	,01410	,01459	,01504	,01547	,01882	276,46
* 2,25	,00898	,00918	,00936	,00954	,00971	,00987	,01115	,01211	,01290	,01358	,01419	,01475	,01526	,01573	,01618	,01968	282,74
* 2,30	,00936	,00957	,00977	,00996	,01013	,01030	,01164	,01265	,01347	,01419	,01483	,01541	,01594	,01644	,01690	,02056	289,03
* 2,35	,00976	,00998	,01019	,01038	,01056	,01074	,01214	,01319	,01406	,01481	,01548	,01608	,01664	,01715	,01764	,02146	295,31
* 2,40	,01016	,01039	,01061	,01081	,01101	,01119	,01266	,01378	,01466	,01544	,01614	,01677	,01735	,01789	,01840	,02239	301,59
* 2,45	,01057	,01081	,01104	,01125	,01146	,01165	,01318	,01433	,01527	,01609	,01681	,01747	,01808	,01864	,01917	,02333	307,88
* 2,50	,01099	,01125	,01148	,01171	,01192	,01212	,01372	,01491	,01590	,01675	,01750	,01819	,01882	,01941	,01996	,02429	314,16
* 2,55	,01142	,01168	,01193	,01216	,01238	,01259	,01426	,01551	,01654	,01742	,01821	,01892	,01958	,02019	,02076	,02527	320,44
* 2,60	,01185	,01213	,01239	,01263	,01286	,01308	,01482	,01612	,01719	,01811	,01892	,01967	,02035	,02098	,02158	,02627	326,73
* 2,65	,01230	,01259	,01286	,01311	,01335	,01358	,01539	,01674	,01785	,01881	,01966	,02043	,02114	,02180	,02241	,02728	333,01
* 2,70	,01275	,01305	,01333	,01360	,01384	,01408	,01597	,01737	,01852	,01952	,02040	,02120	,02194	,02262	,02327	,02832	339,29
* 2,75	,01321	,01352	,01381	,01409	,01435	,01459	,01656	,01801	,01921	,02024	,02116	,02199	,02278	,02347	,02413	,02938	345,58
* 2,80	,01367	,01400	,01431	,01459	,01488	,01512	,01716	,01867	,01991	,02098	,02193	,02279	,02359	,02432	,02502	,03045	351,86
* 2,85	,01415	,01449	,01481	,01510	,01539	,01565	,01777	,01934	,02062	,02173	,02272	,02361	,02443	,02520	,02592	,03155	358,14
* 2,90	,01463	,01499	,01532	,01563	,01592	,01619	,01839	,02001	,02135	,02250	,02352	,02444	,02530	,02609	,02683	,03267	364,43
* 2,95	,01512	,01549	,01583	,01616	,01646	,01674	,01902	,02070	,02209	,02328	,02433	,02529	,02617	,02699	,02776	,03380	370,71
* 3,00	,01562	,01600	,01636	,01669	,01701	,01730	,01966	,02141	,02284	,02407	,02516	,02615	,02706	,02791	,02871	,03495	376,99

DIAMETRO DO CONDUITO D= 450, (MM)																	AREA DA SECAO DO CONDUITO S= ,1590 M2																	CETESB
* VELO *	PERUA DE CARGA UNITARIA EM M/M																QBS: K	EM MILIMETROS																* VAZAO *
* CIDADE *																																		(L/S)
* (M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0																		
* ,30	,00018	,00018	,00018	,00018	,00018	,00019	,00020	,00021	,00022	,00022	,00023	,00024	,00025	,00025	,00026	,00031	47,71																	
* ,35	,00024	,00024	,00024	,00024	,00025	,00025	,00026	,00028	,00029	,00030	,00031	,00032	,00033	,00034	,00035	,00042	55,67																	
* ,40	,00030	,00031	,00031	,00031	,00031	,00032	,00034	,00036	,00038	,00039	,00041	,00042	,00043	,00044	,00045	,00054	63,62																	
* ,45	,00038	,00038	,00039	,00039	,00039	,00040	,00042	,00045	,00047	,00049	,00051	,00053	,00054	,00056	,00057	,00068	71,57																	
* ,50	,00046	,00046	,00047	,00047	,00048	,00048	,00052	,00055	,00058	,00060	,00063	,00065	,00067	,00069	,00070	,00084	79,52																	
* ,55	,00055	,00055	,00056	,00056	,00057	,00058	,00062	,00066	,00070	,00073	,00076	,00078	,00081	,00083	,00085	,00102	87,47																	
* ,60	,00064	,00065	,00066	,00066	,00067	,00068	,00074	,00078	,00083	,00086	,00090	,00093	,00096	,00098	,00101	,00121	95,43																	
* ,65	,00075	,00076	,00076	,00077	,00078	,00079	,00086	,00092	,00097	,00101	,00105	,00109	,00112	,00115	,00118	,00142	103,38																	
* ,70	,00086	,00087	,00088	,00089	,00090	,00091	,00099	,00106	,00112	,00117	,00121	,00126	,00130	,00133	,00137	,00165	111,33																	
* ,75	,00097	,00099	,00100	,00101	,00102	,00103	,00113	,00121	,00128	,00134	,00139	,00144	,00149	,00153	,00157	,00189	119,28																	
* ,80	,00110	,00111	,00113	,00114	,00116	,00117	,00128	,00137	,00145	,00152	,00158	,00164	,00169	,00174	,00178	,00215	127,23																	
* ,85	,00123	,00125	,00127	,00128	,00130	,00131	,00144	,00154	,00163	,00171	,00178	,00184	,00190	,00196	,00201	,00242	135,19																	
* ,90	,00137	,00139	,00141	,00143	,00145	,00146	,00161	,00173	,00183	,00191	,00199	,00206	,00213	,00219	,00225	,00272	143,14																	
* ,95	,00152	,00154	,00156	,00158	,00160	,00162	,00179	,00192	,00203	,00213	,00222	,00230	,00237	,00244	,00251	,00302	151,09																	
* 1,00	,00167	,00170	,00172	,00174	,00177	,00179	,00197	,00212	,00225	,00235	,00245	,00254	,00262	,00270	,00277	,00335	159,04																	
* 1,05	,00183	,00186	,00189	,00191	,00194	,00196	,00217	,00233	,00247	,00259	,00270	,00280	,00289	,00298	,00306	,00369	167,00																	
* 1,10	,00200	,00203	,00206	,00209	,00212	,00215	,00238	,00256	,00271	,00284	,00296	,00307	,00317	,00326	,00335	,00405	174,95																	
* 1,15	,00217	,00221	,00224	,00228	,00231	,00234	,00259	,00279	,00296	,00310	,00323	,00335	,00346	,00357	,00366	,00443	182,90																	
* 1,20	,00236	,00239	,00243	,00247	,00250	,00254	,00281	,00303	,00321	,00337	,00352	,00365	,00377	,00388	,00398	,00482	190,85																	
* 1,25	,00254	,00259	,00263	,00267	,00271	,00274	,00305	,00329	,00348	,00366	,00381	,00395	,00409	,00421	,00432	,00523	198,80																	
* 1,30	,00274	,00279	,00283	,00288	,00292	,00296	,00329	,00355	,00376	,00395	,00412	,00427	,00442	,00455	,00467	,00565	206,76																	
* 1,35	,00294	,00300	,00305	,00309	,00314	,00318	,00354	,00382	,00406	,00426	,00444	,00461	,00476	,00490	,00504	,00609	214,71																	
* 1,40	,00315	,00321	,00326	,00332	,00336	,00341	,00380	,00410	,00436	,00458	,00477	,00495	,00512	,00527	,00541	,00655	222,66																	
* 1,45	,00337	,00343	,00349	,00355	,00360	,00365	,00407	,00440	,00467	,00491	,00512	,00531	,00549	,00565	,00581	,00703	230,61																	
* 1,50	,00359	,00366	,00372	,00379	,00384	,00390	,00435	,00470	,00499	,00525	,00547	,00568	,00587	,00604	,00621	,00752	238,57																	
* 1,55	,00383	,00390	,00397	,00403	,00409	,00415	,00464	,00502	,00533	,00560	,00584	,00606	,00626	,00645	,00663	,00803	246,52																	
* 1,60	,00406	,00414	,00422	,00429	,00435	,00442	,00494	,00534	,00567	,00596	,00622	,00645	,00667	,00687	,00706	,00855	254,47																	
* 1,65	,00431	,00439	,00447	,00455	,00462	,00469	,00525	,00567	,00603	,00634	,00661	,00686	,00709	,00731	,00751	,00909	262,42																	
* 1,70	,00456	,00465	,00474	,00482	,00489	,00496	,00556	,00602	,00640	,00672	,00702	,00728	,00753	,00775	,00797	,00965	270,37																	
* 1,75	,00482	,00492	,00501	,00509	,00517	,00525	,00589	,00637	,00677	,00712	,00743	,00771	,00797	,00821	,00844	,01022	278,33																	
* 1,80	,00509	,00519	,00529	,00538	,00546	,00555	,00622	,00674	,00716	,00753	,00786	,00816	,00843	,00869	,00893	,01082	286,28																	
* 1,85	,00536	,00547	,00557	,00567	,00576	,00585	,00657	,00711	,00756	,00795	,00830	,00861	,00890	,00917	,00943	,01142	294,23																	
* 1,90	,00564	,00576	,00587	,00597	,00607	,00616	,00692	,00749	,00797	,00838	,00875	,00908	,00939	,00968	,00994	,01205	302,18																	
* 1,95	,00593	,00605	,00617	,00628	,00638	,00648	,00728	,00789	,00839	,00883	,00921	,00956	,00989	,01019	,01047	,01269	310,14																	
* 2,00	,00622	,00635	,00647	,00659	,00670	,00680	,00765	,00829	,00882	,00928	,00969	,01006	,01040	,01072	,01101	,01335	318,09																	
* 2,05	,00652	,00666	,00679	,00691	,00703	,00714	,00803	,00871	,00927	,00975	,01018	,01056	,01092	,01126	,01157	,01402	326,04																	
* 2,10	,00683	,00698	,00711	,00724	,00737	,00748	,00842	,00913	,00972	,01023	,01068	,01108	,01146	,01181	,01214	,01471	333,99																	
* 2,15	,00715	,00730	,00744	,00758	,00771	,00783	,00882	,00957	,01018	,01071	,01119	,01161	,01201	,01238	,01272	,01542	341,94																	
* 2,20	,00747	,00763	,00778	,00793	,00806	,00819	,00923	,01001	,01066	,01121	,01171	,01216	,01257	,01296	,01332	,01614	349,90																	
* 2,25	,00780	,00797	,00813	,00828	,00842	,00856	,00965	,01047	,01114	,01173	,01224	,01271	,01315	,01355	,01393	,01689	357,85																	
* 2,30	,00813	,00831	,00848	,00864	,00879	,00893	,01008	,01093	,01164	,01225	,01279	,01328	,01374	,01416	,01455	,01764	365,80																	
* 2,35	,00848	,00867	,00884	,00901	,00917	,00931	,01051	,01141	,01215	,01279	,01335	,01386	,01434	,01477	,01519	,01842	373,75																	
* 2,40	,00883	,00902	,00921	,00938	,00955	,00970	,01096	,01190	,01267	,01333	,01392	,01446	,01495	,01541	,01584	,01921	381,71																	
* 2,45	,00918	,00939	,00959	,00977	,00994	,01010	,01141	,01239	,01320	,01389	,01451	,01506	,01558	,01605	,01650	,02001	389,66																	
* 2,50	,00955	,00977	,00997	,01016	,01034	,01051	,01188	,01290	,01374	,01446	,01510	,01568	,01622	,01671	,01718	,02084	397,61																	
* 2,55	,00992	,01015	,01036	,01056	,01075	,01092	,01235	,01341	,01429	,01504	,01571	,01631	,01687	,01739	,01787	,02166	405,56																	
* 2,60	,01030	,01053	,01076	,01096	,01116	,01135	,01283	,01394	,01485	,01563	,01633	,01696	,01753	,01807	,01858	,02254	413,51																	
* 2,65	,01068	,01093	,01116	,01138	,01158	,01178	,01332	,01448	,01542	,01623	,01696	,01761	,01821	,01877	,01930	,02341	421,47																	
* 2,70	,01107	,01133	,01157	,01180	,01201	,01221	,01382	,01502	,01600	,01685	,01760	,01828	,01890	,01948	,02003	,02430	429,42																	
* 2,75	,01147	,01174	,01199	,01223	,01245	,01266	,01433	,01558	,01660	,01747	,01825	,01896	,01961	,02021	,02078	,02521	437,37																	
* 2,80	,01188	,01216	,01242	,01266	,01290	,01311	,01485	,01614	,01720	,01811	,01892	,01965	,02033	,02095	,02154	,02613	445,32																	
* 2,85	,01229	,01258	,01285	,01311	,01335	,01358	,01538	,01672	,01782	,01876	,01960	,02036	,02105	,02170	,02231	,02707	453,28																	
* 2,90	,01271	,01301	,01330	,01356	,01381	,01405	,01592	,01731	,01844	,01942	,02029	,02108	,02180	,02247	,02310	,02803	461,23																	
* 2,95	,01314	,01345	,01375	,01402	,01428	,01452	,01647	,01790	,01908	,02009	,02099	,02181	,02255	,02325	,02390	,02900	469,18																	
* 3,00	,01357	,01390	,01420	,01449	,01476	,01501	,01702	,01851	,01973	,02078	,02171	,02255	,02332	,02404	,02471	,02999	477,13																	

***** CETESB *****																	
DIAMETRO DO CONDUTO DE 500, (MM) AREA DA SECAO DO CONDUTO S* ,2376 M2																	

TABELA DE CARGA UNITARIA EM M3/M OBS: K EM MILIMETROS																	
VELD* * CIDADE* * (M/S) *	K=,05 K=,06 K=,07 K=,08 K=,09 K=,10 K=,11 K=,12 K=,13 K=,14 K=,15 K=,16 K=,17 K=,18 K=,19 K=,20															VAZAO (L/S) *	
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
* ,30	.00014	.00014	.00014	.00014	.00014	.00015	.00015	.00016	.00017	.00017	.00018	.00019	.00019	.00020	.00020	.00024	71,27
* ,35	.00019	.00019	.00019	.00019	.00019	.00019	.00021	.00022	.00023	.00024	.00024	.00025	.00026	.00026	.00027	.00032	83,15
* ,40	.00024	.00024	.00024	.00024	.00025	.00025	.00027	.00028	.00029	.00031	.00032	.00033	.00033	.00034	.00035	.00042	95,03
* ,45	.00030	.00030	.00030	.00030	.00031	.00031	.00033	.00035	.00037	.00038	.00040	.00041	.00042	.00043	.00044	.00053	106,91
* ,50	.00036	.00036	.00037	.00037	.00037	.00038	.00041	.00043	.00045	.00047	.00049	.00050	.00052	.00053	.00055	.00065	118,79
* ,55	.00043	.00043	.00044	.00044	.00045	.00045	.00049	.00052	.00054	.00057	.00059	.00061	.00063	.00064	.00066	.00079	130,67
* ,60	.00051	.00051	.00052	.00052	.00053	.00053	.00058	.00061	.00064	.00067	.00070	.00072	.00074	.00076	.00078	.00094	142,55
* ,65	.00059	.00059	.00060	.00061	.00061	.00062	.00067	.00072	.00075	.00079	.00082	.00084	.00087	.00089	.00092	.00110	154,43
* ,70	.00067	.00068	.00069	.00070	.00070	.00071	.00078	.00083	.00087	.00091	.00094	.00098	.00101	.00103	.00106	.00127	166,31
* ,75	.00077	.00078	.00079	.00079	.00080	.00081	.00089	.00095	.00100	.00104	.00108	.00112	.00115	.00119	.00122	.00146	178,19
* ,80	.00086	.00088	.00089	.00090	.00091	.00092	.00100	.00107	.00113	.00118	.00123	.00127	.00131	.00135	.00138	.00166	190,07
* ,85	.00097	.00098	.00099	.00101	.00102	.00103	.00113	.00121	.00127	.00133	.00138	.00143	.00148	.00152	.00156	.00187	201,95
* ,90	.00108	.00109	.00111	.00112	.00114	.00115	.00126	.00135	.00142	.00149	.00155	.00160	.00165	.00170	.00175	.00210	213,82
* ,95	.00119	.00121	.00123	.00124	.00126	.00127	.00140	.00150	.00158	.00166	.00172	.00179	.00184	.00189	.00194	.00233	225,70
* 1,00	.00131	.00133	.00135	.00137	.00139	.00140	.00155	.00166	.00175	.00183	.00191	.00198	.00204	.00210	.00215	.00258	237,58
* 1,05	.00144	.00146	.00148	.00150	.00152	.00154	.00170	.00182	.00193	.00202	.00210	.00218	.00225	.00231	.00237	.00285	249,46
* 1,10	.00157	.00160	.00162	.00164	.00166	.00168	.00186	.00200	.00211	.00221	.00230	.00239	.00246	.00253	.00260	.00312	261,34
* 1,15	.00171	.00174	.00176	.00179	.00181	.00183	.00203	.00218	.00231	.00242	.00252	.00261	.00269	.00277	.00284	.00341	273,22
* 1,20	.00185	.00188	.00191	.00194	.00197	.00199	.00220	.00237	.00251	.00263	.00274	.00284	.00293	.00301	.00309	.00372	285,10
* 1,25	.00200	.00204	.00207	.00210	.00213	.00215	.00239	.00257	.00272	.00285	.00297	.00307	.00317	.00327	.00335	.00403	296,98
* 1,30	.00216	.00219	.00223	.00226	.00229	.00232	.00258	.00277	.00294	.00308	.00321	.00332	.00343	.00353	.00362	.00436	308,86
* 1,35	.00232	.00236	.00239	.00243	.00246	.00250	.00277	.00299	.00316	.00332	.00346	.00358	.00370	.00381	.00391	.00470	320,74
* 1,40	.00248	.00252	.00257	.00261	.00264	.00268	.00298	.00321	.00340	.00357	.00371	.00385	.00397	.00409	.00420	.00505	332,62
* 1,45	.00265	.00270	.00274	.00279	.00283	.00287	.00319	.00344	.00364	.00382	.00396	.00413	.00426	.00439	.00450	.00542	344,50
* 1,50	.00283	.00288	.00293	.00297	.00302	.00306	.00341	.00367	.00390	.00409	.00426	.00442	.00456	.00469	.00482	.00580	356,38
* 1,55	.00301	.00307	.00312	.00317	.00322	.00326	.00363	.00392	.00416	.00436	.00455	.00471	.00487	.00501	.00514	.00619	368,25
* 1,60	.00320	.00326	.00331	.00337	.00342	.00347	.00387	.00417	.00443	.00465	.00484	.00502	.00518	.00533	.00548	.00660	380,13
* 1,65	.00339	.00346	.00352	.00357	.00363	.00368	.00411	.00443	.00470	.00494	.00515	.00534	.00551	.00567	.00582	.00701	392,01
* 1,70	.00359	.00366	.00372	.00378	.00384	.00390	.00435	.00470	.00499	.00524	.00546	.00566	.00585	.00602	.00618	.00744	403,89
* 1,75	.00379	.00387	.00394	.00400	.00406	.00412	.00461	.00498	.00528	.00555	.00578	.00606	.00619	.00638	.00655	.00789	415,77
* 1,80	.00400	.00408	.00416	.00423	.00429	.00436	.00487	.00526	.00559	.00587	.00612	.00634	.00655	.00674	.00692	.00834	427,65
* 1,85	.00422	.00430	.00438	.00446	.00453	.00459	.00514	.00556	.00590	.00619	.00646	.00670	.00692	.00712	.00731	.00881	439,53
* 1,90	.00444	.00453	.00461	.00469	.00477	.00484	.00542	.00586	.00622	.00653	.00681	.00706	.00729	.00751	.00771	.00929	451,41
* 1,95	.00467	.00476	.00485	.00493	.00501	.00509	.00570	.00616	.00655	.00688	.00717	.00744	.00768	.00791	.00812	.00979	463,29
* 2,00	.00490	.00500	.00509	.00518	.00526	.00534	.00599	.00648	.00688	.00723	.00754	.00782	.00808	.00832	.00854	.01030	475,17
* 2,05	.00513	.00524	.00534	.00543	.00552	.00561	.00629	.00680	.00723	.00759	.00792	.00821	.00849	.00874	.00897	.01082	487,05
* 2,10	.00538	.00549	.00559	.00569	.00579	.00588	.00660	.00714	.00758	.00797	.00831	.00862	.00890	.00917	.00941	.01135	498,93
* 2,15	.00563	.00574	.00585	.00596	.00606	.00615	.00691	.00746	.00794	.00835	.00871	.00903	.00933	.00961	.00987	.01190	510,81
* 2,20	.00588	.00600	.00612	.00623	.00633	.00643	.00723	.00782	.00832	.00874	.00911	.00945	.00977	.01006	.01033	.01245	522,68
* 2,25	.00614	.00627	.00639	.00651	.00662	.00672	.00756	.00818	.00869	.00914	.00953	.00989	.01021	.01052	.01080	.01303	534,56
* 2,30	.00640	.00654	.00667	.00679	.00691	.00701	.00789	.00854	.00908	.00954	.00996	.01033	.01067	.01099	.01128	.01361	546,44
* 2,35	.00667	.00682	.00695	.00708	.00720	.00731	.00823	.00892	.00948	.00996	.01039	.01078	.01114	.01147	.01178	.01421	558,32
* 2,40	.00695	.00710	.00724	.00738	.00750	.00762	.00858	.00930	.00988	.01039	.01084	.01124	.01161	.01195	.01228	.01482	570,20
* 2,45	.00723	.00739	.00754	.00768	.00781	.00793	.00894	.00968	.01028	.01082	.01129	.01171	.01210	.01246	.01280	.01544	582,08
* 2,50	.00752	.00768	.00784	.00798	.00812	.00825	.00930	.01008	.01072	.01129	.01175	.01219	.01260	.01297	.01333	.01608	593,96
* 2,55	.00781	.00798	.00815	.00830	.00844	.00858	.00967	.01048	.01115	.01172	.01222	.01268	.01310	.01350	.01386	.01672	605,84
* 2,60	.00811	.00829	.00846	.00862	.00877	.00891	.01005	.01089	.01158	.01218	.01271	.01318	.01362	.01403	.01441	.01739	617,72
* 2,65	.00841	.00860	.00878	.00894	.00910	.00925	.01043	.01131	.01203	.01265	.01320	.01369	.01415	.01457	.01497	.01806	629,60
* 2,70	.00872	.00892	.00910	.00927	.00944	.00959	.01082	.01174	.01249	.01313	.01370	.01421	.01469	.01512	.01554	.01875	641,48
* 2,75	.00903	.00924	.00943	.00961	.00978	.00994	.01122	.01217	.01295	.01362	.01421	.01474	.01523	.01569	.01611	.01945	653,36
* 2,80	.00935	.00957	.00977	.00995	.01013	.01030	.01163	.01262	.01342	.01411	.01473	.01528	.01579	.01626	.01670	.02016	665,23
* 2,85	.00968	.00990	.01011	.01030	.01049	.01066	.01204	.01307	.01390	.01462	.01525	.01583	.01636	.01685	.01730	.02088	677,11
* 2,90	.01001	.01024	.01046	.01066	.01085	.01103	.01246	.01352	.01439	.01513	.01579	.01639	.01693	.01744	.01792	.02162	688,99
* 2,95	.01034	.01058	.01081	.01102	.01122	.01141	.01289	.01399	.01489	.01566	.01634	.01695	.01752	.01805	.01854	.02237	700,87
* 3,00	.01068	.01094	.01117	.01139	.01159	.01179	.01333	.01446	.01539	.01619	.01689	.01753	.01812	.01860	.01917	.02314	712,75

***** CETESB ****																	
DIAMETRO DO CONDUITO D= 600. (MM) AREA DA SECAO DO CONDUITO S= ,2827 M2																	
VELO	PERDA DE CARGA UNITARIA EM M/M																
CIUADE	OBS: K EM MILIMETROS																
* (M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	* VAZAO *
																	(L/S)
* ,30	,00013	,00013	,00013	,00013	,00013	,00013	,00014	,00015	,00015	,00016	,00016	,00017	,00017	,00018	,00018	,00021	84,82
* ,35	,00017	,00017	,00017	,00017	,00017	,00017	,00019	,00020	,00020	,00021	,00022	,00023	,00023	,00024	,00024	,00029	98,96
* ,40	,00022	,00022	,00022	,00022	,00022	,00022	,00024	,00025	,00026	,00027	,00028	,00029	,00030	,00031	,00032	,00037	113,10
* ,45	,00027	,00027	,00027	,00027	,00028	,00028	,00030	,00032	,00033	,00034	,00036	,00037	,00038	,00039	,00040	,00047	127,23
* ,50	,00032	,00033	,00033	,00033	,00034	,00034	,00037	,00039	,00041	,00042	,00044	,00045	,00047	,00048	,00049	,00058	141,37
* ,55	,00039	,00039	,00040	,00040	,00040	,00041	,00044	,00047	,00049	,00051	,00053	,00055	,00056	,00058	,00059	,00070	155,51
* ,60	,00046	,00046	,00047	,00047	,00047	,00048	,00052	,00055	,00058	,00060	,00063	,00065	,00067	,00068	,00070	,00084	169,65
* ,65	,00053	,00053	,00054	,00055	,00055	,00056	,00060	,00064	,00068	,00071	,00073	,00076	,00078	,00080	,00082	,00098	183,78
* ,70	,00061	,00061	,00062	,00063	,00063	,00064	,00070	,00074	,00078	,00082	,00085	,00088	,00090	,00093	,00095	,00114	197,92
* ,75	,00069	,00070	,00071	,00072	,00072	,00073	,00080	,00085	,00089	,00093	,00097	,00100	,00103	,00106	,00109	,00130	212,06
* ,80	,00078	,00079	,00080	,00081	,00082	,00083	,00090	,00096	,00102	,00106	,00110	,00114	,00118	,00121	,00124	,00148	226,20
* ,85	,00087	,00088	,00090	,00091	,00092	,00093	,00101	,00108	,00114	,00120	,00124	,00129	,00133	,00136	,00140	,00167	240,33
* ,90	,00097	,00098	,00100	,00101	,00102	,00103	,00113	,00121	,00128	,00134	,00139	,00144	,00148	,00153	,00156	,00187	254,47
* ,95	,00108	,00109	,00111	,00112	,00113	,00115	,00126	,00135	,00142	,00149	,00155	,00160	,00165	,00170	,00174	,00209	268,61
* 1,00	,00118	,00120	,00122	,00123	,00125	,00126	,00139	,00149	,00157	,00165	,00171	,00177	,00183	,00188	,00193	,00231	282,74
* 1,05	,00130	,00132	,00134	,00135	,00137	,00139	,00153	,00164	,00173	,00181	,00189	,00195	,00201	,00207	,00212	,00255	296,88
* 1,10	,00142	,00144	,00146	,00148	,00150	,00152	,00167	,00180	,00190	,00199	,00207	,00214	,00221	,00227	,00233	,00279	311,02
* 1,15	,00154	,00157	,00159	,00161	,00163	,00165	,00182	,00196	,00207	,00217	,00226	,00234	,00241	,00248	,00253	,00305	325,16
* 1,20	,00167	,00170	,00172	,00175	,00177	,00179	,00198	,00213	,00225	,00236	,00246	,00254	,00262	,00270	,00277	,00332	339,29
* 1,25	,00180	,00183	,00186	,00189	,00191	,00194	,00215	,00231	,00244	,00256	,00266	,00276	,00285	,00293	,00300	,00360	353,43
* 1,30	,00194	,00198	,00201	,00204	,00206	,00209	,00232	,00249	,00264	,00276	,00288	,00298	,00308	,00316	,00325	,00390	367,57
* 1,35	,00209	,00212	,00216	,00219	,00222	,00225	,00249	,00266	,00284	,00298	,00310	,00321	,00332	,00341	,00350	,00420	381,70
* 1,40	,00224	,00228	,00231	,00235	,00238	,00241	,00268	,00286	,00305	,00320	,00333	,00345	,00356	,00367	,00376	,00452	395,84
* 1,45	,00239	,00243	,00247	,00251	,00255	,00258	,00287	,00309	,00327	,00343	,00357	,00370	,00382	,00393	,00404	,00485	409,98
* 1,50	,00255	,00260	,00264	,00268	,00272	,00276	,00307	,00330	,00350	,00367	,00382	,00396	,00409	,00421	,00432	,00519	424,12
* 1,55	,00271	,00276	,00281	,00285	,00290	,00294	,00327	,00352	,00373	,00392	,00408	,00423	,00436	,00449	,00461	,00554	438,25
* 1,60	,00286	,00294	,00299	,00303	,00308	,00312	,00348	,00375	,00396	,00417	,00434	,00450	,00465	,00478	,00491	,00590	452,39
* 1,65	,00306	,00311	,00317	,00322	,00327	,00331	,00369	,00398	,00422	,00443	,00462	,00479	,00494	,00508	,00522	,00627	466,53
* 1,70	,00324	,00330	,00336	,00341	,00346	,00351	,00392	,00423	,00448	,00470	,00490	,00508	,00524	,00539	,00554	,00666	480,67
* 1,75	,00342	,00348	,00355	,00361	,00366	,00371	,00415	,00447	,00475	,00496	,00519	,00538	,00555	,00572	,00587	,00705	494,80
* 1,80	,00361	,00368	,00375	,00381	,00387	,00392	,00438	,00473	,00502	,00527	,00549	,00569	,00587	,00604	,00621	,00746	508,94
* 1,85	,00380	,00388	,00395	,00401	,00408	,00414	,00462	,00499	,00530	,00556	,00580	,00601	,00620	,00638	,00655	,00788	523,08
* 1,90	,00400	,00408	,00416	,00423	,00429	,00436	,00487	,00526	,00559	,00586	,00611	,00633	,00654	,00673	,00691	,00831	537,21
* 1,95	,00421	,00429	,00437	,00444	,00451	,00458	,00513	,00554	,00586	,00617	,00643	,00667	,00689	,00709	,00728	,00875	551,35
* 2,00	,00442	,00450	,00459	,00467	,00474	,00481	,00539	,00583	,00618	,00649	,00677	,00701	,00724	,00746	,00765	,00921	565,49
* 2,05	,00463	,00472	,00481	,00490	,00497	,00505	,00566	,00612	,00649	,00682	,00711	,00737	,00761	,00783	,00804	,00967	579,63
* 2,10	,00485	,00495	,00504	,00513	,00521	,00529	,00593	,00642	,00681	,00715	,00746	,00773	,00798	,00822	,00844	,01015	593,76
* 2,15	,00507	,00518	,00528	,00537	,00546	,00554	,00621	,00672	,00714	,00749	,00781	,00810	,00836	,00861	,00884	,01064	607,90
* 2,20	,00530	,00541	,00552	,00561	,00571	,00579	,00650	,00703	,00747	,00784	,00816	,00848	,00876	,00901	,00925	,01114	622,04
* 2,25	,00553	,00565	,00576	,00586	,00596	,00605	,00680	,00735	,00781	,00820	,00855	,00887	,00916	,00943	,00968	,01165	636,17
* 2,30	,00577	,00590	,00601	,00612	,00622	,00632	,00710	,00768	,00816	,00857	,00893	,00926	,00957	,00985	,01011	,01217	650,31
* 2,35	,00602	,00615	,00627	,00638	,00649	,00659	,00740	,00801	,00851	,00894	,00932	,00967	,00999	,01028	,01056	,01270	664,45
* 2,40	,00627	,00640	,00653	,00665	,00676	,00686	,00772	,00835	,00886	,00933	,00972	,01008	,01041	,01072	,01101	,01325	678,59
* 2,45	,00652	,00666	,00679	,00692	,00703	,00715	,00804	,00870	,00925	,00972	,01013	,01051	,01085	,01117	,01147	,01380	692,72
* 2,50	,00678	,00693	,00706	,00719	,00732	,00743	,00837	,00906	,00963	,01011	,01055	,01094	,01130	,01163	,01194	,01437	706,86
* 2,55	,00704	,00720	,00734	,00748	,00761	,00773	,00870	,00942	,01001	,01052	,01097	,01138	,01175	,01210	,01242	,01495	721,00
* 2,60	,00731	,00747	,00762	,00776	,00790	,00803	,00904	,00979	,01040	,01093	,01140	,01183	,01221	,01257	,01291	,01554	735,14
* 2,65	,00758	,00775	,00791	,00806	,00820	,00833	,00938	,01017	,01081	,01136	,01184	,01228	,01269	,01306	,01341	,01615	749,27
* 2,70	,00786	,00804	,00820	,00836	,00850	,00864	,00974	,01055	,01121	,01179	,01229	,01275	,01317	,01356	,01392	,01676	763,41
* 2,75	,00814	,00833	,00850	,00866	,00881	,00896	,01010	,01094	,01163	,01222	,01275	,01322	,01366	,01406	,01444	,01739	777,55
* 2,80	,00843	,00862	,00880	,00897	,00913	,00928	,01046	,01134	,01205	,01267	,01321	,01371	,01418	,01458	,01497	,01802	791,68
* 2,85	,00872	,00892	,00911	,00928	,00945	,00960	,01083	,01174	,01249	,01312	,01369	,01420	,01467	,01510	,01551	,01867	805,82
* 2,90	,00902	,00923	,00942	,00960	,00977	,00994	,01121	,01216	,01293	,01359	,01417	,01470	,01518	,01563	,01605	,01933	819,96
* 2,95	,00933	,00954	,00974	,00993	,01011	,01027	,01160	,01258	,01337	,01406	,01466	,01521	,01571	,01617	,01661	,02000	834,10
* 3,00	,00963	,00986	,01007	,01026	,01044	,01062	,01199	,01300	,01383	,01453	,01516	,01573	,01624	,01673	,01718	,02069	848,23

***** CETESB *****																	
DIAMETRO DO CONDUITO D= 650, (MM) AREA DA SECAU DO CONDUITO S= 3318 M2																	

* VELO- * PERDA DE CARGA UNITARIA EM M/M OBSERVAÇÕES EM MILIMETROS * VAZÃO *																	
* CIDADE- * (M/S) * K=,05 K=,06 K=,07 K=,08 K=,09 K=,10 K=,20 K=,30 K=,40 K=,50 K=,60 K=,70 K=,80 K=,90 K=1,0 K=2,0 * (L/S) *																	

* .30	.00012	.00012	.00012	.00012	.00012	.00012	.00013	.00013	.00014	.00014	.00015	.00015	.00015	.00016	.00016	.00019	99,55 *
* .35	.00015	.00015	.00016	.00016	.00016	.00016	.00017	.00018	.00018	.00019	.00020	.00020	.00021	.00021	.00022	.00026	116,14 *
* .40	.00020	.00020	.00020	.00020	.00020	.00020	.00022	.00023	.00024	.00025	.00026	.00026	.00027	.00028	.00029	.00034	132,73 *
* .45	.00024	.00025	.00025	.00025	.00025	.00025	.00027	.00029	.00030	.00031	.00032	.00033	.00034	.00035	.00036	.00043	149,32 *
* .50	.00030	.00030	.00030	.00030	.00031	.00031	.00033	.00035	.00037	.00038	.00040	.00041	.00042	.00043	.00044	.00053	165,92 *
* .55	.00035	.00036	.00036	.00036	.00037	.00037	.00040	.00042	.00044	.00046	.00048	.00049	.00051	.00052	.00053	.00063	182,51 *
* .60	.00041	.00042	.00042	.00043	.00043	.00044	.00047	.00050	.00052	.00055	.00057	.00059	.00060	.00062	.00063	.00075	199,10 *
* .65	.00046	.00049	.00049	.00050	.00050	.00051	.00055	.00058	.00061	.00064	.00066	.00069	.00071	.00072	.00074	.00088	215,69 *
* .70	.00055	.00056	.00056	.00057	.00058	.00058	.00063	.00067	.00071	.00074	.00077	.00079	.00082	.00084	.00086	.00103	232,28 *
* .75	.00063	.00064	.00064	.00065	.00066	.00066	.00072	.00077	.00081	.00085	.00088	.00091	.00094	.00096	.00099	.00118	248,87 *
* .80	.00071	.00072	.00073	.00073	.00074	.00075	.00082	.00087	.00092	.00096	.00100	.00103	.00106	.00109	.00112	.00134	265,47 *
* .85	.00079	.00080	.00081	.00082	.00083	.00084	.00092	.00098	.00104	.00108	.00112	.00116	.00120	.00123	.00126	.00151	282,06 *
* .90	.00088	.00090	.00091	.00092	.00093	.00094	.00103	.00110	.00116	.00121	.00126	.00130	.00134	.00138	.00141	.00169	298,65 *
* .95	.00098	.00099	.00100	.00102	.00103	.00104	.00114	.00122	.00129	.00135	.00140	.00145	.00149	.00154	.00157	.00188	315,24 *
* 1,00	.00108	.00109	.00111	.00112	.00114	.00115	.00126	.00135	.00143	.00149	.00155	.00160	.00165	.00170	.00174	.00208	331,83 *
* 1,05	.00118	.00120	.00121	.00123	.00125	.00126	.00139	.00149	.00157	.00164	.00171	.00177	.00182	.00187	.00192	.00230	348,42 *
* 1,10	.00129	.00131	.00133	.00134	.00136	.00138	.00152	.00163	.00172	.00180	.00187	.00194	.00200	.00205	.00211	.00252	365,01 *
* 1,15	.00140	.00142	.00144	.00146	.00148	.00150	.00166	.00178	.00188	.00197	.00204	.00212	.00218	.00224	.00230	.00275	381,61 *
* 1,20	.00152	.00154	.00157	.00159	.00161	.00163	.00180	.00193	.00204	.00214	.00222	.00230	.00237	.00244	.00250	.00300	398,20 *
* 1,25	.00164	.00167	.00169	.00172	.00174	.00176	.00195	.00209	.00221	.00232	.00241	.00250	.00257	.00265	.00272	.00325	414,79 *
* 1,30	.00177	.00180	.00182	.00185	.00188	.00190	.00210	.00226	.00239	.00250	.00261	.00270	.00278	.00286	.00294	.00352	431,38 *
* 1,35	.00190	.00193	.00196	.00199	.00202	.00204	.00226	.00243	.00258	.00270	.00281	.00291	.00300	.00308	.00317	.00379	447,97 *
* 1,40	.00203	.00207	.00210	.00213	.00216	.00219	.00243	.00261	.00277	.00290	.00302	.00313	.00322	.00332	.00340	.00408	464,56 *
* 1,45	.00217	.00221	.00225	.00228	.00231	.00235	.00260	.00280	.00297	.00311	.00324	.00335	.00346	.00356	.00365	.00437	481,16 *
* 1,50	.00232	.00236	.00240	.00244	.00247	.00250	.00278	.00299	.00317	.00332	.00346	.00358	.00370	.00380	.00390	.00468	497,75 *
* 1,55	.00247	.00251	.00255	.00259	.00263	.00267	.00297	.00319	.00338	.00355	.00369	.00383	.00395	.00406	.00417	.00500	514,34 *
* 1,60	.00262	.00267	.00271	.00276	.00280	.00284	.00316	.00340	.00360	.00378	.00393	.00407	.00420	.00432	.00444	.00532	530,93 *
* 1,65	.00278	.00283	.00288	.00293	.00297	.00301	.00335	.00361	.00383	.00401	.00418	.00433	.00447	.00460	.00472	.00566	547,52 *
* 1,70	.00294	.00300	.00305	.00310	.00315	.00319	.00355	.00383	.00406	.00426	.00444	.00460	.00474	.00488	.00501	.00601	564,11 *
* 1,75	.00311	.00317	.00322	.00328	.00333	.00337	.00376	.00406	.00430	.00451	.00470	.00487	.00502	.00517	.00530	.00636	580,71 *
* 1,80	.00328	.00334	.00340	.00346	.00351	.00356	.00398	.00429	.00455	.00477	.00497	.00515	.00531	.00547	.00561	.00673	597,30 *
* 1,85	.00346	.00353	.00359	.00365	.00370	.00376	.00420	.00453	.00480	.00504	.00525	.00544	.00561	.00577	.00593	.00711	613,89 *
* 1,90	.00364	.00371	.00378	.00384	.00390	.00396	.00442	.00477	.00506	.00531	.00553	.00573	.00592	.00609	.00625	.00750	630,48 *
* 1,95	.00382	.00390	.00397	.00404	.00410	.00416	.00465	.00502	.00533	.00559	.00583	.00604	.00623	.00641	.00658	.00790	647,07 *
* 2,00	.00401	.00409	.00417	.00424	.00431	.00437	.00489	.00528	.00560	.00588	.00613	.00635	.00655	.00674	.00692	.00831	663,66 *
* 2,05	.00421	.00429	.00437	.00445	.00452	.00459	.00513	.00555	.00588	.00618	.00643	.00667	.00688	.00708	.00727	.00873	680,26 *
* 2,10	.00441	.00450	.00458	.00466	.00474	.00481	.00538	.00582	.00617	.00648	.00675	.00700	.00722	.00743	.00763	.00916	696,85 *
* 2,15	.00461	.00471	.00480	.00488	.00496	.00503	.00564	.00609	.00647	.00679	.00707	.00733	.00757	.00779	.00799	.00960	713,44 *
* 2,20	.00482	.00492	.00501	.00510	.00518	.00526	.00590	.00638	.00677	.00711	.00740	.00767	.00792	.00815	.00837	.01005	730,03 *
* 2,25	.00503	.00514	.00524	.00533	.00542	.00550	.00617	.00667	.00708	.00743	.00774	.00803	.00828	.00853	.00875	.01051	746,62 *
* 2,30	.00525	.00536	.00546	.00556	.00565	.00574	.00644	.00696	.00739	.00776	.00809	.00838	.00866	.00891	.00914	.01098	763,21 *
* 2,35	.00547	.00559	.00570	.00580	.00589	.00599	.00672	.00727	.00771	.00810	.00844	.00875	.00903	.00930	.00954	.01146	779,81 *
* 2,40	.00570	.00582	.00593	.00604	.00614	.00624	.00700	.00756	.00804	.00845	.00880	.00913	.00942	.00970	.00995	.01195	796,40 *
* 2,45	.00593	.00605	.00617	.00629	.00639	.00649	.00729	.00789	.00838	.00880	.00917	.00951	.00982	.01010	.01037	.01246	812,99 *
* 2,50	.00616	.00630	.00642	.00654	.00665	.00675	.00759	.00821	.00872	.00916	.00955	.00990	.01022	.01052	.01080	.01297	829,58 *
* 2,55	.00640	.00654	.00667	.00679	.00691	.00702	.00789	.00854	.00907	.00953	.00993	.01030	.01063	.01094	.01123	.01349	846,17 *
* 2,60	.00665	.00679	.00693	.00706	.00718	.00729	.00820	.00888	.00943	.00990	.01032	.01070	.01105	.01137	.01168	.01403	862,76 *
* 2,65	.00689	.00705	.00719	.00732	.00745	.00757	.00852	.00922	.00979	.01028	.01072	.01112	.01148	.01181	.01213	.01457	879,36 *
* 2,70	.00715	.00731	.00745	.00759	.00772	.00785	.00884	.00957	.01016	.01067	.01113	.01154	.01191	.01226	.01259	.01512	895,95 *
* 2,75	.00740	.00757	.00773	.00787	.00801	.00814	.00916	.00992	.01054	.01107	.01154	.01197	.01236	.01272	.01306	.01569	912,54 *
* 2,80	.00767	.00784	.00800	.00815	.00829	.00843	.00949	.01028	.01092	.01148	.01196	.01240	.01281	.01318	.01353	.01626	929,13 *
* 2,85	.00793	.00811	.00828	.00844	.00858	.00872	.00983	.01065	.01131	.01189	.01239	.01285	.01327	.01366	.01402	.01685	945,72 *
* 2,90	.00820	.00839	.00857	.00873	.00888	.00903	.01017	.01102	.01171	.01230	.01283	.01330	.01374	.01414	.01452	.01744	962,31 *
* 2,95	.00848	.00867	.00886	.00902	.00918	.00933	.01052	.01140	.01212	.01273	.01327	.01376	.01421	.01463	.01502	.01805	978,91 *
* 3,00	.00876	.00896	.00915	.00932	.00949	.00965	.01088	.01179	.01253	.01316	.01372	.01423	.01470	.01513	.01553	.01867	995,50 *

***** CETESB ****																	
DIAMETRO DO CONDUTO D= 700. (MM) AREA DA SECAO DO CONDUTO S= 3848 M2																	
VELO- *	PERDA DE CARGA UNITARIA EM M/M															VAZAO *	
CIDADE	OBS: K EM MILIMETROS															(L/S)	
(M/S)	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	
* ,30	.00011	.00011	.00011	.00011	.00011	.00011	.00012	.00012	.00013	.00013	.00013	.00014	.00014	.00014	.00015	.00017	115,45
* ,35	.00014	.00014	.00014	.00014	.00014	.00014	.00015	.00016	.00017	.00017	.00018	.00019	.00019	.00020	.00020	.00024	134,70
* ,40	.00018	.00018	.00018	.00018	.00018	.00018	.00019	.00020	.00021	.00022	.00023	.00023	.00024	.00025	.00025	.00026	153,94
* ,45	.00022	.00022	.00023	.00023	.00023	.00023	.00025	.00026	.00027	.00028	.00029	.00030	.00031	.00032	.00033	.00039	173,18
* ,50	.00027	.00027	.00028	.00028	.00028	.00028	.00030	.00032	.00034	.00035	.00036	.00037	.00038	.00039	.00040	.00048	192,42
* ,55	.00032	.00033	.00033	.00033	.00033	.00034	.00036	.00039	.00040	.00042	.00044	.00045	.00046	.00047	.00049	.00058	211,67
* ,60	.00038	.00038	.00039	.00039	.00039	.00040	.00043	.00046	.00048	.00050	.00052	.00053	.00055	.00056	.00058	.00069	230,91
* ,65	.00044	.00044	.00045	.00045	.00046	.00046	.00050	.00053	.00056	.00058	.00061	.00062	.00064	.00066	.00068	.00080	250,15
* ,70	.00050	.00051	.00052	.00052	.00053	.00053	.00058	.00062	.00065	.00067	.00070	.00072	.00074	.00076	.00078	.00093	269,39
* ,75	.00057	.00058	.00059	.00059	.00060	.00061	.00066	.00070	.00074	.00077	.00080	.00083	.00085	.00088	.00090	.0107	288,63
* ,80	.00065	.00066	.00066	.00067	.00068	.00069	.00075	.00080	.00084	.00088	.00091	.00094	.00097	.00100	.00102	.00122	307,88
* ,85	.00073	.00074	.00074	.00075	.00076	.00077	.00084	.00090	.00095	.00099	.00103	.00106	.00109	.00112	.00115	.00137	327,12
* ,90	.00081	.00082	.00083	.00084	.00085	.00086	.00094	.00100	.00106	.00111	.00115	.00119	.00122	.00126	.00129	.00154	346,36
* ,95	.00089	.00091	.00092	.00093	.00094	.00095	.00104	.00112	.00118	.00123	.00128	.00132	.00136	.00140	.00143	.00171	365,60
* 1,00	.00099	.00100	.00101	.00100	.00104	.00105	.00115	.00123	.00130	.00136	.00141	.00146	.00151	.00155	.00159	.00190	384,85
* 1,05	.00108	.00110	.00111	.00113	.00114	.00115	.00127	.00136	.00143	.00150	.00156	.00161	.00166	.00171	.00175	.00209	404,09
* 1,10	.00118	.00120	.00121	.00123	.00125	.00126	.00139	.00149	.00157	.00164	.00171	.00177	.00182	.00187	.00192	.00229	423,33
* 1,15	.00128	.00130	.00132	.00134	.00136	.00137	.00151	.00162	.00171	.00179	.00186	.00193	.00199	.00204	.00210	.00251	442,57
* 1,20	.00139	.00141	.00143	.00145	.00147	.00149	.00164	.00176	.00186	.00195	.00203	.00210	.00216	.00222	.00228	.00273	461,82
* 1,25	.00150	.00153	.00155	.00157	.00159	.00161	.00178	.00191	.00202	.00211	.00220	.00228	.00235	.00241	.00247	.00296	481,06
* 1,30	.00162	.00164	.00167	.00169	.00172	.00174	.00192	.00206	.00218	.00229	.00238	.00246	.00254	.00261	.00268	.00320	500,30
* 1,35	.00174	.00177	.00179	.00182	.00185	.00187	.00207	.00222	.00235	.00246	.00256	.00265	.00273	.00281	.00288	.00345	519,54
* 1,40	.00186	.00189	.00192	.00195	.00198	.00201	.00222	.00239	.00253	.00265	.00275	.00285	.00294	.00302	.00310	.00371	538,78
* 1,45	.00199	.00202	.00206	.00209	.00212	.00215	.00238	.00256	.00271	.00284	.00295	.00306	.00315	.00324	.00332	.00398	558,03
* 1,50	.00212	.00215	.00220	.00223	.00226	.00229	.00254	.00273	.00289	.00303	.00316	.00327	.00337	.00347	.00356	.00426	577,27
* 1,55	.00226	.00230	.00234	.00237	.00241	.00244	.00271	.00292	.00309	.00324	.00337	.00349	.00360	.00370	.00380	.00454	596,51
* 1,60	.00240	.00244	.00248	.00252	.00256	.00260	.00288	.00311	.00329	.00345	.00359	.00372	.00383	.00394	.00404	.00484	615,75
* 1,65	.00255	.00259	.00264	.00268	.00272	.00275	.00306	.00330	.00350	.00366	.00381	.00395	.00407	.00419	.00430	.00515	635,00
* 1,70	.00269	.00274	.00279	.00284	.00288	.00292	.00325	.00350	.00371	.00389	.00405	.00419	.00432	.00446	.00456	.00546	654,24
* 1,75	.00285	.00290	.00295	.00300	.00304	.00309	.00344	.00371	.00393	.00412	.00429	.00444	.00458	.00471	.00483	.00579	673,48
* 1,80	.00301	.00306	.00312	.00317	.00321	.00326	.00363	.00392	.00415	.00435	.00453	.00470	.00484	.00498	.00511	.00612	692,72
* 1,85	.00317	.00323	.00328	.00334	.00339	.00344	.00384	.00414	.00438	.00460	.00479	.00496	.00512	.00526	.00540	.00647	711,97
* 1,90	.00333	.00340	.00346	.00352	.00357	.00362	.00404	.00436	.00462	.00485	.00505	.00523	.00539	.00555	.00569	.00682	731,21
* 1,95	.00350	.00357	.00364	.00370	.00375	.00381	.00425	.00459	.00487	.00510	.00531	.00550	.00568	.00584	.00600	.00718	750,45
* 2,00	.00368	.00375	.00382	.00388	.00394	.00400	.00447	.00482	.00512	.00537	.00559	.00579	.00597	.00615	.00631	.00755	769,69
* 2,05	.00385	.00393	.00400	.00407	.00414	.00420	.00469	.00507	.00537	.00564	.00587	.00608	.00627	.00646	.00662	.00794	788,94
* 2,10	.00404	.00412	.00419	.00427	.00433	.00440	.00492	.00531	.00563	.00591	.00616	.00638	.00658	.00677	.00695	.00833	808,18
* 2,15	.00422	.00431	.00439	.00447	.00454	.00461	.00515	.00557	.00590	.00625	.00654	.00689	.00710	.00728	.00748	.00893	827,42
* 2,20	.00441	.00450	.00459	.00467	.00474	.00482	.00539	.00583	.00618	.00648	.00675	.00700	.00722	.00743	.00762	.00914	846,66
* 2,25	.00461	.00470	.00479	.00488	.00496	.00503	.00564	.00609	.00646	.00678	.00706	.00732	.00755	.00777	.00797	.00956	865,90
* 2,30	.00481	.00491	.00500	.00509	.00517	.00525	.00589	.00636	.00675	.00708	.00738	.00765	.00789	.00812	.00833	.00999	885,15
* 2,35	.00501	.00512	.00521	.00531	.00539	.00548	.00614	.00664	.00704	.00739	.00770	.00798	.00824	.00847	.00870	.01042	904,39
* 2,40	.00522	.00533	.00543	.00553	.00562	.00571	.00640	.00692	.00734	.00771	.00803	.00832	.00859	.00884	.00907	.01087	923,63
* 2,45	.00543	.00554	.00565	.00575	.00585	.00594	.00667	.00721	.00765	.00803	.00837	.00867	.00895	.00921	.00945	.01133	942,87
* 2,50	.00564	.00576	.00588	.00598	.00608	.00618	.00694	.00750	.00796	.00836	.00871	.00903	.00932	.00959	.00984	.01180	962,12
* 2,55	.00586	.00599	.00611	.00622	.00632	.00642	.00721	.00780	.00828	.00869	.00906	.00939	.00969	.00997	.01023	.01227	981,36
* 2,60	.00609	.00622	.00634	.00646	.00657	.00667	.00750	.00811	.00861	.00904	.00942	.00976	.01007	.01036	.01064	.01276	1000,60
* 2,65	.00631	.00645	.00658	.00670	.00682	.00692	.00778	.00842	.00894	.00939	.00978	.01014	.01046	.01077	.01105	.01325	1019,84
* 2,70	.00655	.00669	.00682	.00695	.00707	.00718	.00808	.00874	.00928	.00974	.01015	.01052	.01086	.01117	.01147	.01375	1039,09
* 2,75	.00678	.00693	.00707	.00720	.00733	.00744	.00837	.00906	.00962	.01010	.01053	.01091	.01126	.01159	.01190	.01427	1058,33
* 2,80	.00702	.00718	.00732	.00746	.00759	.00771	.00869	.00939	.00997	.01047	.01091	.01131	.01168	.01202	.01233	.01479	1077,57
* 2,85	.00727	.00743	.00758	.00772	.00786	.00798	.00898	.00973	.01033	.01085	.01130	.01172	.01210	.01245	.01277	.01532	1096,81
* 2,90	.00751	.00768	.00784	.00799	.00813	.00826	.00930	.01007	.01069	.01123	.01170	.01213	.01252	.01289	.01323	.01586	1116,06
* 2,95	.00777	.00794	.00811	.00826	.00840	.00854	.00962	.01041	.01106	.01162	.01211	.01255	.01296	.01333	.01368	.01642	1135,30
* 3,00	.00802	.00821	.00838	.00854	.00868	.00883	.00994	.01077	.01144	.01201	.01252	.01298	.01340	.01379	.01415	.01698	1154,54

DIÂMETRO DO CONDUTO D= 750, (MM)

ÁREA DA SEÇÃO DO CONDUTO S= ,4418 M2

LEIESB *

VELU-	PERDA DE CARGA UNITÁRIA EM M/M																*VAZAO*
	OBS: K EM MILIMETROS (L/S)																
C/ABE																	
*(M/S)	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	
* ,30	.00010	.00010	.00010	.00010	.00010	.00010	.00011	.00011	.00012	.00012	.00012	.00013	.00013	.00013	.00014	.00016	132,54
* ,35	.00013	.00013	.00013	.00013	.00013	.00013	.00014	.00015	.00015	.00016	.00017	.00017	.00017	.00018	.00018	.00022	154,63
* ,40	.00016	.00017	.00017	.00017	.00017	.00017	.00018	.00019	.00020	.00021	.00022	.00022	.00023	.00023	.00024	.00028	176,71
* ,45	.00020	.00021	.00021	.00021	.00021	.00021	.00023	.00024	.00025	.00026	.00027	.00028	.00029	.00029	.00030	.00035	198,80
* ,50	.00025	.00025	.00025	.00025	.00026	.00026	.00028	.00029	.00031	.00032	.00033	.00034	.00035	.00036	.00037	.00044	220,89
* ,55	.00030	.00030	.00030	.00031	.00031	.00031	.00033	.00035	.00037	.00039	.00040	.00041	.00042	.00044	.00045	.00053	242,98
* ,60	.00035	.00035	.00036	.00036	.00036	.00037	.00040	.00042	.00044	.00046	.00047	.00049	.00050	.00052	.00053	.00063	265,07
* ,65	.00041	.00041	.00041	.00042	.00042	.00043	.00046	.00049	.00051	.00054	.00056	.00057	.00059	.00061	.00062	.00074	287,16
* ,70	.00047	.00047	.00048	.00048	.00049	.00049	.00053	.00057	.00059	.00062	.00064	.00066	.00068	.00070	.00072	.00085	309,25
* ,75	.00053	.00054	.00054	.00055	.00055	.00055	.00061	.00065	.00068	.00071	.00074	.00076	.00078	.00080	.00082	.00098	331,34
* ,80	.00050	.00050	.00051	.00052	.00053	.00053	.00060	.00063	.00067	.00071	.00074	.00076	.00079	.00081	.00084	.00111	353,43
* ,85	.00067	.00068	.00069	.00069	.00070	.00071	.00077	.00083	.00087	.00091	.00094	.00097	.00100	.00103	.00106	.00126	375,52
* ,90	.00074	.00075	.00076	.00077	.00078	.00079	.00086	.00092	.00097	.00102	.00105	.00109	.00112	.00115	.00118	.00141	397,61
* ,95	.00082	.00084	.00085	.00086	.00087	.00088	.00096	.00103	.00108	.00113	.00117	.00121	.00125	.00128	.00132	.00157	419,70
* 1,00	.00091	.00092	.00093	.00094	.00096	.00097	.00106	.00113	.00120	.00125	.00130	.00134	.00138	.00142	.00146	.00174	441,79
* 1,05	.00100	.00101	.00102	.00104	.00105	.00106	.00117	.00125	.00132	.00138	.00143	.00148	.00152	.00157	.00161	.00191	463,88
* 1,10	.00109	.00110	.00112	.00113	.00115	.00116	.00128	.00137	.00144	.00151	.00157	.00162	.00167	.00172	.00176	.00210	485,97
* 1,15	.00116	.00120	.00122	.00123	.00125	.00126	.00139	.00149	.00157	.00165	.00171	.00177	.00183	.00188	.00192	.00229	508,06
* 1,20	.00128	.00130	.00132	.00134	.00135	.00137	.00151	.00162	.00171	.00179	.00186	.00193	.00199	.00204	.00209	.00250	530,15
* 1,25	.00138	.00141	.00143	.00145	.00147	.00148	.00164	.00176	.00186	.00194	.00202	.00209	.00215	.00221	.00227	.00271	552,23
* 1,30	.00149	.00151	.00154	.00156	.00158	.00160	.00177	.00190	.00201	.00210	.00218	.00226	.00233	.00239	.00245	.00293	574,32
* 1,35	.00160	.00163	.00165	.00168	.00170	.00172	.00190	.00204	.00216	.00226	.00235	.00243	.00251	.00258	.00264	.00316	596,41
* 1,40	.00172	.00174	.00177	.00180	.00182	.00185	.00204	.00219	.00232	.00243	.00253	.00262	.00270	.00277	.00284	.00340	618,50
* 1,45	.00183	.00187	.00189	.00192	.00195	.00198	.00219	.00235	.00249	.00260	.00271	.00280	.00289	.00297	.00305	.00364	640,59
* 1,50	.00196	.00199	.00202	.00205	.00208	.00211	.00234	.00251	.00266	.00279	.00290	.00300	.00309	.00318	.00326	.00390	662,68
* 1,55	.00208	.00212	.00215	.00219	.00222	.00225	.00249	.00268	.00284	.00297	.00309	.00320	.00330	.00339	.00348	.00416	684,77
* 1,60	.00221	.00225	.00229	.00232	.00236	.00239	.00265	.00286	.00302	.00317	.00329	.00341	.00352	.00362	.00371	.00443	706,86
* 1,65	.00235	.00239	.00243	.00247	.00250	.00254	.00282	.00303	.00321	.00336	.00350	.00362	.00374	.00384	.00394	.00471	728,95
* 1,70	.00248	.00253	.00257	.00261	.00265	.00269	.00299	.00322	.00341	.00357	.00372	.00385	.00397	.00408	.00418	.00500	751,04
* 1,75	.00262	.00267	.00272	.00276	.00280	.00284	.00316	.00341	.00361	.00378	.00394	.00407	.00420	.00432	.00443	.00530	773,13
* 1,80	.00277	.00282	.00287	.00292	.00296	.00300	.00334	.00360	.00381	.00400	.00416	.00431	.00444	.00457	.00469	.00561	795,22
* 1,85	.00292	.00297	.00303	.00307	.00312	.00317	.00353	.00380	.00403	.00422	.00439	.00455	.00469	.00483	.00495	.00592	817,31
* 1,90	.00307	.00313	.00318	.00324	.00329	.00333	.00372	.00401	.00425	.00445	.00463	.00480	.00495	.00509	.00522	.00624	839,40
* 1,95	.00323	.00329	.00335	.00340	.00346	.00351	.00391	.00422	.00447	.00469	.00488	.00505	.00521	.00536	.00550	.00658	861,49
* 2,00	.00339	.00345	.00352	.00357	.00363	.00368	.00411	.00444	.00470	.00493	.00513	.00531	.00548	.00564	.00578	.00692	883,58
* 2,05	.00355	.00362	.00369	.00375	.00381	.00386	.00432	.00466	.00494	.00518	.00539	.00558	.00576	.00592	.00608	.00727	905,67
* 2,10	.00372	.00379	.00386	.00393	.00399	.00405	.00453	.00488	.00518	.00543	.00565	.00586	.00604	.00621	.00637	.00763	927,76
* 2,15	.00389	.00397	.00404	.00411	.00418	.00424	.00474	.00512	.00542	.00569	.00592	.00614	.00633	.00651	.00668	.00799	949,84
* 2,20	.00407	.00415	.00423	.00430	.00437	.00443	.00496	.00535	.00568	.00596	.00620	.00642	.00663	.00682	.00699	.00837	971,93
* 2,25	.00425	.00433	.00441	.00449	.00456	.00463	.00519	.00560	.00594	.00626	.00648	.00672	.00693	.00713	.00731	.00875	994,02
* 2,30	.00443	.00452	.00461	.00469	.00475	.00484	.00542	.00585	.00620	.00650	.00677	.00702	.00724	.00745	.00764	.00914	1016,11
* 2,35	.00462	.00471	.00480	.00489	.00497	.00506	.00565	.00610	.00647	.00679	.00707	.00732	.00756	.00777	.00798	.00954	1038,20
* 2,40	.00481	.00491	.00500	.00509	.00517	.00525	.00589	.00636	.00675	.00708	.00737	.00764	.00788	.00811	.00832	.00995	1060,29
* 2,45	.00500	.00511	.00521	.00530	.00539	.00547	.00613	.00663	.00703	.00736	.00768	.00796	.00821	.00845	.00867	.01037	1082,38
* 2,50	.00520	.00531	.00541	.00551	.00560	.00569	.00638	.00690	.00732	.00768	.00800	.00828	.00855	.00879	.00902	.01080	1104,47
* 2,55	.00540	.00552	.00563	.00573	.00583	.00591	.00664	.00717	.00751	.00789	.00832	.00862	.00889	.00915	.00939	.01124	1126,56
* 2,60	.00561	.00573	.00584	.00595	.00605	.00614	.00690	.00745	.00781	.00830	.00865	.00896	.00924	.00951	.00976	.01168	1148,65
* 2,65	.00582	.00594	.00606	.00617	.00628	.00638	.00716	.00774	.00821	.00862	.00908	.00930	.00960	.00988	.01013	.01213	1170,74
* 2,70	.00603	.00616	.00629	.00640	.00651	.00661	.00743	.00803	.00852	.00895	.00932	.00966	.00997	.01025	.01052	.01259	1192,83
* 2,75	.00625	.00639	.00653	.00665	.00675	.00685	.00770	.00833	.00884	.00926	.00967	.01002	.01034	.01063	.01091	.01306	1214,92
* 2,80	.00647	.00661	.00675	.00687	.00699	.00710	.00798	.00863	.00916	.00962	.01002	.01038	.01071	.01102	.01131	.01354	1237,01
* 2,85	.00670	.00684	.00698	.00711	.00723	.00735	.00827	.00894	.00949	.00996	.01038	.01075	.01110	.01142	.01172	.01403	1259,10
* 2,90	.00692	.00708	.00722	.00736	.00748	.00760	.00856	.00925	.00982	.01031	.01074	.01113	.01149	.01182	.01213	.01453	1281,19
* 2,95	.00716	.00732	.00747	.00761	.00774	.00786	.00885	.00957	.01016	.01067	.01112	.01152	.01189	.01223	.01255	.01503	1303,28
* 3,00	.00739	.00756	.00772	.00786	.00800	.00813	.00915	.00990	.01051	.01103	.01149	.01191	.01229	.01265	.01298	.01554	1325,37

***** CETESB **

DIAMETRO DO CONDUTO D= 800, (MM) AREA DA SECAO DO CONDUTO S= ,5027 M2

VELO * CIDADE * (M/S) *	PERDA DE CARGA UNITARIA EM M/M																OBS: K EM MILIMETROS	VAZAO * (L/S) *
	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0		
* ,30	.00009	.00009	.00009	.00009	.00009	.00009	.00010	.00010	.00011	.00011	.00011	.00012	.00012	.00012	.00012	.00015	150,80	
* ,35	.00012	.00012	.00012	.00012	.00012	.00012	.00013	.00014	.00014	.00015	.00015	.00016	.00016	.00017	.00017	.00020	175,93	
* ,40	.00015	.00015	.00015	.00016	.00016	.00016	.00017	.00018	.00018	.00019	.00020	.00020	.00021	.00021	.00022	.00026	201,06	
* ,45	.00019	.00019	.00019	.00019	.00020	.00020	.00021	.00022	.00023	.00024	.00025	.00026	.00026	.00027	.00028	.00033	226,20	
* ,50	.00023	.00023	.00023	.00024	.00024	.00024	.00026	.00027	.00029	.00030	.00031	.00032	.00032	.00033	.00034	.00040	251,33	
* ,55	.00027	.00028	.00028	.00028	.00029	.00029	.00031	.00033	.00034	.00036	.00037	.00038	.00039	.00040	.00041	.00049	276,46	
* ,60	.00032	.00033	.00033	.00033	.00034	.00034	.00037	.00039	.00041	.00042	.00044	.00045	.00047	.00048	.00049	.00058	301,59	
* ,65	.00038	.00038	.00038	.00039	.00039	.00039	.00043	.00045	.00048	.00049	.00051	.00053	.00054	.00056	.00057	.00068	326,73	
* ,70	.00043	.00044	.00044	.00045	.00045	.00045	.00049	.00052	.00055	.00057	.00059	.00061	.00063	.00065	.00066	.00079	351,86	
* ,75	.00049	.00050	.00050	.00051	.00051	.00052	.00056	.00060	.00063	.00066	.00068	.00070	.00072	.00074	.00076	.00090	376,99	
* ,80	.00055	.00056	.00057	.00057	.00058	.00058	.00064	.00068	.00071	.00074	.00077	.00080	.00082	.00084	.00086	.00103	402,12	
* ,85	.00062	.00063	.00064	.00064	.00065	.00066	.00072	.00076	.00080	.00084	.00087	.00090	.00093	.00095	.00097	.00116	427,26	
* ,90	.00069	.00070	.00071	.00072	.00072	.00073	.00080	.00085	.00090	.00094	.00097	.00101	.00104	.00106	.00109	.00130	452,39	
* ,95	.00076	.00077	.00078	.00079	.00080	.00081	.00089	.00095	.00100	.00104	.00108	.00112	.00115	.00118	.00121	.00144	477,52	
* 1,00	.00084	.00085	.00086	.00087	.00089	.00090	.00098	.00105	.00110	.00115	.00120	.00124	.00128	.00131	.00134	.00160	502,66	
* 1,05	.00092	.00094	.00095	.00096	.00097	.00098	.00108	.00115	.00122	.00127	.00132	.00137	.00141	.00144	.00148	.00176	527,79	
* 1,10	.00101	.00102	.00104	.00105	.00106	.00107	.00118	.00126	.00133	.00139	.00145	.00150	.00154	.00158	.00162	.00193	552,92	
* 1,15	.00109	.00111	.00113	.00114	.00116	.00117	.00129	.00138	.00145	.00152	.00158	.00163	.00168	.00173	.00177	.00211	578,05	
* 1,20	.00119	.00120	.00122	.00124	.00125	.00127	.00140	.00150	.00158	.00165	.00172	.00178	.00183	.00188	.00193	.00230	603,19	
* 1,25	.00128	.00130	.00132	.00134	.00136	.00137	.00151	.00162	.00171	.00179	.00186	.00193	.00199	.00204	.00209	.00249	628,32	
* 1,30	.00138	.00140	.00142	.00144	.00146	.00148	.00163	.00175	.00185	.00194	.00201	.00208	.00215	.00221	.00226	.00270	653,45	
* 1,35	.00148	.00151	.00153	.00155	.00157	.00159	.00176	.00189	.00200	.00209	.00217	.00225	.00232	.00238	.00244	.00291	678,59	
* 1,40	.00159	.00162	.00164	.00166	.00169	.00171	.00189	.00203	.00214	.00224	.00233	.00241	.00249	.00256	.00262	.00313	703,72	
* 1,45	.00170	.00173	.00175	.00178	.00181	.00183	.00202	.00217	.00230	.00241	.00250	.00259	.00267	.00274	.00281	.00335	728,85	
* 1,50	.00181	.00184	.00187	.00190	.00193	.00195	.00216	.00232	.00248	.00257	.00268	.00277	.00285	.00293	.00301	.00359	753,98	
* 1,55	.00193	.00196	.00199	.00202	.00205	.00208	.00231	.00248	.00262	.00275	.00286	.00296	.00305	.00313	.00321	.00383	779,12	
* 1,60	.00205	.00208	.00212	.00215	.00218	.00221	.00245	.00264	.00279	.00292	.00304	.00315	.00325	.00334	.00342	.00408	804,25	
* 1,65	.00217	.00221	.00225	.00228	.00232	.00235	.00261	.00280	.00297	.00311	.00323	.00335	.00345	.00355	.00364	.00434	829,38	
* 1,70	.00230	.00234	.00238	.00242	.00245	.00249	.00276	.00297	.00315	.00330	.00343	.00355	.00366	.00376	.00386	.00461	854,52	
* 1,75	.00243	.00248	.00252	.00256	.00260	.00263	.00293	.00315	.00333	.00349	.00363	.00376	.00388	.00399	.00409	.00488	879,65	
* 1,80	.00257	.00261	.00266	.00270	.00274	.00278	.00309	.00333	.00352	.00369	.00384	.00398	.00410	.00422	.00432	.00516	904,78	
* 1,85	.00270	.00275	.00280	.00285	.00289	.00293	.00326	.00351	.00372	.00390	.00406	.00420	.00433	.00445	.00457	.00545	929,91	
* 1,90	.00284	.00290	.00295	.00300	.00304	.00309	.00344	.00370	.00392	.00411	.00428	.00443	.00457	.00470	.00482	.00575	955,05	
* 1,95	.00299	.00306	.00310	.00315	.00320	.00325	.00362	.00390	.00413	.00433	.00450	.00466	.00481	.00495	.00507	.00606	980,18	
* 2,00	.00314	.00320	.00326	.00331	.00336	.00341	.00380	.00410	.00434	.00455	.00474	.00490	.00506	.00520	.00533	.00637	1005,31	
* 2,05	.00329	.00335	.00342	.00347	.00353	.00358	.00399	.00430	.00456	.00478	.00498	.00515	.00531	.00546	.00560	.00669	1030,45	
* 2,10	.00345	.00351	.00358	.00364	.00370	.00375	.00419	.00451	.00478	.00501	.00522	.00540	.00557	.00573	.00588	.00702	1055,58	
* 2,15	.00360	.00368	.00374	.00381	.00387	.00393	.00439	.00473	.00501	.00525	.00547	.00566	.00584	.00601	.00616	.00736	1080,71	
* 2,20	.00377	.00384	.00391	.00398	.00404	.00410	.00459	.00495	.00525	.00550	.00573	.00593	.00612	.00629	.00645	.00771	1105,84	
* 2,25	.00393	.00401	.00409	.00416	.00423	.00429	.00480	.00517	.00548	.00575	.00599	.00620	.00640	.00658	.00675	.00806	1130,98	
* 2,30	.00410	.00419	.00427	.00434	.00441	.00448	.00501	.00540	.00573	.00601	.00625	.00648	.00668	.00687	.00705	.00842	1156,11	
* 2,35	.00428	.00437	.00445	.00453	.00460	.00467	.00523	.00564	.00598	.00627	.00653	.00676	.00697	.00717	.00736	.00879	1181,24	
* 2,40	.00446	.00455	.00463	.00471	.00479	.00486	.00545	.00588	.00623	.00654	.00681	.00705	.00727	.00748	.00767	.00917	1206,38	
* 2,45	.00463	.00473	.00482	.00491	.00499	.00506	.00567	.00613	.00649	.00681	.00709	.00735	.00758	.00779	.00799	.00955	1231,51	
* 2,50	.00482	.00492	.00501	.00510	.00519	.00527	.00590	.00638	.00676	.00709	.00738	.00765	.00789	.00811	.00832	.00995	1256,64	
* 2,55	.00500	.00511	.00521	.00530	.00539	.00547	.00614	.00663	.00703	.00738	.00768	.00795	.00821	.00844	.00866	.01035	1281,77	
* 2,60	.00520	.00531	.00541	.00551	.00560	.00569	.00638	.00689	.00731	.00767	.00798	.00827	.00853	.00877	.00900	.01076	1306,91	
* 2,65	.00539	.00551	.00561	.00572	.00581	.00590	.00662	.00716	.00759	.00796	.00829	.00859	.00886	.00911	.00935	.01117	1332,04	
* 2,70	.00559	.00571	.00582	.00593	.00603	.00612	.00687	.00743	.00788	.00826	.00861	.00891	.00920	.00946	.00970	.01160	1357,17	
* 2,75	.00579	.00592	.00603	.00614	.00625	.00635	.00712	.00770	.00817	.00857	.00893	.00925	.00954	.00981	.01006	.01203	1382,31	
* 2,80	.00599	.00613	.00625	.00636	.00647	.00657	.00738	.00798	.00847	.00888	.00925	.00958	.00989	.01017	.01043	.01247	1407,44	
* 2,85	.00620	.00634	.00647	.00659	.00670	.00680	.00765	.00827	.00877	.00920	.00958	.00993	.01024	.01053	.01081	.01292	1432,57	
* 2,90	.00641	.00656	.00669	.00681	.00693	.00704	.00791	.00856	.00908	.00953	.00992	.01028	.01060	.01091	.01119	.01338	1457,71	
* 2,95	.00663	.00678	.00692	.00704	.00717	.00728	.00818	.00885	.00939	.00985	.01026	.01063	.01097	.01128	.01158	.01384	1482,84	
* 3,00	.00685	.00700	.00715	.00728	.00740	.00752	.00846	.00915	.00971	.01019	.01061	.01100	.01135	.01167	.01197	.01432	1507,97	

VELO-	PERDA DE CARGA UNITARIA EM M/M															*VAZAO*	
	OBS: K EM MILIMETROS																
CIDADE																* (L/S) *	
* (M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	
* 30	.00008	.00008	.00008	.00008	.00009	.00009	.00009	.00009	.00010	.00010	.00011	.00011	.00011	.00011	.00012	.00014	170,24
* 35	.00011	.00011	.00011	.00011	.00011	.00011	.00012	.00013	.00013	.00014	.00014	.00015	.00015	.00015	.00016	.00018	198,61
* 40	.00014	.00014	.00014	.00015	.00015	.00015	.00016	.00016	.00017	.00018	.00018	.00019	.00019	.00020	.00020	.00024	226,98
* 45	.00018	.00018	.00018	.00018	.00018	.00018	.00020	.00021	.00022	.00022	.00023	.00024	.00024	.00025	.00026	.00030	255,35
* 50	.00021	.00022	.00022	.00022	.00022	.00022	.00024	.00025	.00026	.00026	.00028	.00029	.00030	.00031	.00032	.00037	283,73
* 55	.00026	.00026	.00026	.00026	.00027	.00027	.00029	.00030	.00032	.00033	.00034	.00035	.00036	.00037	.00038	.00045	312,10
* 60	.00030	.00030	.00031	.00031	.00031	.00032	.00034	.00036	.00038	.00039	.00041	.00042	.00043	.00044	.00045	.00054	340,47
* 65	.00035	.00035	.00036	.00036	.00036	.00037	.00040	.00042	.00044	.00046	.00048	.00049	.00051	.00052	.00053	.00063	368,84
* 70	.00040	.00041	.00041	.00041	.00042	.00042	.00046	.00049	.00051	.00053	.00055	.00057	.00058	.00060	.00061	.00073	397,22
* 75	.00046	.00046	.00047	.00047	.00048	.00048	.00052	.00056	.00058	.00061	.00063	.00065	.00067	.00069	.00070	.00083	425,59
* 80	.00051	.00052	.00053	.00053	.00054	.00054	.00059	.00063	.00066	.00069	.00072	.00074	.00076	.00078	.00080	.00095	453,96
* 85	.00058	.00058	.00059	.00060	.00060	.00061	.00066	.00071	.00075	.00078	.00081	.00083	.00086	.00088	.00090	.00107	482,33
* 90	.00064	.00065	.00066	.00067	.00067	.00068	.00074	.00079	.00083	.00087	.00090	.00093	.00096	.00099	.00101	.00120	510,71
* 95	.00071	.00072	.00073	.00074	.00075	.00075	.00082	.00088	.00093	.00097	.00101	.00104	.00107	.00110	.00113	.00134	539,08
* 1,00	.00076	.00079	.00080	.00081	.00082	.00083	.00091	.00097	.00103	.00107	.00111	.00115	.00118	.00122	.00125	.00148	567,45
* 1,05	.00080	.00087	.00088	.00089	.00090	.00091	.00100	.00107	.00113	.00118	.00123	.00127	.00130	.00134	.00137	.00163	595,82
* 1,10	.00094	.00095	.00096	.00098	.00099	.00100	.00110	.00117	.00124	.00129	.00134	.00139	.00143	.00147	.00151	.00179	624,20
* 1,15	.00102	.00103	.00105	.00106	.00108	.00109	.00120	.00128	.00135	.00141	.00147	.00152	.00156	.00160	.00164	.00196	652,57
* 1,20	.00110	.00112	.00114	.00115	.00117	.00118	.00130	.00139	.00147	.00154	.00160	.00165	.00170	.00175	.00179	.00210	680,94
* 1,25	.00119	.00121	.00123	.00125	.00126	.00128	.00141	.00151	.00159	.00166	.00173	.00179	.00184	.00189	.00194	.00231	709,31
* 1,30	.00128	.00131	.00132	.00134	.00136	.00138	.00152	.00163	.00172	.00180	.00187	.00193	.00199	.00205	.00210	.00250	737,69
* 1,35	.00138	.00140	.00142	.00144	.00146	.00148	.00164	.00175	.00185	.00194	.00201	.00208	.00215	.00221	.00226	.00269	766,06
* 1,40	.00148	.00150	.00153	.00155	.00157	.00159	.00176	.00188	.00199	.00208	.00217	.00224	.00231	.00237	.00243	.00289	794,43
* 1,45	.00158	.00161	.00163	.00166	.00168	.00170	.00188	.00202	.00213	.00223	.00232	.00240	.00247	.00254	.00261	.00310	822,80
* 1,50	.00169	.00171	.00174	.00177	.00179	.00182	.00201	.00216	.00228	.00239	.00248	.00257	.00265	.00272	.00279	.00332	851,18
* 1,55	.00179	.00183	.00186	.00188	.00191	.00193	.00214	.00230	.00243	.00255	.00265	.00274	.00283	.00290	.00298	.00355	879,55
* 1,60	.00191	.00194	.00197	.00200	.00203	.00206	.00228	.00245	.00259	.00271	.00282	.00292	.00301	.00309	.00317	.00378	907,92
* 1,65	.00202	.00206	.00209	.00212	.00215	.00218	.00242	.00260	.00275	.00288	.00300	.00310	.00320	.00329	.00337	.00402	936,30
* 1,70	.00214	.00218	.00222	.00225	.00228	.00231	.00257	.00276	.00292	.00306	.00318	.00329	.00340	.00349	.00358	.00426	964,67
* 1,75	.00226	.00230	.00234	.00238	.00241	.00245	.00272	.00293	.00310	.00324	.00337	.00349	.00360	.00370	.00379	.00452	993,04
* 1,80	.00239	.00243	.00247	.00251	.00255	.00258	.00287	.00309	.00327	.00343	.00357	.00369	.00380	.00391	.00401	.00478	1021,41
* 1,85	.00252	.00256	.00261	.00265	.00269	.00273	.00303	.00326	.00346	.00362	.00376	.00390	.00402	.00413	.00423	.00505	1049,79
* 1,90	.00265	.00270	.00274	.00279	.00283	.00287	.00320	.00344	.00364	.00382	.00397	.00411	.00424	.00435	.00447	.00532	1078,16
* 1,95	.00278	.00284	.00289	.00293	.00298	.00302	.00336	.00362	.00383	.00402	.00418	.00433	.00446	.00459	.00470	.00561	1106,53
* 2,00	.00292	.00298	.00303	.00308	.00313	.00317	.00354	.00381	.00403	.00422	.00440	.00455	.00469	.00482	.00495	.00590	1134,90
* 2,05	.00306	.00312	.00318	.00323	.00328	.00333	.00371	.00400	.00423	.00444	.00462	.00478	.00493	.00507	.00520	.00620	1163,28
* 2,10	.00321	.00327	.00333	.00338	.00344	.00349	.00389	.00419	.00444	.00465	.00484	.00501	.00517	.00532	.00545	.00650	1191,65
* 2,15	.00336	.00342	.00348	.00354	.00360	.00365	.00408	.00439	.00465	.00488	.00508	.00525	.00542	.00557	.00571	.00681	1220,02
* 2,20	.00351	.00358	.00364	.00370	.00376	.00382	.00426	.00460	.00487	.00511	.00531	.00550	.00567	.00583	.00598	.00713	1248,40
* 2,25	.00366	.00374	.00380	.00387	.00393	.00399	.00446	.00481	.00509	.00534	.00556	.00575	.00593	.00610	.00625	.00746	1276,77
* 2,30	.00382	.00390	.00397	.00404	.00410	.00416	.00465	.00502	.00532	.00558	.00580	.00601	.00620	.00637	.00653	.00780	1305,14
* 2,35	.00398	.00406	.00414	.00421	.00428	.00434	.00486	.00524	.00555	.00582	.00606	.00627	.00647	.00665	.00682	.00814	1333,51
* 2,40	.00415	.00423	.00431	.00439	.00446	.00452	.00505	.00546	.00579	.00607	.00632	.00654	.00675	.00693	.00711	.00849	1361,89
* 2,45	.00431	.00440	.00449	.00457	.00464	.00471	.00527	.00569	.00603	.00632	.00658	.00681	.00703	.00723	.00741	.00884	1390,26
* 2,50	.00448	.00458	.00467	.00475	.00483	.00490	.00549	.00592	.00628	.00658	.00685	.00709	.00732	.00752	.00772	.00921	1418,63
* 2,55	.00466	.00476	.00485	.00493	.00502	.00509	.00571	.00616	.00653	.00685	.00713	.00738	.00761	.00783	.00803	.00958	1447,00
* 2,60	.00484	.00494	.00503	.00512	.00521	.00529	.00593	.00640	.00679	.00712	.00741	.00767	.00791	.00813	.00834	.00996	1475,38
* 2,65	.00502	.00512	.00522	.00532	.00541	.00549	.00615	.00665	.00705	.00739	.00769	.00797	.00822	.00845	.00867	.01034	1503,75
* 2,70	.00520	.00531	.00542	.00552	.00561	.00569	.00639	.00690	.00731	.00767	.00798	.00827	.00853	.00877	.00900	.01074	1532,12
* 2,75	.00539	.00551	.00561	.00572	.00581	.00590	.00662	.00715	.00758	.00795	.00828	.00858	.00885	.00910	.00933	.01114	1560,49
* 2,80	.00558	.00570	.00581	.00592	.00602	.00611	.00686	.00741	.00786	.00825	.00858	.00889	.00917	.00943	.00967	.01155	1588,87
* 2,85	.00577	.00590	.00602	.00613	.00623	.00633	.00711	.00768	.00814	.00854	.00889	.00921	.00950	.00977	.01002	.01196	1617,24
* 2,90	.00597	.00610	.00622	.00634	.00645	.00655	.00735	.00793	.00843	.00884	.00921	.00953	.00983	.01011	.01037	.01238	1645,61
* 2,95	.00617	.00631	.00644	.00655	.00667	.00677	.00761	.00822	.00872	.00915	.00952	.00986	.01018	.01046	.01073	.01281	1673,98
* 3,00	.00637	.00652	.00665	.00677	.00689	.00700	.00786	.00850	.00902	.00946	.00985	.01020	.01052	.01082	.01110	.01325	1702,36

***** CETESB *****																	
DIAMETRO DO CONDUTO D= 900, (MM) AREA DA SECAO DO CONDUTO S= 6,362 M2																	
VELL *	PERDA DE CARGA UNITARIA E M M/M															VAZAO *	
CIDADE	OBS: K EM MILIMETROS															(L/S)	
(M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	
* .30	.00008	.00008	.00008	.00008	.00008	.00008	.00008	.00009	.00009	.00010	.00010	.00010	.00010	.00011	.00011	.00013	190,85
* .35	.00010	.00010	.00010	.00011	.00011	.00011	.00011	.00012	.00012	.00013	.00013	.00014	.00014	.00014	.00015	.00017	222,66
* .40	.00013	.00013	.00013	.00014	.00014	.00014	.00015	.00015	.00016	.00017	.00017	.00018	.00018	.00019	.00019	.00022	254,47
* .45	.00016	.00017	.00017	.00017	.00017	.00017	.00018	.00019	.00020	.00021	.00022	.00022	.00023	.00023	.00024	.00028	286,28
* .50	.00020	.00020	.00020	.00021	.00021	.00021	.00022	.00024	.00025	.00026	.00027	.00027	.00028	.00029	.00029	.00035	318,09
* .55	.00024	.00024	.00024	.00025	.00025	.00025	.00027	.00028	.00030	.00031	.00032	.00033	.00034	.00035	.00036	.00042	349,90
* .60	.00028	.00028	.00029	.00029	.00029	.00029	.00032	.00034	.00035	.00037	.00038	.00039	.00040	.00041	.00042	.00050	381,70
* .65	.00033	.00033	.00033	.00034	.00034	.00034	.00037	.00039	.00041	.00043	.00044	.00046	.00047	.00048	.00049	.00058	413,51
* .70	.00037	.00038	.00038	.00039	.00039	.00039	.00043	.00045	.00048	.00050	.00051	.00053	.00054	.00056	.00057	.00068	445,32
* .75	.00043	.00043	.00044	.00044	.00044	.00045	.00049	.00052	.00054	.00057	.00059	.00061	.00062	.00064	.00068	.00078	477,13
* .80	.00048	.00049	.00049	.00050	.00050	.00051	.00055	.00059	.00062	.00064	.00067	.00069	.00071	.00073	.00075	.00088	508,94
* .85	.00054	.00055	.00055	.00056	.00056	.00057	.00062	.00066	.00070	.00073	.00075	.00078	.00080	.00082	.00084	.00100	540,75
* .90	.00060	.00061	.00061	.00062	.00063	.00064	.00069	.00074	.00078	.00081	.00084	.00087	.00090	.00092	.00094	.00112	572,56
* .95	.00066	.00067	.00068	.00069	.00070	.00071	.00077	.00082	.00086	.00090	.00094	.00097	.00100	.00102	.00105	.00124	604,36
* 1,00	.00073	.00074	.00075	.00076	.00077	.00078	.00085	.00091	.00096	.00100	.00104	.00107	.00110	.00113	.00116	.00138	636,17
* 1,05	.00080	.00081	.00082	.00083	.00084	.00085	.00094	.00100	.00105	.00110	.00114	.00118	.00121	.00125	.00128	.00152	667,98
* 1,10	.00088	.00089	.00090	.00091	.00092	.00093	.00102	.00109	.00115	.00121	.00125	.00129	.00133	.00137	.00140	.00166	699,79
* 1,15	.00095	.00097	.00098	.00099	.00100	.00102	.00112	.00119	.00126	.00132	.00137	.00141	.00146	.00149	.00153	.00182	731,60
* 1,20	.00103	.00105	.00106	.00108	.00109	.00110	.00121	.00130	.00137	.00143	.00149	.00154	.00158	.00163	.00167	.00198	763,41
* 1,25	.00111	.00113	.00115	.00117	.00118	.00119	.00131	.00141	.00148	.00155	.00161	.00167	.00172	.00176	.00181	.00219	795,22
* 1,30	.00120	.00122	.00124	.00126	.00127	.00129	.00142	.00152	.00160	.00168	.00174	.00180	.00186	.00191	.00195	.00237	827,03
* 1,35	.00129	.00131	.00133	.00135	.00137	.00138	.00153	.00164	.00173	.00181	.00188	.00194	.00200	.00205	.00211	.00250	858,83
* 1,40	.00138	.00140	.00143	.00145	.00147	.00148	.00166	.00176	.00186	.00194	.00202	.00209	.00215	.00221	.00226	.00269	890,64
* 1,45	.00148	.00150	.00153	.00155	.00157	.00159	.00176	.00188	.00199	.00208	.00216	.00224	.00231	.00237	.00243	.00289	922,45
* 1,50	.00158	.00160	.00163	.00165	.00167	.00170	.00188	.00201	.00213	.00223	.00231	.00239	.00247	.00253	.00260	.00309	954,26
* 1,55	.00168	.00171	.00173	.00176	.00178	.00181	.00200	.00215	.00227	.00238	.00247	.00255	.00263	.00270	.00277	.00330	986,07
* 1,60	.00178	.00181	.00184	.00187	.00190	.00192	.00213	.00229	.00242	.00253	.00263	.00272	.00280	.00288	.00295	.00351	1017,88
* 1,65	.00189	.00192	.00195	.00198	.00201	.00204	.00226	.00243	.00257	.00269	.00280	.00289	.00298	.00306	.00314	.00374	1049,69
* 1,70	.00200	.00204	.00207	.00210	.00213	.00216	.00240	.00258	.00273	.00285	.00297	.00307	.00316	.00325	.00333	.00397	1081,50
* 1,75	.00211	.00215	.00219	.00222	.00226	.00229	.00254	.00273	.00289	.00302	.00314	.00325	.00335	.00344	.00353	.00420	1113,31
* 1,80	.00223	.00227	.00231	.00235	.00238	.00241	.00268	.00289	.00305	.00320	.00332	.00344	.00354	.00364	.00373	.00444	1145,11
* 1,85	.00235	.00239	.00244	.00248	.00251	.00255	.00285	.00305	.00322	.00337	.00351	.00363	.00374	.00385	.00394	.00469	1176,92
* 1,90	.00247	.00252	.00256	.00261	.00264	.00268	.00299	.00321	.00340	.00356	.00370	.00383	.00395	.00406	.00418	.00495	1208,73
* 1,95	.00260	.00265	.00270	.00274	.00278	.00282	.00314	.00338	.00358	.00375	.00390	.00403	.00416	.00427	.00438	.00521	1240,54
* 2,00	.00273	.00278	.00283	.00288	.00292	.00296	.00330	.00355	.00376	.00394	.00410	.00424	.00437	.00449	.00461	.00548	1272,35
* 2,05	.00286	.00292	.00297	.00302	.00306	.00311	.00345	.00373	.00395	.00414	.00430	.00445	.00459	.00472	.00484	.00576	1304,16
* 2,10	.00300	.00306	.00311	.00316	.00321	.00326	.00363	.00391	.00414	.00434	.00451	.00467	.00482	.00495	.00508	.00605	1335,97
* 2,15	.00314	.00320	.00326	.00331	.00336	.00341	.00380	.00410	.00434	.00455	.00473	.00490	.00505	.00519	.00532	.00634	1367,78
* 2,20	.00328	.00334	.00340	.00346	.00351	.00357	.00398	.00429	.00454	.00476	.00493	.00512	.00528	.00543	.00557	.00663	1399,59
* 2,25	.00342	.00349	.00355	.00361	.00367	.00373	.00416	.00448	.00475	.00498	.00516	.00536	.00553	.00568	.00582	.00694	1431,39
* 2,30	.00357	.00364	.00371	.00377	.00383	.00389	.00434	.00468	.00496	.00520	.00541	.00560	.00577	.00593	.00608	.00725	1463,20
* 2,35	.00372	.00380	.00387	.00393	.00400	.00406	.00453	.00488	.00518	.00543	.00565	.00584	.00603	.00619	.00635	.00757	1495,01
* 2,40	.00387	.00395	.00403	.00410	.00418	.00423	.00472	.00510	.00540	.00566	.00589	.00609	.00628	.00646	.00662	.00789	1526,82
* 2,45	.00403	.00411	.00419	.00427	.00433	.00440	.00492	.00531	.00562	.00589	.00613	.00635	.00655	.00673	.00690	.00822	1558,63
* 2,50	.00419	.00428	.00436	.00444	.00451	.00458	.00512	.00552	.00585	.00614	.00638	.00661	.00682	.00701	.00718	.00856	1590,44
* 2,55	.00435	.00445	.00453	.00461	.00469	.00478	.00532	.00575	.00609	.00638	.00664	.00688	.00709	.00729	.00747	.00891	1622,25
* 2,60	.00452	.00462	.00470	.00479	.00487	.00494	.00553	.00597	.00633	.00663	.00690	.00715	.00737	.00758	.00777	.00926	1654,06
* 2,65	.00469	.00479	.00488	.00497	.00505	.00513	.00574	.00620	.00657	.00689	.00717	.00742	.00765	.00787	.00807	.00962	1685,86
* 2,70	.00486	.00497	.00506	.00515	.00524	.00532	.00596	.00643	.00682	.00715	.00744	.00770	.00795	.00817	.00838	.00999	1717,67
* 2,75	.00504	.00514	.00523	.00534	.00543	.00551	.00618	.00667	.00707	.00742	.00772	.00799	.00824	.00847	.00869	.01036	1749,48
* 2,80	.00521	.00533	.00543	.00553	.00562	.00571	.00640	.00692	.00733	.00769	.00800	.00828	.00854	.00878	.00901	.01074	1781,29
* 2,85	.00540	.00551	.00562	.00573	.00582	.00591	.00663	.00716	.00759	.00796	.00829	.00858	.00885	.00910	.00933	.01112	1813,10
* 2,90	.00558	.00570	.00582	.00593	.00602	.00612	.00686	.00741	.00786	.00824	.00858	.00888	.00916	.00942	.00966	.01152	1844,91
* 2,95	.00577	.00590	.00601	.00612	.00623	.00632	.00709	.00767	.00813	.00853	.00888	.00919	.00948	.00975	.00999	.01192	1876,72
* 3,00	.00596	.00609	.00621	.00633	.00643	.00654	.00734	.00793	.00841	.00882	.00918	.00950	.00980	.01008	.01033	.01232	1908,53

VEL. (P/S)	PERDA DE CARGA UNITARIA EM M/M																UBS: K EM MILIMETROS	VAZAO (L/S)
	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0		
* .30	.00007	.00007	.00007	.00007	.00007	.00008	.00008	.00008	.00009	.00009	.00009	.00009	.00010	.00010	.00010	.00012	212,65	
* .35	.00010	.00010	.00010	.00010	.00010	.00010	.00011	.00011	.00012	.00012	.00012	.00013	.00013	.00013	.00014	.00016	248,09	
* .40	.00012	.00013	.00013	.00013	.00013	.00013	.00014	.00014	.00015	.00016	.00016	.00017	.00017	.00017	.00018	.00021	283,53	
* .45	.00015	.00016	.00016	.00016	.00016	.00016	.00017	.00018	.00019	.00020	.00020	.00021	.00021	.00022	.00022	.00026	318,97	
* .50	.00019	.00019	.00019	.00019	.00019	.00020	.00021	.00022	.00023	.00024	.00025	.00026	.00026	.00027	.00028	.00032	354,41	
* .55	.00022	.00023	.00023	.00023	.00023	.00023	.00025	.00027	.00028	.00029	.00030	.00031	.00032	.00032	.00033	.00039	389,85	
* .60	.00026	.00027	.00027	.00027	.00027	.00028	.00030	.00031	.00033	.00034	.00035	.00037	.00038	.00039	.00040	.00047	425,29	
* .65	.00031	.00031	.00031	.00032	.00032	.00032	.00035	.00037	.00038	.00040	.00041	.00043	.00044	.00045	.00046	.00055	460,73	
* .70	.00035	.00036	.00036	.00036	.00037	.00037	.00040	.00042	.00044	.00046	.00048	.00050	.00051	.00052	.00053	.00063	496,18	
* .75	.00040	.00040	.00041	.00041	.00042	.00042	.00046	.00048	.00051	.00053	.00055	.00057	.00058	.00060	.00061	.00072	531,62	
* .80	.00045	.00046	.00046	.00047	.00047	.00048	.00052	.00055	.00058	.00060	.00062	.00064	.00066	.00068	.00070	.00082	567,06	
* .85	.00051	.00051	.00052	.00052	.00053	.00053	.00058	.00062	.00065	.00068	.00070	.00073	.00075	.00077	.00079	.00093	602,50	
* .90	.00056	.00057	.00058	.00058	.00059	.00060	.00065	.00069	.00073	.00076	.00079	.00081	.00084	.00086	.00088	.00104	637,94	
* .95	.00062	.00063	.00064	.00065	.00065	.00066	.00072	.00077	.00081	.00084	.00088	.00091	.00093	.00096	.00098	.00116	673,38	
* 1.00	.00069	.00070	.00070	.00071	.00072	.00073	.00080	.00085	.00090	.00093	.00097	.00100	.00103	.00106	.00108	.00129	708,82	
* 1.05	.00075	.00076	.00077	.00078	.00079	.00080	.00088	.00094	.00099	.00103	.00107	.00110	.00114	.00117	.00119	.00142	744,26	
* 1.10	.00082	.00083	.00084	.00085	.00087	.00088	.00096	.00103	.00108	.00113	.00117	.00121	.00125	.00128	.00131	.00155	779,71	
* 1.15	.00089	.00091	.00092	.00093	.00094	.00095	.00105	.00112	.00118	.00123	.00128	.00132	.00136	.00140	.00143	.00170	815,15	
* 1.20	.00097	.00098	.00100	.00101	.00102	.00103	.00114	.00122	.00128	.00134	.00139	.00144	.00148	.00152	.00156	.00185	850,59	
* 1.25	.00105	.00106	.00108	.00109	.00111	.00112	.00123	.00132	.00139	.00145	.00151	.00156	.00161	.00165	.00169	.00201	886,03	
* 1.30	.00113	.00114	.00116	.00118	.00119	.00121	.00133	.00142	.00150	.00157	.00163	.00169	.00174	.00178	.00183	.00217	921,47	
* 1.35	.00121	.00123	.00125	.00126	.00128	.00130	.00143	.00153	.00162	.00169	.00176	.00182	.00187	.00192	.00197	.00234	956,91	
* 1.40	.00130	.00132	.00134	.00136	.00137	.00139	.00154	.00165	.00174	.00182	.00189	.00195	.00201	.00207	.00212	.00251	992,35	
* 1.45	.00139	.00141	.00143	.00145	.00147	.00149	.00164	.00175	.00186	.00195	.00202	.00209	.00216	.00221	.00227	.00270	1027,79	
* 1.50	.00148	.00150	.00153	.00155	.00157	.00159	.00176	.00189	.00199	.00208	.00216	.00224	.00231	.00237	.00243	.00288	1063,24	
* 1.55	.00157	.00160	.00163	.00165	.00167	.00169	.00187	.00201	.00213	.00222	.00231	.00239	.00246	.00253	.00259	.00306	1098,68	
* 1.60	.00167	.00170	.00173	.00175	.00178	.00180	.00199	.00214	.00226	.00237	.00246	.00254	.00262	.00269	.00276	.00328	1134,12	
* 1.65	.00177	.00180	.00183	.00186	.00189	.00191	.00212	.00228	.00240	.00252	.00262	.00271	.00279	.00286	.00294	.00349	1169,56	
* 1.70	.00188	.00191	.00194	.00197	.00200	.00203	.00225	.00241	.00255	.00267	.00278	.00287	.00296	.00304	.00311	.00370	1205,00	
* 1.75	.00198	.00202	.00205	.00208	.00211	.00214	.00238	.00256	.00270	.00283	.00294	.00304	.00313	.00322	.00330	.00392	1240,44	
* 1.80	.00209	.00213	.00217	.00220	.00223	.00226	.00251	.00270	.00286	.00299	.00311	.00322	.00331	.00341	.00349	.00415	1275,88	
* 1.85	.00221	.00225	.00228	.00232	.00235	.00239	.00265	.00285	.00302	.00316	.00328	.00340	.00350	.00360	.00369	.00438	1311,33	
* 1.90	.00232	.00236	.00240	.00244	.00248	.00251	.00279	.00301	.00318	.00333	.00346	.00358	.00369	.00379	.00389	.00462	1346,77	
* 1.95	.00244	.00249	.00253	.00257	.00261	.00264	.00294	.00316	.00335	.00351	.00364	.00377	.00389	.00399	.00409	.00487	1382,21	
* 2.00	.00256	.00261	.00265	.00270	.00274	.00278	.00309	.00333	.00352	.00369	.00383	.00397	.00409	.00420	.00431	.00512	1417,65	
* 2.05	.00268	.00274	.00278	.00283	.00287	.00291	.00325	.00349	.00370	.00387	.00403	.00417	.00429	.00441	.00452	.00538	1453,09	
* 2.10	.00281	.00287	.00292	.00297	.00301	.00305	.00340	.00366	.00388	.00406	.00422	.00437	.00450	.00463	.00474	.00564	1488,53	
* 2.15	.00294	.00300	.00305	.00310	.00315	.00320	.00356	.00384	.00406	.00425	.00443	.00458	.00472	.00485	.00497	.00592	1523,97	
* 2.20	.00307	.00314	.00319	.00325	.00330	.00334	.00373	.00402	.00425	.00445	.00463	.00479	.00494	.00508	.00521	.00619	1559,41	
* 2.25	.00321	.00327	.00333	.00339	.00344	.00349	.00390	.00420	.00445	.00466	.00484	.00501	.00517	.00531	.00544	.00648	1594,86	
* 2.30	.00335	.00342	.00348	.00354	.00359	.00365	.00407	.00439	.00464	.00486	.00506	.00524	.00540	.00555	.00569	.00677	1630,30	
* 2.35	.00349	.00356	.00363	.00369	.00375	.00380	.00425	.00458	.00485	.00508	.00528	.00547	.00563	.00579	.00594	.00707	1665,74	
* 2.40	.00363	.00371	.00378	.00384	.00390	.00396	.00443	.00477	.00505	.00529	.00551	.00570	.00588	.00604	.00619	.00737	1701,18	
* 2.45	.00378	.00386	.00393	.00400	.00406	.00412	.00461	.00497	.00526	.00552	.00574	.00594	.00612	.00629	.00645	.00768	1736,62	
* 2.50	.00393	.00401	.00409	.00416	.00423	.00429	.00480	.00517	.00548	.00574	.00597	.00618	.00637	.00655	.00672	.00800	1772,06	
* 2.55	.00408	.00417	.00425	.00432	.00439	.00446	.00499	.00538	.00570	.00597	.00621	.00643	.00663	.00681	.00699	.00832	1807,50	
* 2.60	.00424	.00433	.00441	.00449	.00456	.00463	.00518	.00559	.00592	.00621	.00646	.00668	.00689	.00708	.00726	.00865	1842,94	
* 2.65	.00440	.00449	.00458	.00466	.00474	.00481	.00538	.00581	.00615	.00645	.00671	.00694	.00716	.00736	.00754	.00898	1878,39	
* 2.70	.00456	.00466	.00475	.00483	.00491	.00499	.00558	.00603	.00638	.00669	.00696	.00721	.00743	.00764	.00783	.00932	1913,83	
* 2.75	.00472	.00483	.00492	.00501	.00509	.00517	.00579	.00625	.00662	.00694	.00722	.00747	.00771	.00792	.00812	.00967	1949,27	
* 2.80	.00489	.00500	.00510	.00519	.00527	.00535	.00600	.00648	.00686	.00719	.00748	.00775	.00799	.00821	.00842	.01003	1984,71	
* 2.85	.00506	.00517	.00527	.00537	.00546	.00554	.00621	.00671	.00711	.00745	.00775	.00803	.00828	.00851	.00872	.01039	2020,15	
* 2.90	.00524	.00535	.00546	.00555	.00565	.00573	.00643	.00694	.00736	.00771	.00803	.00831	.00857	.00881	.00903	.01075	2055,59	
* 2.95	.00541	.00553	.00564	.00574	.00584	.00593	.00665	.00718	.00761	.00798	.00830	.00860	.00886	.00911	.00934	.01113	2091,03	
* 3.00	.00559	.00571	.00583	.00593	.00603	.00613	.00688	.00743	.00787	.00825	.00859	.00889	.00917	.00942	.00966	.01151	2126,48	

***** CETESB ****																	
DIAMETRO DO CONDUTO D = 1000, (MM)										AREA DA SECAO DO CONDUTO S = 7854 M2							

VELL *	PERDA DE CARGA UNITARIA EM M/M																*VAZAO *
CIDABE	OBS: K EM MILIMETROS																(L/S)
* (M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	*
* .30	.0007	.0007	.0007	.0007	.0007	.0007	.0007	.0008	.0008	.0008	.0009	.0009	.0009	.0009	.0009	.0011	235,62 *
* .35	.0009	.0009	.0009	.0009	.0009	.0009	.0010	.0010	.0011	.0011	.0012	.0012	.0012	.0013	.0013	.0015	274,89 *
* .40	.0012	.0012	.0012	.0012	.0012	.0012	.0013	.0014	.0014	.0015	.0015	.0015	.0016	.0016	.0017	.0019	314,16 *
* .45	.0015	.0015	.0015	.0015	.0015	.0015	.0016	.0017	.0018	.0018	.0019	.0020	.0020	.0021	.0021	.0025	353,43 *
* .50	.0018	.0018	.0018	.0018	.0018	.0018	.0020	.0021	.0022	.0023	.0023	.0024	.0025	.0025	.0026	.0030	392,70 *
* .55	.0021	.0021	.0021	.0022	.0022	.0022	.0024	.0025	.0026	.0027	.0028	.0029	.0030	.0031	.0031	.0037	431,97 *
* .60	.0025	.0025	.0025	.0026	.0026	.0026	.0028	.0030	.0031	.0032	.0033	.0034	.0035	.0036	.0037	.0044	471,24 *
* .65	.0029	.0029	.0029	.0030	.0030	.0030	.0033	.0034	.0036	.0038	.0038	.0040	.0041	.0042	.0043	.0051	510,51 *
* .70	.0033	.0033	.0034	.0034	.0034	.0035	.0038	.0040	.0042	.0044	.0045	.0046	.0048	.0049	.0050	.0059	549,78 *
* .75	.0038	.0038	.0038	.0039	.0039	.0040	.0043	.0046	.0048	.0050	.0052	.0053	.0055	.0056	.0058	.0068	589,05 *
* .80	.0042	.0043	.0043	.0044	.0044	.0045	.0049	.0052	.0054	.0057	.0059	.0061	.0062	.0064	.0065	.0077	628,32 *
* .85	.0048	.0048	.0049	.0049	.0050	.0050	.0055	.0058	.0061	.0064	.0066	.0068	.0070	.0072	.0074	.0087	667,59 *
* .90	.0054	.0054	.0054	.0055	.0055	.0056	.0061	.0065	.0068	.0071	.0074	.0076	.0079	.0081	.0083	.0098	706,86 *
* .95	.0059	.0059	.0060	.0061	.0062	.0062	.0068	.0072	.0076	.0079	.0082	.0085	.0087	.0090	.0092	.0109	746,13 *
* 1,00	.0065	.0065	.0065	.0067	.0068	.0069	.0075	.0080	.0084	.0088	.0091	.0094	.0097	.0099	.0102	.0120	785,40 *
* 1,05	.0071	.0072	.0073	.0074	.0074	.0075	.0082	.0088	.0093	.0097	.0100	.0104	.0107	.0109	.0112	.0133	824,67 *
* 1,10	.0077	.0078	.0079	.0080	.0081	.0082	.0090	.0096	.0101	.0106	.0110	.0114	.0117	.0120	.0123	.0146	863,94 *
* 1,15	.0084	.0085	.0086	.0088	.0089	.0090	.0098	.0105	.0111	.0116	.0120	.0124	.0128	.0131	.0134	.0159	903,21 *
* 1,20	.0091	.0092	.0094	.0095	.0096	.0097	.0107	.0114	.0120	.0126	.0131	.0135	.0139	.0143	.0146	.0173	942,48 *
* 1,25	.0098	.0100	.0101	.0103	.0104	.0105	.0116	.0124	.0131	.0136	.0142	.0146	.0151	.0155	.0159	.0188	981,75 *
* 1,30	.0106	.0108	.0109	.0111	.0112	.0114	.0125	.0134	.0141	.0147	.0153	.0158	.0163	.0167	.0171	.0203	1021,02 *
* 1,35	.0114	.0116	.0117	.0119	.0121	.0122	.0134	.0144	.0152	.0159	.0165	.0170	.0176	.0180	.0185	.0219	1060,29 *
* 1,40	.0122	.0124	.0126	.0128	.0129	.0131	.0144	.0155	.0163	.0171	.0177	.0183	.0189	.0194	.0199	.0236	1099,56 *
* 1,45	.0130	.0133	.0135	.0137	.0138	.0140	.0155	.0165	.0175	.0183	.0190	.0196	.0202	.0208	.0213	.0253	1138,83 *
* 1,50	.0139	.0141	.0144	.0146	.0148	.0150	.0165	.0177	.0187	.0196	.0203	.0210	.0216	.0222	.0228	.0270	1178,10 *
* 1,55	.0148	.0151	.0153	.0155	.0157	.0159	.0176	.0189	.0200	.0209	.0217	.0224	.0231	.0237	.0243	.0289	1217,37 *
* 1,60	.0157	.0160	.0163	.0165	.0167	.0169	.0188	.0201	.0213	.0222	.0231	.0239	.0246	.0253	.0259	.0307	1256,64 *
* 1,65	.0167	.0170	.0172	.0175	.0178	.0180	.0199	.0214	.0226	.0236	.0246	.0254	.0262	.0269	.0275	.0327	1295,91 *
* 1,70	.0177	.0180	.0183	.0185	.0188	.0191	.0211	.0227	.0240	.0251	.0261	.0269	.0278	.0285	.0292	.0347	1335,18 *
* 1,75	.0187	.0190	.0193	.0196	.0199	.0202	.0224	.0240	.0254	.0266	.0275	.0285	.0294	.0302	.0310	.0368	1374,45 *
* 1,80	.0197	.0201	.0204	.0207	.0210	.0213	.0236	.0254	.0268	.0281	.0292	.0302	.0311	.0320	.0327	.0389	1413,72 *
* 1,85	.0208	.0211	.0215	.0218	.0222	.0225	.0249	.0268	.0283	.0297	.0308	.0319	.0328	.0337	.0346	.0411	1452,99 *
* 1,90	.0218	.0222	.0226	.0230	.0233	.0237	.0263	.0282	.0299	.0313	.0325	.0336	.0346	.0356	.0365	.0433	1492,26 *
* 1,95	.0230	.0234	.0238	.0242	.0245	.0249	.0277	.0297	.0314	.0329	.0342	.0354	.0365	.0375	.0384	.0456	1531,53 *
* 2,00	.0241	.0246	.0250	.0254	.0258	.0261	.0291	.0313	.0331	.0346	.0360	.0372	.0384	.0394	.0404	.0480	1570,80 *
* 2,05	.0253	.0258	.0262	.0266	.0270	.0274	.0305	.0328	.0347	.0364	.0378	.0391	.0403	.0414	.0424	.0504	1610,07 *
* 2,10	.0265	.0270	.0275	.0279	.0283	.0287	.0320	.0344	.0364	.0381	.0396	.0410	.0423	.0434	.0445	.0529	1649,34 *
* 2,15	.0277	.0282	.0287	.0292	.0297	.0301	.0335	.0361	.0382	.0400	.0415	.0430	.0443	.0455	.0467	.0554	1688,61 *
* 2,20	.0289	.0295	.0300	.0305	.0310	.0315	.0351	.0377	.0399	.0418	.0435	.0450	.0464	.0476	.0488	.0580	1727,88 *
* 2,25	.0302	.0308	.0314	.0319	.0324	.0329	.0366	.0395	.0418	.0437	.0455	.0471	.0485	.0498	.0511	.0607	1767,15 *
* 2,30	.0315	.0321	.0327	.0333	.0338	.0343	.0383	.0412	.0436	.0457	.0475	.0492	.0507	.0521	.0534	.0634	1806,42 *
* 2,35	.0328	.0335	.0341	.0347	.0353	.0358	.0399	.0430	.0455	.0477	.0496	.0513	.0529	.0543	.0557	.0662	1845,69 *
* 2,40	.0342	.0349	.0355	.0362	.0367	.0373	.0414	.0448	.0475	.0497	.0517	.0535	.0551	.0567	.0581	.0691	1884,96 *
* 2,45	.0356	.0363	.0370	.0376	.0382	.0388	.0433	.0467	.0494	.0518	.0539	.0557	.0575	.0590	.0605	.0720	1924,23 *
* 2,50	.0370	.0378	.0385	.0391	.0398	.0404	.0451	.0488	.0515	.0539	.0561	.0580	.0598	.0615	.0630	.0749	1963,50 *
* 2,55	.0384	.0392	.0400	.0407	.0413	.0420	.0469	.0506	.0535	.0561	.0583	.0604	.0622	.0639	.0656	.0779	2002,77 *
* 2,60	.0399	.0407	.0415	.0422	.0429	.0436	.0487	.0525	.0556	.0583	.0605	.0627	.0647	.0665	.0681	.0810	2042,04 *
* 2,65	.0414	.0423	.0431	.0438	.0446	.0452	.0506	.0546	.0578	.0605	.0630	.0652	.0672	.0690	.0708	.0842	2081,31 *
* 2,70	.0429	.0438	.0447	.0455	.0462	.0469	.0525	.0566	.0600	.0628	.0654	.0676	.0697	.0717	.0735	.0874	2120,58 *
* 2,75	.0445	.0454	.0463	.0471	.0479	.0486	.0544	.0587	.0622	.0652	.0678	.0702	.0723	.0743	.0762	.0906	2159,85 *
* 2,80	.0460	.0470	.0479	.0488	.0496	.0504	.0564	.0609	.0645	.0675	.0703	.0727	.0750	.0771	.0790	.0940	2199,12 *
* 2,85	.0476	.0487	.0496	.0505	.0514	.0521	.0584	.0630	.0668	.0700	.0728	.0753	.0777	.0798	.0818	.0973	2238,39 *
* 2,90	.0493	.0503	.0513	.0523	.0531	.0539	.0605	.0652	.0691	.0724	.0754	.0780	.0804	.0826	.0847	.01008	2277,67 *
* 2,95	.0509	.0520	.0531	.0540	.0549	.0558	.0625	.0675	.0715	.0749	.0780	.0807	.0832	.0855	.0877	.01043	2316,93 *
* 3,00	.0526	.0536	.0548	.0558	.0568	.0577	.0646	.0698	.0739	.0775	.0806	.0834	.0860	.0884	.0906	.01078	2356,21 *

		DIAMETRO DO CONDUTO D= 1650. (MM)										ÁREA DA SEÇÃO DO CONDUTO S= ,8659 M2						LETESB	
*VELU- *		PERDA DE CARGA UNITÁRIA EM M/M																*VAZAO *	
*CIDADE *																		(L/S)	
* (M/S) *		K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1.0	K=2.0	*	
* ,30		.00006	.00007	.00007	.00007	.00007	.00007	.00007	.00007	.00008	.00008	.00008	.00008	.00009	.00009	.00009	.00010	259,77	
* ,35		.00009	.00009	.00009	.00009	.00009	.00009	.00009	.00010	.00010	.00011	.00011	.00011	.00012	.00012	.00012	.00014	303,07	
* ,40		.00011	.00011	.00011	.00011	.00011	.00011	.00012	.00013	.00013	.00014	.00014	.00015	.00015	.00015	.00016	.00018	346,36	
* ,45		.00014	.00014	.00014	.00014	.00014	.00014	.00015	.00015	.00017	.00017	.00018	.00018	.00019	.00019	.00020	.00023	389,66	
* ,50		.00017	.00017	.00017	.00017	.00017	.00017	.00019	.00020	.00020	.00022	.00022	.00023	.00023	.00024	.00024	.00029	432,95	
* ,55		.00020	.00020	.00020	.00020	.00021	.00021	.00022	.00024	.00025	.00026	.00026	.00027	.00028	.00029	.00029	.00034	476,25	
* ,60		.00023	.00024	.00024	.00024	.00024	.00024	.00026	.00028	.00029	.00030	.00031	.00032	.00033	.00034	.00035	.00041	519,54	
* ,65		.00027	.00027	.00028	.00028	.00028	.00028	.00031	.00033	.00034	.00035	.00037	.00038	.00039	.00040	.00041	.00048	562,84	
* ,70		.00031	.00032	.00032	.00032	.00032	.00033	.00035	.00038	.00039	.00041	.00042	.00044	.00045	.00046	.00047	.00056	606,13	
* ,75		.00035	.00036	.00036	.00037	.00037	.00037	.00040	.00043	.00045	.00047	.00049	.00050	.00052	.00053	.00054	.00064	649,43	
* ,80		.00040	.00041	.00041	.00041	.00042	.00042	.00045	.00049	.00051	.00053	.00055	.00057	.00059	.00060	.00062	.00073	692,72	
* ,85		.00045	.00045	.00046	.00046	.00047	.00047	.00052	.00055	.00058	.00060	.00062	.00064	.00066	.00068	.00069	.00082	736,02	
* ,90		.00050	.00051	.00051	.00052	.00052	.00053	.00058	.00061	.00064	.00067	.00070	.00072	.00074	.00076	.00078	.00092	779,31	
* ,95		.00055	.00055	.00057	.00057	.00058	.00059	.00064	.00068	.00072	.00075	.00078	.00080	.00082	.00084	.00086	.00102	822,61	
* 1,00		.00061	.00062	.00063	.00063	.00064	.00065	.00071	.00075	.00079	.00083	.00086	.00089	.00091	.00094	.00096	.00113	865,90	
* 1,05		.00067	.00068	.00069	.00069	.00070	.00071	.00078	.00083	.00087	.00091	.00094	.00098	.00100	.00103	.00106	.00125	909,20	
* 1,10		.00073	.00074	.00075	.00076	.00077	.00078	.00085	.00091	.00096	.00100	.00104	.00107	.00110	.00113	.00116	.00137	952,49	
* 1,15		.00079	.00080	.00082	.00083	.00084	.00085	.00093	.00099	.00104	.00109	.00113	.00117	.00120	.00123	.00126	.00150	995,79	
* 1,20		.00086	.00087	.00088	.00089	.00091	.00092	.00101	.00108	.00113	.00119	.00123	.00127	.00131	.00134	.00138	.00163	1039,08	
* 1,25		.00093	.00094	.00096	.00097	.00098	.00099	.00109	.00117	.00123	.00128	.00133	.00138	.00142	.00146	.00149	.00177	1082,38	
* 1,30		.00100	.00102	.00103	.00104	.00106	.00107	.00118	.00126	.00133	.00139	.00144	.00149	.00153	.00157	.00161	.00191	1125,68	
* 1,35		.00107	.00109	.00111	.00112	.00114	.00115	.00127	.00136	.00143	.00150	.00155	.00161	.00165	.00170	.00174	.00206	1168,97	
* 1,40		.00115	.00117	.00119	.00120	.00122	.00124	.00136	.00146	.00154	.00161	.00167	.00173	.00178	.00182	.00187	.00221	1212,27	
* 1,45		.00123	.00125	.00127	.00129	.00131	.00132	.00146	.00156	.00165	.00172	.00179	.00185	.00191	.00196	.00200	.00237	1255,56	
* 1,50		.00131	.00133	.00136	.00138	.00139	.00141	.00156	.00167	.00176	.00184	.00191	.00198	.00204	.00209	.00214	.00254	1298,86	
* 1,55		.00140	.00142	.00144	.00146	.00148	.00150	.00166	.00178	.00188	.00197	.00204	.00211	.00216	.00223	.00229	.00271	1342,15	
* 1,60		.00149	.00151	.00153	.00156	.00158	.00160	.00177	.00190	.00200	.00209	.00218	.00225	.00232	.00238	.00244	.00289	1385,45	
* 1,65		.00157	.00160	.00163	.00165	.00168	.00170	.00188	.00202	.00213	.00223	.00231	.00239	.00246	.00253	.00259	.00307	1428,74	
* 1,70		.00167	.00170	.00172	.00175	.00177	.00180	.00199	.00214	.00226	.00236	.00245	.00254	.00261	.00268	.00275	.00326	1472,04	
* 1,75		.00176	.00179	.00182	.00185	.00188	.00190	.00211	.00226	.00239	.00250	.00260	.00269	.00277	.00284	.00291	.00346	1515,33	
* 1,80		.00186	.00189	.00192	.00195	.00198	.00201	.00223	.00239	.00253	.00265	.00275	.00284	.00293	.00301	.00308	.00366	1558,63	
* 1,85		.00196	.00200	.00203	.00206	.00209	.00212	.00235	.00253	.00267	.00279	.00290	.00300	.00309	.00318	.00325	.00386	1601,92	
* 1,90		.00206	.00210	.00214	.00217	.00220	.00223	.00248	.00266	.00281	.00295	.00306	.00317	.00326	.00335	.00343	.00407	1645,21	
* 1,95		.00217	.00221	.00225	.00228	.00231	.00235	.00261	.00280	.00296	.00310	.00322	.00333	.00343	.00353	.00361	.00429	1688,51	
* 2,00		.00228	.00232	.00236	.00240	.00243	.00247	.00274	.00295	.00312	.00326	.00339	.00350	.00361	.00371	.00380	.00451	1731,81	
* 2,05		.00239	.00243	.00247	.00251	.00255	.00259	.00288	.00309	.00327	.00342	.00356	.00368	.00379	.00390	.00399	.00474	1775,11	
* 2,10		.00250	.00255	.00259	.00263	.00267	.00271	.00302	.00324	.00343	.00359	.00373	.00386	.00396	.00409	.00419	.00497	1818,40	
* 2,15		.00261	.00266	.00271	.00276	.00280	.00284	.00316	.00340	.00360	.00376	.00391	.00405	.00417	.00428	.00439	.00521	1861,70	
* 2,20		.00273	.00279	.00283	.00288	.00293	.00297	.00331	.00356	.00376	.00394	.00410	.00424	.00437	.00449	.00460	.00546	1904,99	
* 2,25		.00285	.00291	.00296	.00301	.00306	.00310	.00346	.00372	.00394	.00412	.00428	.00443	.00457	.00469	.00481	.00571	1948,29	
* 2,30		.00298	.00303	.00309	.00314	.00319	.00324	.00361	.00388	.00411	.00430	.00447	.00463	.00477	.00490	.00502	.00596	1991,58	
* 2,35		.00310	.00316	.00322	.00328	.00333	.00338	.00376	.00405	.00429	.00449	.00467	.00483	.00498	.00511	.00524	.00623	2034,88	
* 2,40		.00323	.00329	.00336	.00341	.00347	.00352	.00392	.00423	.00447	.00468	.00487	.00504	.00519	.00533	.00547	.00649	2078,17	
* 2,45		.00336	.00343	.00349	.00355	.00361	.00366	.00409	.00440	.00466	.00488	.00507	.00525	.00541	.00556	.00570	.00677	2121,47	
* 2,50		.00349	.00356	.00363	.00369	.00375	.00381	.00425	.00458	.00485	.00508	.00526	.00546	.00563	.00579	.00593	.00704	2164,76	
* 2,55		.00363	.00370	.00377	.00384	.00390	.00396	.00442	.00477	.00504	.00528	.00549	.00568	.00586	.00602	.00617	.00733	2208,05	
* 2,60		.00377	.00385	.00392	.00399	.00405	.00411	.00460	.00495	.00524	.00549	.00571	.00591	.00609	.00626	.00641	.00762	2251,35	
* 2,65		.00391	.00399	.00407	.00414	.00420	.00427	.00477	.00514	.00544	.00570	.00593	.00614	.00632	.00650	.00666	.00791	2294,65	
* 2,70		.00405	.00414	.00422	.00429	.00436	.00443	.00495	.00534	.00565	.00592	.00616	.00637	.00656	.00675	.00691	.00821	2337,95	
* 2,75		.00420	.00429	.00437	.00445	.00452	.00459	.00513	.00553	.00586	.00614	.00639	.00661	.00681	.00700	.00717	.00852	2381,24	
* 2,80		.00435	.00444	.00453	.00461	.00468	.00475	.00532	.00574	.00607	.00636	.00662	.00685	.00706	.00725	.00743	.00883	2424,54	
* 2,85		.00450	.00459	.00468	.00477	.00485	.00492	.00551	.00594	.00629	.00659	.00686	.00709	.00731	.00751	.00770	.00915	2467,83	
* 2,90		.00465	.00475	.00485	.00493	.00501	.00509	.00570	.00615	.00651	.00682	.00710	.00734	.00757	.00778	.00797	.00947	2511,13	
* 2,95		.00481	.00491	.00501	.00510	.00518	.00526	.00590	.00636	.00674	.00706	.00734	.00760	.00783	.00805	.00825	.00980	2554,42	
* 3,00		.00497	.00508	.00518	.00527	.00536	.00544	.00610	.00658	.00697	.00730	.00759	.00786	.00810	.00832	.00853	.01014	2597,72	

***** CETESB *****																	
DIAMETRO DO CONDUITO D= 1100. (MM) AREA DA SECAO DO CONDUITO S= ,9503 M2																	

* VELO= * PERDA DE CARGA UNITARIA EM M/M OBS: K EM MILIMETRUS * VAZAO *																	
* CIDADE * * * * * (L/S) *																	
* (M/S) *	* K=,05 *	* K=,06 *	* K=,07 *	* K=,08 *	* K=,09 *	* K=,10 *	* K=,20 *	* K=,30 *	* K=,40 *	* K=,50 *	* K=,60 *	* K=,70 *	* K=,80 *	* K=,90 *	* K=1,0 *	* K=2,0 *	* *
* ,30	.00006	.00006	.00006	.00006	.00006	.00006	.00007	.00007	.00007	.00007	.00008	.00008	.00008	.00008	.00008	.00010	285,10 *
* ,35	.00008	.00008	.00008	.00008	.00008	.00008	.00009	.00009	.00010	.00010	.00010	.00011	.00011	.00011	.00011	.00013	332,62 *
* ,40	.00010	.00011	.00011	.00011	.00011	.00011	.00011	.00012	.00013	.00013	.00013	.00014	.00014	.00014	.00015	.00017	380,13 *
* ,45	.00013	.00013	.00013	.00013	.00013	.00013	.00014	.00015	.00016	.00016	.00017	.00017	.00018	.00018	.00019	.00022	427,65 *
* ,50	.00016	.00016	.00016	.00016	.00016	.00016	.00018	.00018	.00019	.00020	.00021	.00021	.00022	.00022	.00023	.00027	475,17 *
* ,55	.00019	.00019	.00019	.00019	.00019	.00020	.00021	.00022	.00023	.00024	.00025	.00026	.00026	.00027	.00028	.00033	522,68 *
* ,60	.00022	.00022	.00023	.00023	.00023	.00023	.00025	.00026	.00028	.00029	.00030	.00031	.00031	.00032	.00033	.00039	570,20 *
* ,65	.00026	.00026	.00026	.00026	.00027	.00027	.00029	.00031	.00032	.00033	.00035	.00036	.00037	.00038	.00038	.00045	617,72 *
* ,70	.00030	.00030	.00030	.00030	.00031	.00031	.00033	.00035	.00037	.00039	.00040	.00041	.00042	.00044	.00045	.00052	665,23 *
* ,75	.00034	.00034	.00034	.00035	.00035	.00035	.00038	.00041	.00043	.00044	.00046	.00047	.00049	.00050	.00051	.00060	712,75 *
* ,80	.00038	.00038	.00039	.00039	.00040	.00040	.00043	.00046	.00048	.00050	.00052	.00054	.00055	.00057	.00058	.00068	760,27 *
* ,85	.00042	.00043	.00043	.00044	.00044	.00045	.00049	.00052	.00054	.00057	.00059	.00061	.00062	.00064	.00065	.00077	807,78 *
* ,90	.00047	.00048	.00048	.00049	.00050	.00050	.00054	.00058	.00061	.00063	.00066	.00068	.00070	.00072	.00073	.00087	855,30 *
* ,95	.00052	.00053	.00054	.00054	.00055	.00055	.00060	.00064	.00068	.00071	.00073	.00076	.00078	.00080	.00082	.00096	902,82 *
* 1,00	.00058	.00058	.00059	.00060	.00061	.00061	.00067	.00071	.00075	.00078	.00081	.00084	.00086	.00088	.00090	.00107	950,33 *
* 1,05	.00063	.00064	.00065	.00066	.00066	.00067	.00073	.00078	.00082	.00086	.00089	.00092	.00095	.00097	.00100	.00118	997,85 *
* 1,10	.00069	.00070	.00071	.00072	.00073	.00073	.00080	.00086	.00090	.00094	.00098	.00101	.00104	.00107	.00109	.00129	1045,37 *
* 1,15	.00075	.00076	.00077	.00078	.00079	.00080	.00088	.00094	.00099	.00103	.00107	.00110	.00114	.00117	.00119	.00141	1092,88 *
* 1,20	.00081	.00083	.00084	.00085	.00086	.00087	.00095	.00102	.00107	.00112	.00116	.00120	.00124	.00127	.00130	.00154	1140,40 *
* 1,25	.00088	.00089	.00090	.00092	.00093	.00094	.00103	.00110	.00116	.00121	.00126	.00130	.00134	.00137	.00141	.00167	1187,92 *
* 1,30	.00095	.00096	.00098	.00099	.00100	.00101	.00111	.00119	.00126	.00131	.00136	.00141	.00145	.00149	.00152	.00180	1235,43 *
* 1,35	.00102	.00103	.00105	.00106	.00108	.00109	.00120	.00128	.00135	.00141	.00147	.00152	.00156	.00160	.00164	.00194	1282,95 *
* 1,40	.00109	.00111	.00112	.00114	.00115	.00117	.00129	.00138	.00145	.00152	.00158	.00163	.00168	.00172	.00176	.00209	1330,47 *
* 1,45	.00117	.00118	.00120	.00122	.00124	.00125	.00138	.00148	.00156	.00163	.00169	.00175	.00180	.00185	.00189	.00224	1377,98 *
* 1,50	.00124	.00126	.00128	.00130	.00132	.00134	.00147	.00158	.00167	.00174	.00181	.00187	.00192	.00198	.00202	.00240	1425,50 *
* 1,55	.00132	.00135	.00137	.00139	.00140	.00142	.00157	.00168	.00178	.00186	.00193	.00199	.00205	.00211	.00216	.00256	1473,02 *
* 1,60	.00141	.00143	.00145	.00147	.00149	.00151	.00167	.00179	.00189	.00198	.00206	.00212	.00219	.00225	.00230	.00273	1520,54 *
* 1,65	.00149	.00152	.00154	.00156	.00159	.00161	.00178	.00191	.00201	.00210	.00218	.00226	.00233	.00239	.00245	.00290	1568,05 *
* 1,70	.00158	.00161	.00163	.00166	.00168	.00170	.00188	.00202	.00213	.00223	.00232	.00240	.00247	.00253	.00260	.00308	1615,57 *
* 1,75	.00167	.00170	.00173	.00175	.00178	.00180	.00199	.00214	.00226	.00236	.00246	.00254	.00261	.00268	.00275	.00326	1663,09 *
* 1,80	.00176	.00179	.00182	.00185	.00188	.00190	.00211	.00226	.00239	.00250	.00260	.00268	.00276	.00284	.00291	.00345	1710,60 *
* 1,85	.00186	.00189	.00192	.00195	.00198	.00200	.00222	.00239	.00252	.00264	.00274	.00283	.00292	.00300	.00307	.00364	1758,12 *
* 1,90	.00195	.00199	.00202	.00205	.00208	.00211	.00234	.00252	.00266	.00278	.00289	.00299	.00308	.00316	.00324	.00384	1805,64 *
* 1,95	.00205	.00209	.00213	.00216	.00219	.00222	.00247	.00265	.00280	.00293	.00304	.00315	.00324	.00333	.00341	.00404	1853,15 *
* 2,00	.00215	.00219	.00223	.00227	.00230	.00233	.00259	.00279	.00294	.00308	.00320	.00331	.00341	.00350	.00359	.00425	1900,67 *
* 2,05	.00226	.00230	.00234	.00238	.00241	.00245	.00272	.00292	.00309	.00324	.00336	.00348	.00358	.00368	.00377	.00447	1948,19 *
* 2,10	.00237	.00241	.00245	.00249	.00253	.00256	.00285	.00307	.00324	.00339	.00353	.00365	.00376	.00386	.00395	.00469	1995,70 *
* 2,15	.00247	.00252	.00257	.00261	.00265	.00269	.00299	.00321	.00340	.00356	.00370	.00382	.00394	.00404	.00414	.00491	2043,22 *
* 2,20	.00259	.00264	.00268	.00273	.00277	.00281	.00313	.00336	.00356	.00372	.00387	.00400	.00412	.00423	.00434	.00515	2090,74 *
* 2,25	.00270	.00275	.00280	.00285	.00289	.00293	.00327	.00352	.00372	.00389	.00405	.00418	.00431	.00443	.00454	.00538	2138,25 *
* 2,30	.00282	.00287	.00292	.00297	.00302	.00306	.00341	.00367	.00388	.00407	.00423	.00437	.00450	.00463	.00474	.00562	2185,77 *
* 2,35	.00294	.00299	.00305	.00310	.00315	.00319	.00356	.00383	.00405	.00424	.00441	.00456	.00470	.00483	.00495	.00587	2233,29 *
* 2,40	.00306	.00312	.00318	.00323	.00328	.00333	.00371	.00399	.00423	.00442	.00460	.00476	.00490	.00504	.00516	.00612	2280,80 *
* 2,45	.00318	.00324	.00330	.00336	.00341	.00346	.00386	.00416	.00440	.00461	.00479	.00496	.00511	.00525	.00538	.00638	2328,32 *
* 2,50	.00331	.00337	.00344	.00350	.00355	.00360	.00402	.00433	.00458	.00480	.00499	.00516	.00532	.00546	.00560	.00664	2375,84 *
* 2,55	.00344	.00351	.00357	.00363	.00369	.00375	.00418	.00450	.00477	.00499	.00519	.00537	.00553	.00568	.00582	.00691	2423,36 *
* 2,60	.00357	.00364	.00371	.00377	.00383	.00389	.00435	.00468	.00495	.00519	.00539	.00558	.00575	.00591	.00605	.00718	2470,87 *
* 2,65	.00370	.00378	.00385	.00392	.00398	.00404	.00451	.00486	.00515	.00539	.00560	.00580	.00597	.00614	.00629	.00746	2518,39 *
* 2,70	.00384	.00392	.00399	.00406	.00413	.00419	.00468	.00504	.00534	.00559	.00581	.00602	.00620	.00637	.00653	.00775	2565,91 *
* 2,75	.00397	.00406	.00414	.00421	.00428	.00434	.00485	.00523	.00554	.00580	.00603	.00624	.00643	.00661	.00677	.00803	2613,42 *
* 2,80	.00412	.00420	.00428	.00436	.00443	.00450	.00503	.00542	.00574	.00601	.00625	.00647	.00666	.00685	.00702	.00833	2660,94 *
* 2,85	.00426	.00435	.00443	.00451	.00459	.00466	.00521	.00562	.00595	.00623	.00648	.00670	.00690	.00709	.00727	.00863	2708,46 *
* 2,90	.00440	.00450	.00459	.00467	.00474	.00482	.00539	.00581	.00615	.00645	.00670	.00694	.00715	.00734	.00753	.00893	2755,97 *
* 2,95	.00455	.00465	.00474	.00483	.00491	.00498	.00558	.00601	.00637	.00667	.00694	.00718	.00739	.00760	.00779	.00924	2803,49 *
* 3,00	.00470	.00480	.00490	.00499	.00507	.00515	.00576	.00622	.00658	.00690	.00717	.00742	.00765	.00786	.00805	.00956	2851,01 *

***** DIAMETRO DO CONDUTO D= 1150, (MM) AREA DA SECAO DO CONDUTO S= 1,0387 M2 ***** LEIESB **

* VELO- *		PERDA DE CARGA UNITARIA EM M/M																OBS: K EM MILIMETROS		* VAZAO *
* CIDADE *																				* (L/S) *
* (M/S) *		K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0			
* ,30	,00006	,00006	,00006	,00006	,00006	,00006	,00006	,00007	,00007	,00007	,00007	,00007	,00007	,00008	,00008	,00008	,00009	311,61		
* ,35	,00006	,00006	,00006	,00006	,00006	,00006	,00006	,00009	,00009	,00009	,00010	,00010	,00010	,00011	,00011	,00011	,00013	363,54		
* ,40	,00010	,00010	,00010	,00010	,00010	,00010	,00010	,00011	,00011	,00012	,00012	,00013	,00013	,00013	,00014	,00014	,00016	415,48		
* ,45	,00012	,00012	,00012	,00013	,00013	,00013	,00013	,00014	,00014	,00015	,00015	,00016	,00016	,00017	,00017	,00018	,00021	467,41		
* ,50	,00015	,00015	,00015	,00015	,00015	,00016	,00017	,00018	,00018	,00019	,00020	,00020	,00020	,00021	,00021	,00022	,00025	519,35		
* ,55	,00018	,00018	,00018	,00018	,00018	,00019	,00020	,00021	,00022	,00023	,00024	,00024	,00024	,00025	,00026	,00026	,00031	571,28		
* ,60	,00021	,00021	,00021	,00022	,00022	,00022	,00024	,00025	,00026	,00027	,00028	,00029	,00030	,00030	,00031	,00031	,00037	623,21		
* ,65	,00024	,00025	,00025	,00025	,00025	,00026	,00028	,00029	,00031	,00032	,00033	,00034	,00035	,00036	,00036	,00043	675,15			
* ,70	,00028	,00028	,00029	,00029	,00029	,00029	,00032	,00034	,00035	,00037	,00038	,00039	,00040	,00041	,00042	,00050	727,08			
* ,75	,00032	,00032	,00033	,00033	,00033	,00034	,00036	,00038	,00040	,00042	,00043	,00045	,00046	,00047	,00048	,00057	779,02			
* ,80	,00036	,00036	,00037	,00037	,00038	,00038	,00041	,00044	,00046	,00048	,00049	,00051	,00052	,00054	,00055	,00065	830,95			
* ,85	,00040	,00041	,00041	,00042	,00042	,00043	,00046	,00049	,00052	,00054	,00056	,00057	,00059	,00061	,00062	,00073	882,89			
* ,90	,00045	,00045	,00046	,00046	,00047	,00047	,00052	,00055	,00058	,00060	,00062	,00064	,00066	,00068	,00069	,00082	934,82			
* ,95	,00050	,00050	,00051	,00052	,00052	,00053	,00057	,00061	,00064	,00067	,00069	,00072	,00074	,00075	,00077	,00091	986,76			
* 1,00	,00055	,00055	,00056	,00057	,00057	,00058	,00063	,00067	,00071	,00074	,00077	,00079	,00081	,00084	,00086	,00101	1038,69			
* 1,05	,00060	,00061	,00062	,00062	,00063	,00064	,00070	,00074	,00078	,00081	,00084	,00087	,00090	,00092	,00094	,00111	1090,63			
* 1,10	,00065	,00066	,00067	,00068	,00069	,00070	,00076	,00081	,00086	,00089	,00093	,00096	,00098	,00101	,00103	,00122	1142,56			
* 1,15	,00071	,00072	,00073	,00074	,00075	,00076	,00083	,00089	,00093	,00098	,00101	,00104	,00107	,00110	,00113	,00133	1194,49			
* 1,20	,00077	,00078	,00079	,00080	,00081	,00082	,00090	,00096	,00102	,00106	,00110	,00114	,00117	,00120	,00123	,00145	1246,43			
* 1,25	,00083	,00085	,00086	,00087	,00088	,00089	,00098	,00105	,00110	,00115	,00119	,00123	,00127	,00130	,00133	,00157	1298,36			
* 1,30	,00090	,00091	,00093	,00094	,00095	,00096	,00106	,00113	,00119	,00124	,00129	,00133	,00137	,00141	,00144	,00170	1350,30			
* 1,35	,00097	,00098	,00099	,00101	,00102	,00103	,00114	,00122	,00128	,00134	,00139	,00144	,00148	,00152	,00155	,00184	1402,23			
* 1,40	,00103	,00105	,00107	,00108	,00110	,00111	,00122	,00131	,00138	,00144	,00149	,00154	,00159	,00163	,00167	,00197	1454,17			
* 1,45	,00111	,00112	,00114	,00116	,00117	,00119	,00131	,00140	,00148	,00154	,00160	,00165	,00170	,00175	,00179	,00212	1506,10			
* 1,50	,00118	,00120	,00122	,00123	,00125	,00127	,00140	,00150	,00158	,00165	,00171	,00177	,00182	,00187	,00192	,00227	1558,04			
* 1,55	,00125	,00126	,00130	,00131	,00133	,00135	,00149	,00160	,00168	,00176	,00183	,00189	,00194	,00200	,00204	,00242	1609,97			
* 1,60	,00133	,00136	,00138	,00140	,00142	,00144	,00159	,00170	,00179	,00187	,00195	,00201	,00207	,00213	,00218	,00258	1661,91			
* 1,65	,00141	,00144	,00146	,00148	,00150	,00152	,00168	,00181	,00191	,00199	,00207	,00214	,00220	,00226	,00232	,00274	1713,84			
* 1,70	,00150	,00152	,00155	,00157	,00159	,00161	,00179	,00191	,00202	,00211	,00219	,00227	,00234	,00240	,00246	,00291	1765,78			
* 1,75	,00158	,00161	,00164	,00166	,00168	,00171	,00189	,00203	,00214	,00224	,00232	,00240	,00247	,00254	,00260	,00308	1817,71			
* 1,80	,00167	,00170	,00173	,00175	,00178	,00180	,00200	,00214	,00226	,00237	,00246	,00254	,00262	,00269	,00275	,00326	1869,65			
* 1,85	,00176	,00179	,00182	,00185	,00188	,00190	,00211	,00226	,00239	,00250	,00260	,00268	,00276	,00284	,00291	,00344	1921,58			
* 1,90	,00185	,00189	,00192	,00195	,00198	,00200	,00222	,00239	,00252	,00264	,00274	,00283	,00291	,00299	,00307	,00363	1973,52			
* 1,95	,00195	,00198	,00202	,00205	,00208	,00211	,00234	,00251	,00265	,00277	,00288	,00298	,00307	,00315	,00323	,00382	2025,45			
* 2,00	,00204	,00208	,00212	,00215	,00218	,00221	,00246	,00264	,00279	,00292	,00303	,00313	,00323	,00331	,00340	,00402	2077,39			
* 2,05	,00214	,00218	,00222	,00225	,00229	,00232	,00258	,00277	,00293	,00306	,00318	,00329	,00339	,00348	,00357	,00423	2129,32			
* 2,10	,00224	,00229	,00233	,00236	,00240	,00243	,00270	,00291	,00307	,00321	,00334	,00345	,00356	,00365	,00374	,00443	2181,25			
* 2,15	,00235	,00239	,00243	,00247	,00251	,00255	,00283	,00305	,00322	,00337	,00350	,00362	,00373	,00383	,00392	,00465	2233,19			
* 2,20	,00245	,00250	,00255	,00259	,00263	,00266	,00296	,00319	,00337	,00353	,00366	,00379	,00390	,00401	,00411	,00486	2285,12			
* 2,25	,00256	,00261	,00266	,00270	,00274	,00278	,00310	,00333	,00352	,00369	,00383	,00396	,00408	,00419	,00429	,00509	2337,06			
* 2,30	,00267	,00273	,00277	,00282	,00286	,00290	,00323	,00348	,00368	,00385	,00400	,00414	,00426	,00438	,00449	,00532	2388,99			
* 2,35	,00279	,00284	,00289	,00294	,00299	,00303	,00337	,00363	,00384	,00402	,00418	,00432	,00445	,00457	,00468	,00555	2440,93			
* 2,40	,00290	,00296	,00301	,00306	,00311	,00316	,00352	,00379	,00400	,00419	,00436	,00450	,00464	,00477	,00488	,00579	2492,86			
* 2,45	,00302	,00308	,00314	,00319	,00324	,00329	,00366	,00394	,00417	,00437	,00454	,00469	,00483	,00497	,00509	,00603	2544,80			
* 2,50	,00314	,00320	,00326	,00332	,00337	,00342	,00381	,00410	,00434	,00454	,00472	,00489	,00503	,00517	,00530	,00628	2596,73			
* 2,55	,00326	,00333	,00339	,00345	,00350	,00355	,00396	,00427	,00452	,00473	,00491	,00508	,00524	,00538	,00551	,00653	2648,67			
* 2,60	,00338	,00345	,00352	,00358	,00364	,00369	,00412	,00444	,00469	,00491	,00511	,00528	,00544	,00559	,00573	,00679	2700,60			
* 2,65	,00351	,00358	,00365	,00371	,00377	,00383	,00428	,00461	,00487	,00510	,00531	,00549	,00565	,00581	,00595	,00705	2752,54			
* 2,70	,00364	,00372	,00379	,00385	,00391	,00397	,00444	,00478	,00506	,00530	,00551	,00569	,00587	,00603	,00618	,00732	2804,47			
* 2,75	,00377	,00385	,00392	,00399	,00406	,00412	,00460	,00496	,00525	,00549	,00571	,00591	,00609	,00625	,00641	,00760	2856,41			
* 2,80	,00391	,00399	,00406	,00413	,00420	,00427	,00477	,00514	,00544	,00569	,00592	,00612	,00631	,00648	,00664	,00787	2908,34			
* 2,85	,00404	,00413	,00421	,00428	,00435	,00442	,00494	,00532	,00563	,00590	,00613	,00634	,00654	,00671	,00688	,00816	2960,28			
* 2,90	,00418	,00427	,00435	,00443	,00450	,00457	,00511	,00551	,00583	,00611	,00635	,00657	,00677	,00695	,00712	,00845	3012,21			
* 2,95	,00432	,00441	,00450	,00458	,00465	,00472	,00529	,00570	,00603	,00632	,00657	,00679	,00700	,00719	,00737	,00874	3064,15			
* 3,00	,00446	,00456	,00465	,00473	,00481	,00488	,00546	,00589	,00624	,00653	,00679	,00703	,00724	,00744	,00762	,00904	3116,08			

***** CETESB **																	
DIAMETRO DO CONDUTO D= 1200. (MM) AREA DA SECAO DO CONDUTO S= 1,1310 M2																	
VELO *	PERDA DE CARGA UNITARIA EM M/M															OBS: K EM MILIMETROS	VAZAO *
CIDADE *																	(L/S) *
(M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0 *	
* ,30	.00006	.00006	.00006	.00006	.00006	.00006	.00006	.00006	.00006	.00007	.00007	.00007	.00007	.00007	.00008	.00009	339,29 *
* ,35	.00007	.00007	.00007	.00007	.00008	.00008	.00008	.00008	.00009	.00009	.00009	.00010	.00010	.00010	.00010	.00012	395,84 *
* ,40	.00009	.00009	.00010	.00010	.00010	.00010	.00010	.00011	.00011	.00012	.00012	.00012	.00013	.00013	.00013	.00015	452,39 *
* ,45	.00012	.00012	.00012	.00012	.00012	.00012	.00013	.00014	.00014	.00015	.00015	.00016	.00016	.00016	.00017	.00020	508,94 *
* ,50	.00014	.00014	.00014	.00015	.00015	.00015	.00016	.00017	.00017	.00018	.00019	.00019	.00020	.00020	.00021	.00024	565,49 *
* ,55	.00017	.00017	.00017	.00017	.00018	.00018	.00019	.00020	.00021	.00022	.00022	.00023	.00024	.00024	.00025	.00029	622,04 *
* ,60	.00020	.00020	.00020	.00021	.00021	.00021	.00022	.00024	.00025	.00026	.00027	.00027	.00028	.00029	.00030	.00035	678,58 *
* ,65	.00023	.00023	.00024	.00024	.00024	.00024	.00026	.00028	.00029	.00030	.00031	.00032	.00033	.00034	.00035	.00041	735,13 *
* ,70	.00027	.00027	.00027	.00027	.00028	.00028	.00030	.00032	.00033	.00035	.00036	.00037	.00038	.00039	.00040	.00047	791,68 *
* ,75	.00030	.00031	.00031	.00031	.00032	.00032	.00034	.00037	.00038	.00040	.00041	.00043	.00044	.00045	.00046	.00054	848,23 *
* ,80	.00034	.00035	.00035	.00035	.00036	.00036	.00039	.00041	.00043	.00045	.00047	.00048	.00050	.00051	.00052	.00061	904,78 *
* ,85	.00038	.00039	.00039	.00040	.00040	.00040	.00044	.00047	.00049	.00051	.00053	.00054	.00056	.00057	.00059	.00069	961,33 *
* ,90	.00043	.00043	.00044	.00044	.00045	.00045	.00049	.00052	.00055	.00057	.00059	.00061	.00063	.00064	.00066	.00078	1017,88 *
* ,95	.00047	.00048	.00048	.00049	.00050	.00050	.00054	.00058	.00061	.00063	.00066	.00068	.00070	.00072	.00073	.00086	1074,43 *
* 1,00	.00052	.00053	.00053	.00054	.00055	.00055	.00060	.00064	.00067	.00070	.00073	.00075	.00077	.00079	.00081	.00096	1130,97 *
* 1,05	.00057	.00058	.00059	.00059	.00060	.00061	.00066	.00071	.00074	.00077	.00080	.00083	.00085	.00087	.00089	.00105	1187,52 *
* 1,10	.00062	.00063	.00064	.00065	.00066	.00066	.00072	.00077	.00081	.00085	.00088	.00091	.00093	.00096	.00098	.00116	1244,07 *
* 1,15	.00068	.00069	.00070	.00071	.00071	.00072	.00079	.00084	.00089	.00093	.00096	.00099	.00102	.00105	.00107	.00126	1300,62 *
* 1,20	.00073	.00074	.00076	.00076	.00077	.00078	.00086	.00092	.00096	.00101	.00104	.00108	.00111	.00114	.00117	.00138	1357,17 *
* 1,25	.00079	.00081	.00082	.00083	.00084	.00085	.00093	.00099	.00105	.00109	.00113	.00117	.00120	.00123	.00126	.00149	1413,72 *
* 1,30	.00085	.00087	.00088	.00089	.00090	.00091	.00100	.00107	.00113	.00118	.00122	.00126	.00130	.00133	.00137	.00161	1470,27 *
* 1,35	.00092	.00093	.00095	.00096	.00097	.00098	.00108	.00115	.00122	.00127	.00132	.00136	.00140	.00144	.00147	.00174	1526,82 *
* 1,40	.00098	.00100	.00101	.00103	.00104	.00105	.00116	.00124	.00131	.00137	.00142	.00146	.00151	.00155	.00158	.00187	1583,37 *
* 1,45	.00105	.00107	.00108	.00110	.00111	.00113	.00124	.00133	.00140	.00146	.00152	.00157	.00162	.00166	.00170	.00201	1639,92 *
* 1,50	.00112	.00114	.00116	.00117	.00119	.00120	.00133	.00142	.00150	.00157	.00163	.00168	.00173	.00177	.00182	.00215	1696,46 *
* 1,55	.00119	.00121	.00123	.00125	.00127	.00128	.00142	.00152	.00160	.00167	.00173	.00179	.00184	.00189	.00194	.00229	1753,01 *
* 1,60	.00127	.00129	.00131	.00133	.00135	.00136	.00151	.00161	.00170	.00178	.00185	.00191	.00196	.00202	.00207	.00244	1809,56 *
* 1,65	.00135	.00137	.00139	.00141	.00143	.00145	.00160	.00171	.00181	.00189	.00196	.00203	.00209	.00214	.00220	.00260	1866,11 *
* 1,70	.00142	.00145	.00147	.00149	.00151	.00153	.00170	.00182	.00192	.00201	.00208	.00215	.00222	.00228	.00233	.00276	1922,66 *
* 1,75	.00151	.00153	.00156	.00158	.00160	.00162	.00180	.00193	.00203	.00213	.00221	.00228	.00235	.00241	.00247	.00292	1979,21 *
* 1,80	.00159	.00162	.00164	.00167	.00169	.00171	.00190	.00204	.00215	.00225	.00233	.00241	.00248	.00255	.00261	.00309	2035,76 *
* 1,85	.00167	.00170	.00173	.00176	.00178	.00181	.00200	.00215	.00227	.00237	.00246	.00255	.00262	.00269	.00276	.00326	2092,31 *
* 1,90	.00176	.00179	.00182	.00185	.00188	.00190	.00211	.00227	.00239	.00250	.00260	.00269	.00277	.00284	.00291	.00344	2148,86 *
* 1,95	.00185	.00189	.00192	.00195	.00198	.00200	.00222	.00238	.00252	.00263	.00274	.00283	.00291	.00299	.00306	.00362	2205,41 *
* 2,00	.00194	.00198	.00201	.00204	.00207	.00210	.00233	.00251	.00265	.00277	.00288	.00297	.00306	.00314	.00322	.00381	2261,95 *
* 2,05	.00204	.00208	.00211	.00215	.00218	.00221	.00245	.00263	.00278	.00291	.00302	.00312	.00322	.00330	.00338	.00400	2318,50 *
* 2,10	.00213	.00217	.00221	.00225	.00228	.00231	.00257	.00276	.00292	.00305	.00317	.00328	.00338	.00347	.00355	.00420	2375,05 *
* 2,15	.00223	.00228	.00232	.00235	.00239	.00242	.00269	.00289	.00306	.00320	.00332	.00343	.00354	.00363	.00372	.00440	2431,60 *
* 2,20	.00233	.00238	.00242	.00246	.00250	.00253	.00282	.00303	.00320	.00335	.00348	.00359	.00370	.00380	.00390	.00461	2488,15 *
* 2,25	.00244	.00248	.00253	.00257	.00261	.00265	.00294	.00316	.00335	.00350	.00364	.00376	.00387	.00398	.00407	.00482	2544,70 *
* 2,30	.00254	.00259	.00264	.00268	.00272	.00276	.00307	.00331	.00349	.00366	.00380	.00393	.00405	.00415	.00426	.00504	2601,25 *
* 2,35	.00265	.00270	.00275	.00280	.00284	.00288	.00321	.00345	.00365	.00382	.00396	.00410	.00422	.00434	.00444	.00526	2657,80 *
* 2,40	.00276	.00281	.00286	.00291	.00296	.00300	.00334	.00360	.00380	.00398	.00413	.00427	.00440	.00452	.00463	.00549	2714,35 *
* 2,45	.00287	.00293	.00298	.00303	.00308	.00312	.00348	.00375	.00396	.00415	.00431	.00445	.00459	.00471	.00483	.00572	2770,90 *
* 2,50	.00298	.00304	.00310	.00315	.00320	.00325	.00362	.00390	.00412	.00431	.00448	.00464	.00478	.00491	.00503	.00595	2827,45 *
* 2,55	.00310	.00316	.00322	.00328	.00333	.00338	.00377	.00405	.00429	.00449	.00466	.00482	.00497	.00510	.00523	.00619	2883,99 *
* 2,60	.00322	.00328	.00335	.00340	.00346	.00351	.00391	.00421	.00446	.00466	.00485	.00501	.00516	.00530	.00543	.00644	2940,54 *
* 2,65	.00334	.00341	.00347	.00353	.00359	.00364	.00406	.00438	.00463	.00484	.00504	.00521	.00536	.00551	.00564	.00669	2997,09 *
* 2,70	.00346	.00353	.00360	.00366	.00372	.00378	.00422	.00454	.00480	.00503	.00523	.00540	.00557	.00572	.00586	.00694	3053,64 *
* 2,75	.00359	.00366	.00373	.00380	.00386	.00391	.00437	.00471	.00498	.00522	.00542	.00561	.00578	.00593	.00608	.00720	3110,19 *
* 2,80	.00371	.00379	.00386	.00393	.00400	.00406	.00453	.00488	.00516	.00541	.00562	.00581	.00599	.00615	.00630	.00746	3166,74 *
* 2,85	.00384	.00392	.00400	.00407	.00414	.00420	.00469	.00505	.00535	.00560	.00582	.00602	.00620	.00637	.00653	.00773	3223,29 *
* 2,90	.00397	.00406	.00414	.00421	.00428	.00434	.00486	.00523	.00554	.00580	.00603	.00623	.00642	.00659	.00678	.00800	3279,84 *
* 2,95	.00411	.00420	.00428	.00435	.00442	.00449	.00502	.00541	.00573	.00600	.00623	.00645	.00664	.00682	.00699	.00828	3336,39 *
* 3,00	.00424	.00434	.00442	.00450	.00457	.00464	.00519	.00560	.00592	.00620	.00645	.00667	.00687	.00706	.00723	.00857	3392,93 *

VELO	PERUA DE CARGA UNITARIA EM M/M																VAZAO
CIDADE	JBS: K EM MILIMETROS																(L/S)
(M/S)	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	
* ,30	.00005	.00005	.00005	.00005	.00005	.00005	.00005	.00006	.00006	.00006	.00006	.00006	.00007	.00007	.00007	.00008	398,29
* ,35	.00007	.00007	.00007	.00007	.00007	.00007	.00007	.00008	.00008	.00008	.00008	.00009	.00009	.00009	.00009	.00011	464,56
* ,40	.00009	.00009	.00009	.00009	.00009	.00009	.00009	.00010	.00010	.00010	.00010	.00011	.00011	.00012	.00012	.00014	530,93
* ,45	.00011	.00011	.00011	.00011	.00011	.00011	.00012	.00012	.00013	.00013	.00013	.00014	.00014	.00015	.00015	.00018	597,30
* ,50	.00013	.00013	.00013	.00013	.00013	.00013	.00014	.00015	.00016	.00016	.00017	.00017	.00018	.00018	.00019	.00022	663,06
* ,55	.00015	.00016	.00016	.00016	.00016	.00016	.00017	.00018	.00019	.00020	.00020	.00021	.00021	.00022	.00023	.00026	730,03
* ,60	.00018	.00018	.00018	.00019	.00019	.00019	.00020	.00021	.00022	.00023	.00024	.00025	.00026	.00026	.00027	.00031	796,40
* ,65	.00021	.00021	.00021	.00022	.00022	.00022	.00024	.00025	.00026	.00027	.00028	.00029	.00030	.00031	.00031	.00037	862,78
* ,70	.00024	.00024	.00025	.00025	.00025	.00025	.00027	.00029	.00030	.00032	.00033	.00034	.00035	.00035	.00036	.00043	929,13
* ,75	.00028	.00028	.00028	.00028	.00029	.00029	.00031	.00033	.00035	.00036	.00037	.00039	.00040	.00041	.00042	.00049	995,49
* ,80	.00031	.00031	.00032	.00032	.00032	.00033	.00035	.00038	.00039	.00041	.00043	.00044	.00045	.00046	.00047	.00055	1061,86
* ,85	.00035	.00035	.00036	.00036	.00036	.00037	.00040	.00042	.00044	.00046	.00048	.00049	.00051	.00052	.00053	.00063	1128,23
* ,90	.00039	.00039	.00040	.00040	.00041	.00041	.00045	.00047	.00050	.00052	.00054	.00055	.00057	.00058	.00060	.00070	1194,59
* ,95	.00043	.00044	.00044	.00045	.00045	.00045	.00049	.00053	.00055	.00058	.00060	.00062	.00063	.00065	.00066	.00078	1260,96
* 1,00	.00047	.00048	.00049	.00049	.00050	.00050	.00055	.00058	.00061	.00064	.00066	.00068	.00070	.00072	.00074	.00087	1327,33
* 1,05	.00052	.00053	.00053	.00054	.00055	.00055	.00060	.00064	.00067	.00070	.00073	.00075	.00077	.00079	.00081	.00095	1393,69
* 1,10	.00057	.00057	.00058	.00059	.00060	.00060	.00066	.00070	.00074	.00077	.00080	.00082	.00085	.00087	.00089	.00105	1460,06
* 1,15	.00062	.00063	.00063	.00064	.00065	.00066	.00072	.00077	.00081	.00084	.00087	.00090	.00092	.00095	.00097	.00114	1526,42
* 1,20	.00067	.00068	.00069	.00070	.00070	.00071	.00078	.00083	.00088	.00091	.00095	.00098	.00101	.00103	.00106	.00124	1592,79
* 1,25	.00072	.00073	.00074	.00075	.00076	.00077	.00084	.00090	.00095	.00099	.00103	.00106	.00109	.00112	.00114	.00135	1659,16
* 1,30	.00078	.00079	.00080	.00081	.00082	.00083	.00091	.00097	.00103	.00107	.00111	.00115	.00118	.00121	.00124	.00146	1725,52
* 1,35	.00084	.00085	.00086	.00087	.00088	.00089	.00098	.00105	.00110	.00115	.00120	.00123	.00127	.00130	.00133	.00157	1791,89
* 1,40	.00090	.00091	.00092	.00093	.00095	.00096	.00105	.00113	.00119	.00124	.00129	.00133	.00137	.00140	.00143	.00169	1858,26
* 1,45	.00096	.00097	.00099	.00100	.00101	.00103	.00113	.00121	.00127	.00133	.00138	.00142	.00146	.00150	.00154	.00181	1924,62
* 1,50	.00102	.00104	.00105	.00107	.00108	.00109	.00121	.00129	.00136	.00142	.00147	.00152	.00157	.00161	.00165	.00194	1990,99
* 1,55	.00109	.00110	.00112	.00114	.00115	.00117	.00129	.00138	.00145	.00152	.00157	.00162	.00167	.00172	.00176	.00207	2057,36
* 1,60	.00115	.00117	.00119	.00121	.00123	.00124	.00137	.00147	.00155	.00161	.00167	.00173	.00178	.00183	.00187	.00221	2123,72
* 1,65	.00122	.00124	.00126	.00128	.00130	.00132	.00145	.00156	.00164	.00172	.00178	.00184	.00189	.00194	.00199	.00235	2190,09
* 1,70	.00130	.00132	.00134	.00136	.00138	.00140	.00154	.00165	.00174	.00182	.00189	.00195	.00201	.00206	.00211	.00249	2256,46
* 1,75	.00137	.00139	.00142	.00144	.00146	.00148	.00163	.00175	.00184	.00193	.00200	.00207	.00213	.00218	.00224	.00264	2322,82
* 1,80	.00145	.00147	.00149	.00152	.00154	.00156	.00172	.00185	.00195	.00204	.00212	.00219	.00225	.00231	.00237	.00279	2389,19
* 1,85	.00152	.00155	.00158	.00160	.00162	.00164	.00182	.00195	.00206	.00215	.00223	.00231	.00238	.00244	.00250	.00295	2455,56
* 1,90	.00160	.00163	.00166	.00168	.00171	.00173	.00192	.00206	.00217	.00227	.00236	.00243	.00251	.00257	.00263	.00311	2521,92
* 1,95	.00169	.00172	.00174	.00177	.00180	.00182	.00202	.00216	.00229	.00239	.00248	.00256	.00264	.00271	.00277	.00328	2588,29
* 2,00	.00177	.00180	.00183	.00186	.00189	.00191	.00212	.00228	.00240	.00251	.00261	.00270	.00278	.00285	.00292	.00345	2654,66
* 2,05	.00185	.00189	.00192	.00195	.00198	.00201	.00223	.00239	.00252	.00264	.00274	.00283	.00292	.00299	.00306	.00362	2721,02
* 2,10	.00194	.00198	.00201	.00204	.00207	.00210	.00233	.00251	.00265	.00277	.00287	.00297	.00306	.00314	.00322	.00380	2787,39
* 2,15	.00203	.00207	.00211	.00214	.00217	.00220	.00244	.00263	.00277	.00290	.00301	.00311	.00321	.00329	.00337	.00398	2853,76
* 2,20	.00212	.00216	.00220	.00224	.00227	.00230	.00256	.00275	.00290	.00304	.00315	.00326	.00336	.00344	.00353	.00417	2920,12
* 2,25	.00222	.00226	.00230	.00234	.00237	.00241	.00267	.00287	.00304	.00317	.00330	.00341	.00351	.00360	.00369	.00436	2986,49
* 2,30	.00231	.00236	.00240	.00244	.00248	.00251	.00279	.00300	.00317	.00332	.00344	.00356	.00367	.00376	.00385	.00456	3052,86
* 2,35	.00241	.00246	.00250	.00254	.00258	.00262	.00291	.00313	.00331	.00346	.00359	.00372	.00383	.00393	.00402	.00478	3119,22
* 2,40	.00251	.00256	.00261	.00265	.00269	.00273	.00304	.00326	.00345	.00361	.00375	.00387	.00399	.00410	.00420	.00496	3185,59
* 2,45	.00261	.00266	.00271	.00276	.00280	.00284	.00316	.00340	.00359	.00376	.00391	.00404	.00416	.00427	.00437	.00517	3251,96
* 2,50	.00272	.00277	.00282	.00287	.00291	.00295	.00329	.00354	.00374	.00391	.00407	.00420	.00433	.00444	.00455	.00538	3318,32
* 2,55	.00282	.00288	.00293	.00298	.00303	.00307	.00342	.00368	.00389	.00407	.00423	.00437	.00450	.00462	.00474	.00560	3384,69
* 2,60	.00293	.00299	.00304	.00310	.00314	.00319	.00356	.00383	.00404	.00423	.00440	.00454	.00468	.00481	.00492	.00582	3451,06
* 2,65	.00304	.00310	.00316	.00321	.00326	.00331	.00369	.00397	.00420	.00439	.00457	.00472	.00486	.00499	.00511	.00605	3517,42
* 2,70	.00315	.00322	.00328	.00333	.00338	.00343	.00383	.00412	.00436	.00456	.00474	.00490	.00505	.00518	.00531	.00628	3583,79
* 2,75	.00326	.00333	.00339	.00345	.00351	.00356	.00397	.00428	.00452	.00473	.00492	.00508	.00523	.00537	.00550	.00651	3650,16
* 2,80	.00338	.00345	.00352	.00358	.00363	.00369	.00412	.00443	.00469	.00490	.00509	.00527	.00542	.00557	.00571	.00675	3716,52
* 2,85	.00350	.00357	.00364	.00370	.00376	.00382	.00426	.00459	.00485	.00508	.00528	.00546	.00562	.00577	.00591	.00699	3782,89
* 2,90	.00362	.00369	.00376	.00383	.00389	.00395	.00441	.00475	.00502	.00526	.00546	.00565	.00582	.00597	.00612	.00724	3849,25
* 2,95	.00374	.00382	.00389	.00396	.00402	.00408	.00456	.00491	.00520	.00544	.00565	.00584	.00602	.00618	.00633	.00749	3915,62
* 3,00	.00386	.00394	.00402	.00409	.00416	.00422	.00472	.00508	.00537	.00562	.00584	.00604	.00622	.00639	.00655	.00775	3981,99

DIAMETRO DO CONDUITO D= 1400, (MM)

AREA DA SECAO DO CONDUITO S= 1,539384 M2

58

* VELO *	PERDA DE CARGA UNITARIA EM M/M																OBS: K EM MILIMETROS	* VAZAO *
* CIDADE *																		(L/S)
* (M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0		
* ,30	,00005	,00005	,00005	,00005	,00005	,00005	,00005	,00005	,00005	,00006	,00006	,00006	,00006	,00006	,00006	,00007		461,82 *
* ,35	,00006	,00006	,00006	,00006	,00006	,00006	,00007	,00007	,00007	,00007	,00008	,00008	,00008	,00008	,00008	,00010		538,78 *
* ,40	,00008	,00008	,00008	,00008	,00008	,00008	,00009	,00009	,00009	,00010	,00010	,00010	,00010	,00011	,00011	,00013		615,75 *
* ,45	,00010	,00010	,00010	,00010	,00010	,00010	,00011	,00011	,00012	,00012	,00013	,00013	,00013	,00014	,00014	,00016		692,72 *
* ,50	,00012	,00012	,00012	,00012	,00012	,00012	,00013	,00014	,00014	,00015	,00015	,00016	,00016	,00017	,00017	,00020		769,69 *
* ,55	,00014	,00014	,00014	,00015	,00015	,00015	,00016	,00017	,00017	,00018	,00019	,00019	,00020	,00020	,00021	,00024		846,66 *
* ,60	,00017	,00017	,00017	,00017	,00017	,00017	,00019	,00020	,00021	,00021	,00022	,00023	,00023	,00024	,00024	,00029		923,63 *
* ,65	,00019	,00020	,00020	,00020	,00020	,00020	,00022	,00023	,00024	,00025	,00026	,00027	,00027	,00028	,00029	,00033		1000,60 *
* ,70	,00022	,00022	,00023	,00023	,00023	,00023	,00025	,00027	,00028	,00029	,00030	,00031	,00032	,00032	,00033	,00039		1077,57 *
* ,75	,00025	,00026	,00026	,00026	,00026	,00027	,00029	,00030	,00032	,00033	,00034	,00035	,00036	,00037	,00038	,00044		1154,54 *
* ,80	,00028	,00029	,00029	,00029	,00030	,00030	,00032	,00034	,00036	,00038	,00039	,00040	,00041	,00042	,00043	,00051		1231,51 *
* ,85	,00032	,00032	,00033	,00033	,00033	,00034	,00036	,00039	,00041	,00042	,00044	,00045	,00046	,00048	,00049	,00057		1308,48 *
* ,90	,00036	,00036	,00036	,00037	,00037	,00038	,00041	,00043	,00045	,00047	,00049	,00050	,00052	,00053	,00054	,00064		1385,44 *
* ,95	,00039	,00040	,00040	,00041	,00041	,00042	,00045	,00048	,00051	,00053	,00054	,00056	,00058	,00059	,00061	,00071		1462,41 *
* 1,00	,00043	,00044	,00044	,00045	,00045	,00046	,00050	,00053	,00056	,00058	,00060	,00062	,00064	,00066	,00067	,00079		1539,38 *
* 1,05	,00048	,00048	,00049	,00049	,00050	,00050	,00055	,00059	,00062	,00064	,00066	,00069	,00070	,00072	,00074	,00087		1616,35 *
* 1,10	,00052	,00053	,00053	,00054	,00055	,00055	,00060	,00064	,00067	,00070	,00073	,00075	,00077	,00079	,00081	,00095		1693,32 *
* 1,15	,00056	,00057	,00058	,00059	,00059	,00060	,00066	,00070	,00074	,00077	,00080	,00082	,00084	,00087	,00089	,00104		1770,29 *
* 1,20	,00061	,00062	,00063	,00064	,00064	,00065	,00071	,00076	,00080	,00083	,00086	,00089	,00092	,00094	,00096	,00113		1847,26 *
* 1,25	,00066	,00067	,00068	,00069	,00070	,00071	,00077	,00082	,00087	,00090	,00094	,00097	,00100	,00102	,00104	,00123		1924,23 *
* 1,30	,00071	,00072	,00073	,00074	,00075	,00076	,00083	,00089	,00094	,00098	,00101	,00105	,00108	,00110	,00113	,00133		2001,20 *
* 1,35	,00077	,00078	,00079	,00080	,00081	,00082	,00090	,00096	,00101	,00105	,00109	,00113	,00116	,00119	,00122	,00143		2078,17 *
* 1,40	,00082	,00083	,00084	,00086	,00087	,00088	,00096	,00103	,00108	,00113	,00117	,00121	,00125	,00128	,00131	,00154		2155,14 *
* 1,45	,00088	,00089	,00090	,00092	,00093	,00094	,00103	,00110	,00116	,00121	,00126	,00130	,00134	,00137	,00140	,00165		2232,11 *
* 1,50	,00094	,00095	,00096	,00098	,00099	,00100	,00110	,00118	,00124	,00130	,00135	,00139	,00143	,00147	,00150	,00177		2309,08 *
* 1,55	,00100	,00101	,00103	,00104	,00106	,00107	,00118	,00126	,00133	,00138	,00144	,00148	,00153	,00157	,00160	,00189		2386,05 *
* 1,60	,00106	,00108	,00109	,00111	,00112	,00114	,00125	,00134	,00141	,00147	,00153	,00158	,00163	,00167	,00171	,00201		2463,02 *
* 1,65	,00112	,00114	,00116	,00117	,00119	,00121	,00133	,00142	,00150	,00157	,00163	,00168	,00173	,00177	,00182	,00214		2539,99 *
* 1,70	,00119	,00121	,00123	,00124	,00126	,00128	,00141	,00151	,00159	,00166	,00173	,00178	,00183	,00188	,00193	,00227		2616,96 *
* 1,75	,00126	,00128	,00130	,00132	,00133	,00135	,00149	,00160	,00169	,00176	,00183	,00189	,00194	,00199	,00204	,00241		2693,92 *
* 1,80	,00133	,00135	,00137	,00139	,00141	,00143	,00158	,00169	,00178	,00186	,00193	,00200	,00205	,00211	,00216	,00254		2770,89 *
* 1,85	,00140	,00142	,00144	,00147	,00149	,00151	,00166	,00178	,00188	,00197	,00204	,00211	,00217	,00223	,00228	,00269		2847,86 *
* 1,90	,00147	,00150	,00152	,00154	,00156	,00159	,00175	,00186	,00198	,00207	,00215	,00222	,00229	,00235	,00240	,00283		2924,83 *
* 1,95	,00154	,00157	,00160	,00162	,00165	,00167	,00185	,00198	,00209	,00218	,00227	,00234	,00241	,00247	,00253	,00299		3001,80 *
* 2,00	,00162	,00165	,00168	,00170	,00173	,00175	,00194	,00208	,00220	,00230	,00236	,00246	,00253	,00260	,00266	,00314		3078,77 *
* 2,05	,00170	,00173	,00176	,00179	,00181	,00184	,00204	,00219	,00231	,00241	,00250	,00259	,00268	,00273	,00280	,00330		3155,74 *
* 2,10	,00178	,00181	,00184	,00187	,00190	,00193	,00214	,00229	,00242	,00253	,00263	,00271	,00279	,00287	,00293	,00346		3232,71 *
* 2,15	,00186	,00190	,00193	,00196	,00199	,00202	,00224	,00240	,00254	,00265	,00275	,00284	,00293	,00300	,00308	,00363		3309,68 *
* 2,20	,00195	,00198	,00202	,00205	,00208	,00211	,00234	,00251	,00265	,00277	,00288	,00298	,00306	,00314	,00322	,00380		3386,65 *
* 2,25	,00203	,00207	,00211	,00214	,00217	,00220	,00245	,00263	,00277	,00290	,00301	,00311	,00320	,00329	,00337	,00397		3463,62 *
* 2,30	,00212	,00216	,00220	,00223	,00227	,00230	,00256	,00274	,00290	,00303	,00315	,00325	,00335	,00344	,00352	,00415		3540,59 *
* 2,35	,00221	,00225	,00229	,00233	,00237	,00240	,00267	,00286	,00302	,00316	,00328	,00339	,00349	,00359	,00367	,00433		3617,56 *
* 2,40	,00230	,00235	,00239	,00243	,00246	,00250	,00278	,00299	,00315	,00330	,00342	,00354	,00364	,00374	,00383	,00452		3694,53 *
* 2,45	,00239	,00244	,00249	,00253	,00257	,00260	,00289	,00311	,00329	,00344	,00357	,00369	,00380	,00390	,00399	,00471		3771,50 *
* 2,50	,00249	,00254	,00258	,00263	,00267	,00271	,00301	,00324	,00342	,00358	,00371	,00384	,00395	,00406	,00415	,00490		3848,47 *
* 2,55	,00259	,00264	,00269	,00273	,00277	,00281	,00313	,00337	,00356	,00372	,00386	,00399	,00411	,00422	,00432	,00510		3925,44 *
* 2,60	,00269	,00274	,00279	,00284	,00288	,00292	,00325	,00350	,00370	,00387	,00402	,00415	,00427	,00439	,00449	,00530		4002,41 *
* 2,65	,00279	,00284	,00289	,00294	,00299	,00303	,00338	,00363	,00384	,00402	,00417	,00431	,00444	,00456	,00467	,00551		4079,38 *
* 2,70	,00289	,00295	,00300	,00305	,00310	,00315	,00351	,00377	,00398	,00417	,00433	,00447	,00461	,00473	,00484	,00572		4156,35 *
* 2,75	,00299	,00305	,00311	,00316	,00321	,00326	,00363	,00391	,00413	,00432	,00449	,00464	,00478	,00490	,00502	,00593		4233,31 *
* 2,80	,00310	,00316	,00322	,00328	,00333	,00338	,00377	,00405	,00428	,00448	,00465	,00481	,00495	,00508	,00521	,00615		4310,28 *
* 2,85	,00321	,00327	,00333	,00339	,00345	,00350	,00390	,00420	,00444	,00464	,00482	,00496	,00513	,00527	,00539	,00637		4387,25 *
* 2,90	,00332	,00338	,00345	,00351	,00356	,00362	,00404	,00434	,00459	,00480	,00499	,00516	,00531	,00545	,00558	,00659		4464,22 *
* 2,95	,00343	,00350	,00357	,00363	,00369	,00374	,00418	,00449	,00475	,00497	,00516	,00534	,00550	,00564	,00578	,00682		4541,19 *
* 3,00	,00354	,00362	,00368	,00375	,00381	,00387	,00432	,00465	,00491	,00514	,00534	,00552	,00568	,00583	,00598	,00706		4618,16 *

DIAMETRO DO CONDUITO D= 1500, (MM)

ÁREA DA SEÇÃO DO CONDUITO S= 1.767150 m²

LETESB

VELO-*	PERDA DE CARGA UNITARIA EM M/M															QBS: K	EM MILIMETROS	VAZÃO
CIDADE*																		(L/S)
(M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	*	
* ,30	.00004	.00004	.00004	.00004	.00004	.00004	.00005	.00005	.00005	.00005	.00005	.00005	.00005	.00006	.00006	.00007	539,15 *	
* ,35	.00006	.00006	.00006	.00006	.00006	.00006	.00006	.00006	.00007	.00007	.00007	.00007	.00007	.00008	.00008	.00009	616,59 *	
* ,40	.00007	.00007	.00007	.00007	.00007	.00007	.00008	.00008	.00009	.00009	.00009	.00009	.00010	.00010	.00010	.00012	708,86 *	
* ,45	.00009	.00009	.00009	.00009	.00009	.00009	.00010	.00010	.00011	.00011	.00012	.00012	.00012	.00013	.00013	.00015	795,22 *	
* ,50	.00011	.00011	.00011	.00011	.00011	.00011	.00012	.00013	.00013	.00014	.00014	.00015	.00015	.00015	.00016	.00018	883,57 *	
* ,55	.00013	.00013	.00013	.00013	.00013	.00014	.00015	.00015	.00016	.00017	.00017	.00018	.00018	.00018	.00019	.00022	971,93 *	
* ,60	.00015	.00015	.00016	.00016	.00016	.00016	.00017	.00018	.00019	.00020	.00020	.00021	.00021	.00022	.00022	.00026	1060,29 *	
* ,65	.00018	.00018	.00018	.00018	.00018	.00019	.00020	.00021	.00022	.00023	.00024	.00024	.00025	.00026	.00026	.00031	1148,65 *	
* ,70	.00020	.00021	.00021	.00021	.00021	.00021	.00023	.00024	.00026	.00027	.00027	.00028	.00029	.00030	.00030	.00036	1237,00 *	
* ,75	.00023	.00024	.00024	.00024	.00024	.00024	.00026	.00028	.00029	.00030	.00031	.00032	.00033	.00034	.00035	.00041	1325,36 *	
* ,80	.00026	.00027	.00027	.00027	.00027	.00028	.00030	.00032	.00033	.00034	.00036	.00037	.00038	.00039	.00040	.00046	1413,72 *	
* ,85	.00029	.00030	.00030	.00030	.00031	.00031	.00034	.00036	.00037	.00039	.00040	.00041	.00043	.00044	.00045	.00052	1502,08 *	
* ,90	.00033	.00033	.00034	.00034	.00034	.00035	.00038	.00040	.00042	.00043	.00045	.00046	.00048	.00049	.00050	.00059	1590,43 *	
* ,95	.00036	.00037	.00037	.00038	.00038	.00042	.00044	.00046	.00048	.00050	.00052	.00053	.00054	.00056	.00056	.00065	1678,79 *	
* 1,00	.00040	.00040	.00041	.00041	.00042	.00042	.00046	.00049	.00051	.00054	.00055	.00057	.00059	.00060	.00062	.00072	1767,15 *	
* 1,05	.00044	.00044	.00045	.00045	.00046	.00046	.00051	.00054	.00057	.00059	.00061	.00063	.00065	.00066	.00068	.00080	1855,51 *	
* 1,10	.00048	.00049	.00049	.00050	.00050	.00051	.00055	.00059	.00062	.00065	.00067	.00069	.00071	.00073	.00077	.00090	1943,86 *	
* 1,15	.00052	.00053	.00053	.00054	.00055	.00055	.00060	.00064	.00068	.00071	.00073	.00075	.00078	.00079	.00081	.00096	2032,22 *	
* 1,20	.00056	.00057	.00058	.00059	.00059	.00060	.00066	.00070	.00074	.00077	.00080	.00082	.00084	.00086	.00088	.00104	2120,58 *	
* 1,25	.00061	.00062	.00063	.00064	.00064	.00065	.00071	.00076	.00080	.00083	.00086	.00089	.00091	.00094	.00096	.00113	2208,94 *	
* 1,30	.00066	.00067	.00068	.00068	.00069	.00070	.00077	.00082	.00086	.00090	.00093	.00096	.00099	.00101	.00104	.00122	2297,30 *	
* 1,35	.00071	.00072	.00073	.00074	.00075	.00075	.00083	.00088	.00093	.00097	.00100	.00104	.00107	.00109	.00112	.00131	2385,65 *	
* 1,40	.00076	.00077	.00078	.00079	.00080	.00081	.00089	.00095	.00100	.00104	.00108	.00111	.00115	.00117	.00120	.00141	2474,01 *	
* 1,45	.00081	.00082	.00083	.00084	.00086	.00087	.00095	.00102	.00107	.00112	.00116	.00119	.00123	.00126	.00129	.00152	2562,37 *	
* 1,50	.00086	.00088	.00089	.00090	.00091	.00092	.00102	.00109	.00114	.00119	.00124	.00128	.00131	.00135	.00138	.00162	2650,73 *	
* 1,55	.00092	.00093	.00095	.00096	.00097	.00098	.00108	.00116	.00122	.00127	.00132	.00136	.00140	.00144	.00147	.00173	2739,08 *	
* 1,60	.00098	.00099	.00101	.00102	.00103	.00105	.00115	.00123	.00130	.00136	.00141	.00145	.00149	.00153	.00157	.00185	2827,44 *	
* 1,65	.00103	.00105	.00107	.00108	.00110	.00111	.00122	.00131	.00138	.00144	.00149	.00154	.00159	.00163	.00167	.00196	2915,79 *	
* 1,70	.00110	.00111	.00113	.00115	.00116	.00118	.00130	.00139	.00146	.00153	.00159	.00164	.00168	.00173	.00177	.00208	3004,15 *	
* 1,75	.00116	.00118	.00120	.00121	.00123	.00125	.00137	.00147	.00155	.00162	.00168	.00173	.00178	.00183	.00187	.00221	3092,52 *	
* 1,80	.00122	.00124	.00126	.00128	.00130	.00132	.00145	.00156	.00164	.00171	.00176	.00183	.00189	.00194	.00198	.00233	3180,87 *	
* 1,85	.00129	.00131	.00133	.00135	.00137	.00139	.00153	.00164	.00173	.00181	.00188	.00194	.00199	.00205	.00209	.00247	3269,23 *	
* 1,90	.00136	.00138	.00140	.00142	.00144	.00146	.00162	.00173	.00183	.00191	.00198	.00204	.00210	.00216	.00221	.00260	3357,59 *	
* 1,95	.00142	.00145	.00147	.00150	.00152	.00154	.00170	.00182	.00192	.00201	.00208	.00215	.00221	.00227	.00233	.00274	3445,95 *	
* 2,00	.00150	.00152	.00155	.00157	.00159	.00161	.00179	.00192	.00202	.00211	.00219	.00226	.00233	.00239	.00245	.00286	3534,30 *	
* 2,05	.00157	.00160	.00162	.00165	.00167	.00169	.00188	.00201	.00212	.00222	.00230	.00238	.00245	.00251	.00257	.00303	3622,66 *	
* 2,10	.00164	.00167	.00170	.00173	.00175	.00178	.00197	.00211	.00223	.00233	.00241	.00249	.00257	.00263	.00270	.00316	3711,02 *	
* 2,15	.00172	.00175	.00178	.00181	.00183	.00186	.00206	.00221	.00233	.00244	.00253	.00261	.00269	.00276	.00282	.00333	3799,38 *	
* 2,20	.00180	.00183	.00186	.00189	.00192	.00194	.00216	.00231	.00244	.00255	.00265	.00273	.00281	.00289	.00296	.00348	3887,74 *	
* 2,25	.00187	.00191	.00194	.00197	.00200	.00203	.00225	.00242	.00255	.00267	.00277	.00286	.00294	.00302	.00309	.00364	3976,09 *	
* 2,30	.00196	.00199	.00203	.00206	.00209	.00212	.00235	.00253	.00267	.00279	.00289	.00299	.00307	.00315	.00323	.00381	4064,45 *	
* 2,35	.00204	.00208	.00211	.00215	.00218	.00221	.00245	.00264	.00278	.00291	.00302	.00312	.00321	.00329	.00337	.00397	4152,81 *	
* 2,40	.00212	.00216	.00220	.00224	.00227	.00230	.00256	.00275	.00290	.00303	.00315	.00325	.00335	.00343	.00352	.00415	4241,17 *	
* 2,45	.00221	.00225	.00229	.00233	.00236	.00240	.00266	.00286	.00302	.00316	.00328	.00339	.00349	.00358	.00366	.00432	4329,53 *	
* 2,50	.00230	.00234	.00238	.00242	.00246	.00249	.00277	.00298	.00315	.00329	.00341	.00353	.00363	.00373	.00382	.00450	4417,88 *	
* 2,55	.00239	.00243	.00248	.00252	.00256	.00259	.00288	.00310	.00327	.00342	.00355	.00367	.00378	.00388	.00397	.00468	4506,24 *	
* 2,60	.00248	.00253	.00257	.00261	.00265	.00269	.00300	.00322	.00340	.00356	.00369	.00381	.00393	.00403	.00413	.00486	4594,60 *	
* 2,65	.00257	.00262	.00267	.00271	.00275	.00279	.00311	.00334	.00353	.00369	.00383	.00396	.00408	.00418	.00429	.00505	4682,96 *	
* 2,70	.00266	.00272	.00277	.00281	.00286	.00290	.00323	.00347	.00367	.00383	.00398	.00411	.00423	.00434	.00445	.00524	4771,31 *	
* 2,75	.00276	.00282	.00287	.00292	.00296	.00300	.00335	.00360	.00380	.00397	.00413	.00426	.00439	.00451	.00461	.00544	4859,67 *	
* 2,80	.00286	.00292	.00297	.00302	.00307	.00311	.00347	.00373	.00394	.00412	.00428	.00442	.00455	.00467	.00478	.00564	4948,03 *	
* 2,85	.00296	.00302	.00307	.00313	.00318	.00322	.00359	.00386	.00408	.00427	.00443	.00458	.00471	.00484	.00495	.00584	5036,39 *	
* 2,90	.00306	.00312	.00318	.00323	.00329	.00333	.00372	.00400	.00422	.00442	.00459	.00474	.00488	.00501	.00513	.00605	5124,75 *	
* 2,95	.00316	.00323	.00329	.00334	.00340	.00345	.00384	.00414	.00437	.00457	.00475	.00490	.00505	.00518	.00531	.00626	5213,10 *	
* 3,00	.00327	.00333	.00340	.00346	.00351	.00356	.00397	.00428	.00452	.00473	.00491	.00507	.00522	.00536	.00549	.00647	5301,46 *	

***** CETESB ****																	
DIAMETRO DO CONDUTO D= 1600. (MM) AREA DA SECAO DO CONDUTO S= 2,010625 M2																	
VELO	PERDA DE CARGA UNITARIA EM M/M															*VAZAO*	
CIDADE	OBS: K EM MILIMETROS															(L/S)	
(M/S)	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	
* ,30	,00004	,00004	,00004	,00004	,00004	,00004	,00004	,00004	,00005	,00005	,00005	,00005	,00005	,00005	,00005	,00006	603,19
* ,35	,00005	,00005	,00005	,00005	,00005	,00005	,00006	,00006	,00006	,00006	,00007	,00007	,00007	,00007	,00007	,00008	703,72
* ,40	,00007	,00007	,00007	,00007	,00007	,00007	,00007	,00008	,00008	,00008	,00008	,00009	,00009	,00009	,00009	,00011	804,25
* ,45	,00008	,00008	,00008	,00009	,00009	,00009	,00009	,00010	,00010	,00010	,00011	,00011	,00011	,00011	,00012	,00014	904,78
* ,50	,00010	,00010	,00010	,00010	,00010	,00011	,00011	,00012	,00012	,00013	,00013	,00013	,00014	,00014	,00014	,00017	1005,31
* ,55	,00012	,00012	,00012	,00012	,00012	,00013	,00013	,00014	,00015	,00015	,00016	,00016	,00017	,00017	,00017	,00020	1105,84
* ,60	,00014	,00014	,00014	,00015	,00015	,00015	,00016	,00017	,00017	,00018	,00019	,00019	,00020	,00020	,00021	,00024	1206,37
* ,65	,00016	,00017	,00017	,00017	,00017	,00017	,00019	,00020	,00020	,00021	,00022	,00023	,00023	,00024	,00024	,00028	1306,90
* ,70	,00019	,00019	,00019	,00020	,00020	,00020	,00021	,00023	,00024	,00025	,00025	,00026	,00027	,00027	,00028	,00033	1407,44
* ,75	,00022	,00022	,00022	,00022	,00022	,00023	,00024	,00026	,00027	,00028	,00029	,00030	,00031	,00031	,00032	,00038	1507,97
* ,80	,00024	,00025	,00025	,00025	,00025	,00026	,00028	,00029	,00031	,00032	,00033	,00034	,00035	,00036	,00037	,00043	1608,50
* ,85	,00027	,00028	,00028	,00028	,00028	,00029	,00031	,00033	,00035	,00036	,00037	,00038	,00039	,00040	,00041	,00048	1709,03
* ,90	,00030	,00031	,00031	,00031	,00032	,00032	,00035	,00037	,00039	,00040	,00042	,00043	,00044	,00045	,00046	,00054	1809,56
* ,95	,00034	,00034	,00034	,00035	,00035	,00036	,00039	,00041	,00043	,00045	,00046	,00046	,00049	,00050	,00051	,00060	1910,09
* 1,00	,00037	,00038	,00038	,00038	,00039	,00039	,00043	,00045	,00046	,00050	,00051	,00053	,00054	,00056	,00057	,00067	2010,62
* 1,05	,00041	,00041	,00042	,00042	,00043	,00043	,00047	,00050	,00052	,00055	,00056	,00058	,00060	,00061	,00063	,00073	2111,15
* 1,10	,00044	,00045	,00046	,00046	,00047	,00047	,00051	,00055	,00057	,00060	,00062	,00064	,00066	,00067	,00069	,00081	2211,68
* 1,15	,00048	,00049	,00050	,00050	,00051	,00051	,00056	,00060	,00063	,00065	,00068	,00070	,00072	,00073	,00075	,00088	2312,22
* 1,20	,00052	,00053	,00054	,00054	,00055	,00056	,00061	,00065	,00068	,00071	,00074	,00076	,00078	,00080	,00082	,00096	2412,75
* 1,25	,00057	,00057	,00058	,00059	,00060	,00060	,00066	,00070	,00074	,00077	,00080	,00082	,00085	,00087	,00089	,00104	2513,28
* 1,30	,00061	,00062	,00063	,00063	,00064	,00065	,00071	,00076	,00080	,00083	,00086	,00089	,00091	,00094	,00096	,00112	2613,81
* 1,35	,00065	,00066	,00067	,00068	,00069	,00070	,00077	,00082	,00086	,00090	,00093	,00096	,00098	,00101	,00103	,00121	2714,34
* 1,40	,00070	,00071	,00072	,00073	,00074	,00075	,00082	,00088	,00092	,00096	,00100	,00103	,00106	,00109	,00111	,00130	2814,87
* 1,45	,00075	,00076	,00077	,00078	,00079	,00080	,00088	,00094	,00099	,00103	,00107	,00110	,00113	,00116	,00119	,00140	2915,41
* 1,50	,00080	,00081	,00082	,00084	,00085	,00086	,00094	,00100	,00106	,00110	,00114	,00118	,00121	,00124	,00127	,00150	3015,94
* 1,55	,00085	,00086	,00088	,00089	,00090	,00091	,00100	,00107	,00113	,00118	,00122	,00126	,00130	,00133	,00136	,00160	3116,47
* 1,60	,00090	,00092	,00093	,00095	,00096	,00097	,00107	,00114	,00120	,00125	,00130	,00134	,00138	,00142	,00145	,00170	3217,00
* 1,65	,00096	,00097	,00099	,00100	,00102	,00103	,00113	,00121	,00128	,00133	,00138	,00143	,00147	,00150	,00154	,00181	3317,53
* 1,70	,00102	,00103	,00105	,00106	,00108	,00109	,00120	,00129	,00135	,00141	,00147	,00151	,00156	,00160	,00163	,00192	3418,06
* 1,75	,00107	,00109	,00111	,00112	,00114	,00115	,00127	,00136	,00143	,00150	,00155	,00160	,00165	,00169	,00173	,00204	3518,59
* 1,80	,00113	,00115	,00117	,00119	,00120	,00122	,00134	,00144	,00152	,00158	,00164	,00170	,00174	,00179	,00183	,00215	3619,12
* 1,85	,00119	,00121	,00123	,00125	,00127	,00129	,00142	,00152	,00160	,00167	,00173	,00179	,00184	,00189	,00193	,00227	3719,66
* 1,90	,00126	,00128	,00130	,00132	,00134	,00135	,00150	,00160	,00169	,00176	,00183	,00189	,00194	,00199	,00204	,00240	3820,19
* 1,95	,00132	,00134	,00137	,00139	,00141	,00142	,00157	,00169	,00178	,00186	,00193	,00199	,00205	,00210	,00215	,00253	3920,72
* 2,00	,00139	,00141	,00143	,00146	,00148	,00150	,00165	,00177	,00187	,00195	,00202	,00209	,00215	,00221	,00226	,00266	4021,25
* 2,05	,00145	,00148	,00150	,00153	,00155	,00157	,00174	,00186	,00196	,00205	,00213	,00220	,00226	,00232	,00237	,00279	4121,79
* 2,10	,00152	,00155	,00158	,00160	,00162	,00164	,00182	,00195	,00206	,00215	,00223	,00230	,00237	,00243	,00249	,00293	4222,31
* 2,15	,00159	,00162	,00165	,00167	,00170	,00172	,00191	,00204	,00216	,00225	,00234	,00241	,00248	,00255	,00261	,00307	4322,85
* 2,20	,00166	,00170	,00172	,00175	,00178	,00180	,00200	,00214	,00226	,00236	,00245	,00253	,00260	,00267	,00273	,00321	4423,38
* 2,25	,00174	,00177	,00180	,00183	,00186	,00188	,00209	,00224	,00236	,00247	,00256	,00264	,00272	,00279	,00286	,00336	4523,91
* 2,30	,00181	,00185	,00188	,00191	,00194	,00196	,00218	,00234	,00247	,00258	,00267	,00276	,00284	,00292	,00298	,00351	4624,44
* 2,35	,00189	,00193	,00196	,00199	,00202	,00205	,00227	,00244	,00257	,00269	,00279	,00288	,00297	,00304	,00311	,00367	4724,97
* 2,40	,00197	,00201	,00204	,00207	,00210	,00213	,00237	,00254	,00266	,00278	,00291	,00301	,00309	,00317	,00325	,00382	4825,50
* 2,45	,00205	,00209	,00212	,00216	,00219	,00222	,00247	,00265	,00278	,00292	,00303	,00313	,00322	,00331	,00338	,00396	4926,04
* 2,50	,00213	,00217	,00221	,00224	,00228	,00231	,00257	,00276	,00291	,00304	,00316	,00326	,00335	,00344	,00352	,00415	5026,57
* 2,55	,00221	,00225	,00229	,00233	,00237	,00240	,00267	,00287	,00303	,00316	,00328	,00339	,00349	,00358	,00367	,00432	5127,10
* 2,60	,00230	,00234	,00238	,00242	,00246	,00249	,00277	,00298	,00315	,00329	,00341	,00352	,00363	,00372	,00381	,00449	5227,63
* 2,65	,00238	,00243	,00247	,00251	,00255	,00259	,00288	,00309	,00327	,00341	,00354	,00366	,00377	,00387	,00396	,00466	5328,16
* 2,70	,00247	,00252	,00256	,00261	,00265	,00269	,00299	,00321	,00339	,00354	,00368	,00380	,00391	,00401	,00411	,00484	5428,69
* 2,75	,00256	,00261	,00266	,00270	,00274	,00278	,00310	,00333	,00352	,00368	,00382	,00394	,00406	,00416	,00426	,00502	5529,22
* 2,80	,00265	,00270	,00275	,00280	,00284	,00288	,00321	,00345	,00364	,00381	,00395	,00409	,00420	,00431	,00442	,00520	5629,75
* 2,85	,00274	,00280	,00285	,00290	,00294	,00299	,00333	,00357	,00377	,00395	,00410	,00423	,00436	,00447	,00458	,00539	5730,29
* 2,90	,00283	,00289	,00295	,00300	,00304	,00309	,00344	,00370	,00391	,00408	,00424	,00438	,00451	,00463	,00474	,00558	5830,82
* 2,95	,00293	,00299	,00305	,00310	,00315	,00319	,00356	,00383	,00404	,00423	,00439	,00453	,00467	,00479	,00490	,00577	5931,35
* 3,00	,00303	,00309	,00315	,00320	,00325	,00330	,00368	,00396	,00418	,00437	,00454	,00469	,00482	,00495	,00507	,00597	6031,88

DIAMETRO DO CONDUTO D= 1700, (MM)

AREA DA SECAO DO CONDUTO S= 2,269805 M²

CE-ESB

* VELO *	PERDA DE CARGA UNITARIA EM M/H																* VAZAO *
	UBS: K EM MILIMETROS																
* CIDADE *																	* (L/S) *
* (M/8) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0	
* ,30	.00004	.00004	.00004	.00004	.00004	.00004	.00004	.00004	.00004	.00004	.00004	.00005	.00005	.00005	.00005	.00006	680,94
* ,35	.00005	.00005	.00005	.00005	.00005	.00005	.00005	.00006	.00006	.00006	.00006	.00006	.00006	.00007	.00007	.00008	794,43
* ,40	.00006	.00006	.00006	.00006	.00006	.00006	.00007	.00007	.00007	.00008	.00008	.00008	.00008	.00008	.00009	.00010	907,92
* ,45	.00008	.00008	.00008	.00008	.00008	.00008	.00009	.00009	.00009	.00010	.00010	.00010	.00010	.00011	.00011	.00013	1021,41
* ,50	.00009	.00009	.00010	.00010	.00010	.00010	.00010	.00011	.00011	.00012	.00012	.00013	.00013	.00013	.00013	.00016	1134,90
* ,55	.00011	.00011	.00011	.00012	.00012	.00012	.00012	.00013	.00014	.00014	.00015	.00015	.00015	.00016	.00016	.00019	1248,39
* ,60	.00013	.00013	.00013	.00014	.00014	.00014	.00015	.00016	.00016	.00017	.00017	.00018	.00018	.00019	.00019	.00022	1361,88
* ,65	.00015	.00016	.00016	.00016	.00016	.00016	.00017	.00018	.00019	.00020	.00020	.00021	.00022	.00022	.00022	.00026	1475,37
* ,70	.00018	.00018	.00018	.00018	.00018	.00018	.00020	.00021	.00022	.00023	.00024	.00024	.00025	.00025	.00026	.00030	1588,86
* ,75	.00020	.00020	.00020	.00021	.00021	.00021	.00023	.00024	.00025	.00026	.00027	.00028	.00029	.00029	.00030	.00035	1702,35
* ,80	.00023	.00023	.00023	.00023	.00024	.00024	.00026	.00027	.00029	.00030	.00031	.00032	.00032	.00033	.00034	.00040	1815,84
* ,85	.00025	.00026	.00026	.00026	.00027	.00027	.00029	.00031	.00032	.00033	.00035	.00036	.00037	.00038	.00045	.00045	1929,33
* ,90	.00028	.00029	.00029	.00029	.00030	.00030	.00032	.00034	.00036	.00037	.00039	.00040	.00041	.00042	.00043	.00050	2042,82
* ,95	.00031	.00032	.00032	.00032	.00033	.00033	.00036	.00038	.00040	.00042	.00043	.00044	.00046	.00047	.00048	.00056	2156,31
* 1,00	.00035	.00035	.00035	.00036	.00036	.00037	.00040	.00042	.00044	.00046	.00048	.00049	.00050	.00052	.00053	.00062	2269,80
* 1,05	.00038	.00038	.00039	.00039	.00040	.00040	.00044	.00046	.00049	.00051	.00052	.00054	.00056	.00057	.00058	.00068	2383,29
* 1,10	.00041	.00042	.00042	.00043	.00043	.00044	.00048	.00051	.00053	.00056	.00057	.00059	.00061	.00062	.00064	.00075	2496,78
* 1,15	.00045	.00046	.00046	.00047	.00047	.00048	.00052	.00055	.00058	.00061	.00063	.00065	.00066	.00068	.00070	.00082	2610,28
* 1,20	.00049	.00049	.00050	.00051	.00051	.00052	.00057	.00060	.00063	.00066	.00068	.00070	.00072	.00074	.00076	.00089	2723,77
* 1,25	.00053	.00053	.00054	.00055	.00055	.00056	.00061	.00065	.00069	.00071	.00074	.00076	.00078	.00080	.00082	.00096	2837,26
* 1,30	.00057	.00058	.00058	.00059	.00060	.00060	.00066	.00070	.00074	.00077	.00080	.00083	.00085	.00087	.00089	.00104	2950,75
* 1,35	.00061	.00062	.00063	.00063	.00064	.00065	.00071	.00076	.00080	.00083	.00086	.00089	.00091	.00094	.00096	.00112	3064,24
* 1,40	.00065	.00066	.00067	.00068	.00069	.00070	.00076	.00082	.00086	.00089	.00093	.00096	.00098	.00101	.00103	.00121	3177,73
* 1,45	.00070	.00071	.00072	.00073	.00074	.00075	.00082	.00087	.00092	.00096	.00099	.00102	.00105	.00108	.00111	.00130	3291,22
* 1,50	.00074	.00076	.00077	.00078	.00079	.00080	.00087	.00093	.00098	.00103	.00106	.00110	.00113	.00116	.00118	.00139	3404,71
* 1,55	.00079	.00081	.00082	.00083	.00084	.00085	.00093	.00100	.00105	.00109	.00113	.00117	.00120	.00123	.00126	.00148	3518,20
* 1,60	.00084	.00086	.00087	.00088	.00089	.00090	.00099	.00106	.00112	.00116	.00121	.00125	.00128	.00131	.00134	.00158	3631,69
* 1,65	.00089	.00091	.00092	.00093	.00095	.00096	.00105	.00113	.00119	.00124	.00128	.00132	.00136	.00140	.00143	.00168	3745,18
* 1,70	.00095	.00096	.00098	.00099	.00100	.00102	.00112	.00120	.00126	.00131	.00136	.00141	.00145	.00148	.00152	.00178	3858,67
* 1,75	.00100	.00102	.00103	.00105	.00106	.00107	.00118	.00127	.00133	.00139	.00144	.00149	.00153	.00157	.00161	.00189	3972,16
* 1,80	.00105	.00107	.00109	.00111	.00112	.00113	.00125	.00134	.00141	.00147	.00153	.00157	.00162	.00166	.00170	.00200	4085,65
* 1,85	.00111	.00113	.00115	.00117	.00118	.00120	.00132	.00141	.00149	.00155	.00161	.00166	.00171	.00175	.00179	.00211	4199,14
* 1,90	.00117	.00119	.00121	.00123	.00124	.00126	.00139	.00149	.00157	.00164	.00170	.00175	.00180	.00185	.00189	.00222	4312,63
* 1,95	.00123	.00125	.00127	.00129	.00131	.00133	.00146	.00157	.00165	.00172	.00179	.00185	.00190	.00195	.00199	.00234	4426,13
* 2,00	.00129	.00131	.00133	.00136	.00137	.00139	.00154	.00165	.00174	.00181	.00188	.00194	.00200	.00205	.00210	.00246	4539,62
* 2,05	.00135	.00138	.00140	.00142	.00144	.00146	.00162	.00173	.00182	.00190	.00198	.00204	.00210	.00215	.00220	.00259	4653,11
* 2,10	.00142	.00144	.00147	.00149	.00151	.00153	.00169	.00181	.00191	.00200	.00207	.00214	.00220	.00226	.00231	.00272	4766,60
* 2,15	.00148	.00151	.00154	.00156	.00158	.00160	.00177	.00190	.00200	.00209	.00217	.00224	.00231	.00237	.00242	.00285	4880,09
* 2,20	.00155	.00158	.00161	.00163	.00165	.00168	.00186	.00199	.00210	.00219	.00227	.00235	.00241	.00248	.00253	.00298	4993,58
* 2,25	.00162	.00165	.00168	.00170	.00173	.00175	.00194	.00208	.00219	.00229	.00238	.00245	.00253	.00259	.00265	.00312	5107,07
* 2,30	.00169	.00172	.00175	.00178	.00180	.00183	.00203	.00217	.00229	.00239	.00248	.00256	.00264	.00271	.00277	.00326	5220,56
* 2,35	.00176	.00179	.00182	.00185	.00188	.00191	.00211	.00227	.00239	.00250	.00259	.00268	.00275	.00282	.00289	.00340	5334,05
* 2,40	.00183	.00187	.00190	.00193	.00196	.00199	.00220	.00236	.00249	.00260	.00270	.00279	.00287	.00295	.00301	.00354	5447,54
* 2,45	.00191	.00194	.00198	.00201	.00204	.00207	.00229	.00246	.00260	.00271	.00282	.00291	.00299	.00307	.00314	.00369	5561,03
* 2,50	.00198	.00202	.00206	.00209	.00212	.00215	.00239	.00256	.00270	.00283	.00293	.00303	.00311	.00320	.00327	.00385	5674,52
* 2,55	.00206	.00210	.00214	.00217	.00220	.00224	.00248	.00267	.00281	.00294	.00305	.00315	.00324	.00332	.00340	.00400	5788,01
* 2,60	.00214	.00218	.00222	.00226	.00229	.00232	.00258	.00277	.00292	.00305	.00317	.00327	.00337	.00346	.00354	.00416	5901,50
* 2,65	.00222	.00226	.00230	.00234	.00238	.00241	.00268	.00288	.00304	.00317	.00329	.00340	.00350	.00359	.00367	.00432	6015,00
* 2,70	.00230	.00235	.00239	.00243	.00246	.00250	.00278	.00298	.00315	.00329	.00342	.00353	.00363	.00373	.00381	.00448	6128,49
* 2,75	.00238	.00243	.00247	.00252	.00255	.00259	.00288	.00310	.00327	.00341	.00354	.00366	.00377	.00386	.00396	.00465	6241,98
* 2,80	.00247	.00252	.00256	.00261	.00265	.00268	.00299	.00321	.00339	.00354	.00367	.00379	.00390	.00401	.00410	.00482	6355,47
* 2,85	.00255	.00260	.00265	.00270	.00274	.00278	.00309	.00332	.00351	.00367	.00381	.00393	.00404	.00415	.00425	.00500	6468,96
* 2,90	.00264	.00269	.00274	.00279	.00283	.00288	.00320	.00344	.00363	.00380	.00394	.00407	.00419	.00430	.00440	.00517	6582,45
* 2,95	.00273	.00278	.00284	.00288	.00293	.00297	.00331	.00356	.00376	.00393	.00408	.00421	.00433	.00444	.00455	.00535	6695,94
* 3,00	.00282	.00288	.00293	.00298	.00303	.00307	.00342	.00368	.00388	.00406	.00421	.00435	.00448	.00460	.00470	.00553	6809,43

DIAMETRO DO CONDUTO D= 1900, (MM)

AREA DA SECAO DO CONDUTO S= 2,835294 M2

VELO *CIDADE* *(M/S)	PENSA DE CARGA UNITARIA EM M/M																OBS: K EM MILIMETROS	*VAZAO* (L/S)
	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0		
*.30	.00003	.00003	.00003	.00003	.00003	.00003	.00003	.00004	.00004	.00004	.00004	.00004	.00004	.00004	.00004	.00005	850,59	
*.35	.00004	.00004	.00004	.00004	.00004	.00004	.00005	.00005	.00005	.00005	.00005	.00005	.00006	.00006	.00006	.00007	992,35	
*.40	.00005	.00005	.00006	.00006	.00006	.00006	.00006	.00006	.00007	.00007	.00007	.00007	.00007	.00007	.00008	.00009	1134,12	
*.45	.00007	.00007	.00007	.00007	.00007	.00007	.00008	.00008	.00008	.00009	.00009	.00009	.00009	.00009	.00009	.00011	1275,88	
*.50	.00008	.00008	.00008	.00008	.00009	.00009	.00009	.00010	.00010	.00010	.00011	.00011	.00011	.00011	.00012	.00014	1417,65	
*.55	.00010	.00010	.00010	.00010	.00010	.00010	.00011	.00012	.00012	.00012	.00013	.00013	.00014	.00014	.00014	.00016	1559,41	
*.60	.00012	.00012	.00012	.00012	.00012	.00012	.00013	.00014	.00014	.00015	.00015	.00016	.00016	.00017	.00017	.00019	1701,18	
*.65	.00013	.00014	.00014	.00014	.00014	.00014	.00015	.00016	.00017	.00017	.00018	.00018	.00019	.00019	.00020	.00023	1842,94	
*.70	.00015	.00016	.00016	.00016	.00016	.00016	.00017	.00018	.00019	.00019	.00020	.00021	.00022	.00022	.00023	.00026	1984,70	
*.75	.00018	.00018	.00018	.00018	.00018	.00018	.00020	.00021	.00022	.00023	.00024	.00024	.00025	.00025	.00026	.00030	2126,47	
*.80	.00020	.00020	.00020	.00021	.00021	.00021	.00023	.00024	.00025	.00026	.00027	.00028	.00028	.00029	.00030	.00035	2268,23	
*.85	.00022	.00023	.00023	.00023	.00023	.00023	.00025	.00027	.00028	.00029	.00030	.00031	.00032	.00033	.00033	.00039	2410,00	
*.90	.00025	.00025	.00025	.00026	.00026	.00026	.00028	.00030	.00031	.00033	.00034	.00035	.00036	.00037	.00037	.00044	2551,76	
*.95	.00027	.00028	.00028	.00028	.00029	.00029	.00031	.00033	.00035	.00036	.00038	.00039	.00040	.00041	.00042	.00049	2693,53	
*1,00	.00030	.00031	.00031	.00031	.00032	.00032	.00035	.00037	.00039	.00040	.00042	.00043	.00044	.00045	.00046	.00054	2835,29	
*1,05	.00033	.00034	.00034	.00034	.00035	.00035	.00038	.00041	.00043	.00044	.00046	.00047	.00048	.00050	.00051	.00059	2977,06	
*1,10	.00036	.00037	.00037	.00038	.00038	.00038	.00042	.00044	.00047	.00049	.00050	.00052	.00053	.00054	.00056	.00065	3118,82	
*1,15	.00039	.00040	.00040	.00041	.00041	.00042	.00046	.00048	.00051	.00053	.00055	.00057	.00058	.00059	.00061	.00071	3260,59	
*1,20	.00043	.00043	.00044	.00044	.00045	.00045	.00050	.00053	.00055	.00058	.00060	.00061	.00063	.00065	.00066	.00077	3402,35	
*1,25	.00048	.00047	.00047	.00048	.00049	.00049	.00054	.00057	.00060	.00062	.00065	.00067	.00068	.00070	.00072	.00084	3544,12	
*1,30	.00050	.00050	.00051	.00052	.00052	.00053	.00058	.00062	.00065	.00067	.00070	.00072	.00074	.00076	.00078	.00091	3685,88	
*1,35	.00053	.00054	.00055	.00056	.00056	.00057	.00062	.00066	.00070	.00073	.00075	.00078	.00080	.00082	.00084	.00098	3827,65	
*1,40	.00057	.00058	.00059	.00060	.00060	.00061	.00067	.00071	.00075	.00078	.00081	.00083	.00086	.00088	.00090	.00105	3969,41	
*1,45	.00061	.00062	.00063	.00064	.00065	.00065	.00072	.00076	.00080	.00084	.00087	.00089	.00092	.00094	.00096	.00113	4111,18	
*1,50	.00065	.00066	.00067	.00068	.00069	.00070	.00077	.00082	.00086	.00090	.00093	.00096	.00098	.00101	.00103	.00121	4252,94	
*1,55	.00070	.00071	.00072	.00073	.00074	.00074	.00082	.00087	.00092	.00096	.00099	.00102	.00105	.00108	.00110	.00129	4394,71	
*1,60	.00074	.00075	.00076	.00077	.00078	.00079	.00087	.00093	.00098	.00102	.00105	.00109	.00112	.00115	.00117	.00137	4536,47	
*1,65	.00078	.00080	.00081	.00082	.00083	.00084	.00092	.00099	.00104	.00108	.00112	.00116	.00119	.00122	.00125	.00146	4678,24	
*1,70	.00083	.00084	.00086	.00087	.00088	.00089	.00098	.00105	.00110	.00115	.00119	.00123	.00126	.00129	.00132	.00155	4820,00	
*1,75	.00088	.00089	.00091	.00092	.00093	.00094	.00104	.00111	.00117	.00122	.00126	.00130	.00134	.00137	.00140	.00164	4961,77	
*1,80	.00093	.00094	.00096	.00097	.00098	.00099	.00110	.00117	.00123	.00129	.00133	.00138	.00141	.00145	.00148	.00174	5103,54	
*1,85	.00098	.00099	.00101	.00102	.00104	.00105	.00116	.00124	.00130	.00136	.00141	.00145	.00149	.00153	.00157	.00184	5245,30	
*1,90	.00103	.00104	.00106	.00108	.00109	.00110	.00122	.00130	.00137	.00143	.00148	.00153	.00157	.00161	.00165	.00194	5387,07	
*1,95	.00108	.00110	.00112	.00113	.00115	.00116	.00128	.00137	.00144	.00151	.00156	.00161	.00166	.00170	.00174	.00204	5528,83	
*2,00	.00113	.00115	.00117	.00119	.00121	.00122	.00135	.00144	.00152	.00159	.00164	.00170	.00174	.00179	.00183	.00214	5670,60	
*2,05	.00119	.00121	.00123	.00125	.00126	.00128	.00141	.00151	.00160	.00166	.00173	.00178	.00183	.00188	.00192	.00225	5812,36	
*2,10	.00124	.00127	.00129	.00131	.00132	.00134	.00148	.00159	.00167	.00175	.00181	.00187	.00192	.00197	.00202	.00236	5954,13	
*2,15	.00130	.00133	.00135	.00137	.00139	.00141	.00155	.00166	.00175	.00183	.00190	.00196	.00201	.00206	.00211	.00248	6095,89	
*2,20	.00136	.00139	.00141	.00143	.00145	.00147	.00163	.00174	.00184	.00192	.00199	.00205	.00211	.00216	.00221	.00259	6237,66	
*2,25	.00142	.00145	.00147	.00149	.00152	.00154	.00170	.00182	.00192	.00200	.00208	.00214	.00220	.00226	.00231	.00271	6379,42	
*2,30	.00148	.00151	.00153	.00156	.00158	.00160	.00177	.00190	.00200	.00209	.00217	.00224	.00230	.00236	.00242	.00283	6521,19	
*2,35	.00154	.00157	.00160	.00163	.00165	.00167	.00185	.00198	.00209	.00218	.00226	.00234	.00240	.00246	.00252	.00296	6662,95	
*2,40	.00161	.00164	.00167	.00169	.00172	.00174	.00193	.00207	.00218	.00228	.00236	.00244	.00251	.00257	.00263	.00309	6804,72	
*2,45	.00167	.00171	.00173	.00176	.00179	.00181	.00201	.00215	.00227	.00237	.00246	.00254	.00261	.00268	.00274	.00322	6946,48	
*2,50	.00174	.00177	.00180	.00183	.00186	.00189	.00209	.00224	.00236	.00247	.00256	.00264	.00272	.00279	.00285	.00335	7088,25	
*2,55	.00181	.00184	.00187	.00191	.00193	.00196	.00217	.00233	.00246	.00257	.00266	.00275	.00283	.00290	.00297	.00348	7230,01	
*2,60	.00188	.00191	.00195	.00198	.00201	.00204	.00226	.00242	.00256	.00267	.00277	.00286	.00294	.00302	.00309	.00362	7371,78	
*2,65	.00195	.00199	.00202	.00205	.00208	.00211	.00235	.00252	.00265	.00277	.00288	.00297	.00305	.00313	.00320	.00376	7513,54	
*2,70	.00202	.00206	.00210	.00213	.00216	.00219	.00243	.00261	.00276	.00288	.00298	.00308	.00317	.00325	.00333	.00390	7655,31	
*2,75	.00209	.00213	.00217	.00221	.00224	.00227	.00252	.00271	.00286	.00298	.00310	.00320	.00329	.00337	.00345	.00405	7797,07	
*2,80	.00217	.00221	.00225	.00229	.00232	.00235	.00262	.00281	.00296	.00309	.00321	.00331	.00341	.00350	.00358	.00420	7938,84	
*2,85	.00224	.00229	.00233	.00237	.00240	.00244	.00271	.00291	.00307	.00320	.00332	.00343	.00353	.00362	.00371	.00435	8080,61	
*2,90	.00232	.00236	.00241	.00245	.00249	.00252	.00280	.00301	.00318	.00332	.00344	.00355	.00365	.00375	.00384	.00450	8222,37	
*2,95	.00240	.00244	.00249	.00253	.00257	.00261	.00290	.00311	.00329	.00343	.00356	.00368	.00378	.00388	.00397	.00466	8364,14	
*3,00	.00248	.00253	.00257	.00262	.00266	.00269	.00300	.00322	.00340	.00355	.00368	.00380	.00391	.00401	.00410	.00482	8505,90	

***** CETESB ****																	
* DIAMETRO DO CONDUITO D= 2000, (MM) AREA DA SECAO DO CONDUITO S= 3,141600 M2 *																	
* VELO *	PERDA DE CARGA UNITARIA EM M/M															* VAZAO *	
* CIDADE *	OBS: K EM MILIMETROS															* (L/S) *	
* (M/S) *	K=,05	K=,06	K=,07	K=,08	K=,09	K=,10	K=,20	K=,30	K=,40	K=,50	K=,60	K=,70	K=,80	K=,90	K=1,0	K=2,0 *	
* ,30	,00003	,00003	,00003	,00003	,00003	,00003	,00003	,00003	,00003	,00004	,00004	,00004	,00004	,00004	,00004	,00005	942,48 *
* ,35	,00004	,00004	,00004	,00004	,00004	,00004	,00004	,00005	,00005	,00005	,00005	,00005	,00005	,00005	,00005	,00006	1099,56 *
* ,40	,00005	,00005	,00005	,00005	,00005	,00005	,00006	,00006	,00006	,00006	,00006	,00007	,00007	,00007	,00007	,00008	1256,64 *
* ,45	,00006	,00006	,00006	,00007	,00007	,00007	,00007	,00007	,00008	,00008	,00008	,00008	,00009	,00009	,00009	,00010	1413,72 *
* ,50	,00008	,00008	,00008	,00008	,00008	,00008	,00009	,00009	,00009	,00010	,00010	,00010	,00011	,00011	,00011	,00013	1570,80 *
* ,55	,00009	,00009	,00009	,00010	,00010	,00010	,00010	,00011	,00011	,00012	,00012	,00012	,00013	,00013	,00013	,00015	1727,88 *
* ,60	,00011	,00011	,00011	,00011	,00011	,00011	,00012	,00013	,00013	,00014	,00014	,00015	,00015	,00015	,00016	,00018	1884,96 *
* ,65	,00013	,00013	,00013	,00013	,00013	,00013	,00014	,00015	,00016	,00016	,00017	,00017	,00018	,00018	,00018	,00021	2042,04 *
* ,70	,00015	,00015	,00015	,00015	,00015	,00015	,00016	,00017	,00018	,00019	,00019	,00020	,00020	,00021	,00021	,00025	2199,12 *
* ,75	,00017	,00017	,00017	,00017	,00017	,00017	,00019	,00020	,00021	,00021	,00022	,00023	,00023	,00024	,00024	,00028	2356,20 *
* ,80	,00019	,00019	,00019	,00019	,00019	,00020	,00021	,00022	,00023	,00024	,00025	,00026	,00027	,00027	,00028	,00032	2513,28 *
* ,85	,00021	,00021	,00021	,00022	,00022	,00022	,00024	,00025	,00026	,00027	,00028	,00029	,00030	,00031	,00031	,00037	2670,36 *
* ,90	,00023	,00024	,00024	,00024	,00024	,00025	,00027	,00028	,00030	,00031	,00032	,00033	,00034	,00034	,00035	,00041	2827,44 *
* ,95	,00026	,00026	,00026	,00027	,00027	,00027	,00030	,00031	,00033	,00034	,00035	,00036	,00037	,00038	,00039	,00046	2984,52 *
* 1,00	,00029	,00029	,00029	,00030	,00030	,00030	,00033	,00035	,00036	,00038	,00039	,00040	,00041	,00042	,00043	,00050	3141,60 *
* 1,05	,00031	,00032	,00032	,00032	,00033	,00033	,00036	,00038	,00040	,00042	,00043	,00044	,00046	,00047	,00048	,00056	3298,68 *
* 1,10	,00034	,00035	,00035	,00035	,00036	,00036	,00039	,00042	,00044	,00046	,00047	,00049	,00051	,00052	,00052	,00061	3455,76 *
* 1,15	,00037	,00038	,00038	,00039	,00039	,00039	,00043	,00046	,00048	,00050	,00052	,00053	,00055	,00056	,00057	,00067	3612,84 *
* 1,20	,00040	,00041	,00041	,00042	,00042	,00043	,00047	,00050	,00052	,00054	,00056	,00058	,00059	,00061	,00062	,00073	3769,92 *
* 1,25	,00044	,00044	,00045	,00045	,00046	,00046	,00050	,00054	,00056	,00059	,00061	,00063	,00064	,00066	,00067	,00079	3927,00 *
* 1,30	,00047	,00048	,00048	,00049	,00049	,00050	,00054	,00058	,00061	,00063	,00066	,00068	,00070	,00071	,00073	,00085	4084,08 *
* 1,35	,00050	,00051	,00052	,00052	,00053	,00054	,00059	,00062	,00066	,00068	,00071	,00073	,00075	,00077	,00079	,00092	4241,16 *
* 1,40	,00054	,00055	,00056	,00056	,00057	,00058	,00063	,00067	,00071	,00073	,00076	,00078	,00081	,00083	,00084	,00099	4398,24 *
* 1,45	,00058	,00059	,00059	,00060	,00061	,00062	,00067	,00072	,00076	,00079	,00082	,00084	,00086	,00089	,00091	,00106	4555,32 *
* 1,50	,00062	,00062	,00063	,00064	,00065	,00066	,00072	,00077	,00081	,00084	,00087	,00090	,00092	,00095	,00097	,00113	4712,40 *
* 1,55	,00066	,00067	,00067	,00068	,00069	,00070	,00077	,00082	,00086	,00090	,00093	,00096	,00099	,00101	,00103	,00121	4869,48 *
* 1,60	,00070	,00071	,00072	,00073	,00074	,00075	,00082	,00087	,00092	,00096	,00099	,00102	,00105	,00108	,00110	,00129	5026,56 *
* 1,65	,00074	,00075	,00076	,00077	,00078	,00079	,00087	,00093	,00098	,00102	,00105	,00109	,00112	,00114	,00117	,00137	5183,64 *
* 1,70	,00078	,00079	,00081	,00082	,00083	,00084	,00092	,00098	,00104	,00108	,00112	,00115	,00119	,00121	,00124	,00145	5340,72 *
* 1,75	,00083	,00084	,00085	,00086	,00088	,00089	,00098	,00104	,00110	,00114	,00118	,00122	,00126	,00129	,00132	,00154	5497,80 *
* 1,80	,00087	,00089	,00090	,00091	,00092	,00094	,00103	,00110	,00116	,00121	,00125	,00129	,00133	,00136	,00139	,00163	5654,88 *
* 1,85	,00092	,00093	,00095	,00096	,00098	,00099	,00109	,00116	,00122	,00128	,00132	,00136	,00140	,00144	,00147	,00172	5811,96 *
* 1,90	,00097	,00098	,00100	,00101	,00103	,00104	,00115	,00123	,00129	,00135	,00139	,00144	,00148	,00152	,00155	,00182	5969,04 *
* 1,95	,00102	,00103	,00105	,00107	,00108	,00109	,00121	,00129	,00136	,00142	,00147	,00151	,00156	,00160	,00163	,00191	6126,12 *
* 2,00	,00107	,00109	,00110	,00112	,00113	,00115	,00127	,00136	,00143	,00149	,00154	,00159	,00164	,00168	,00172	,00201	6283,20 *
* 2,05	,00112	,00114	,00116	,00117	,00119	,00121	,00133	,00142	,00150	,00156	,00162	,00167	,00172	,00176	,00180	,00211	6440,28 *
* 2,10	,00117	,00119	,00121	,00123	,00125	,00126	,00140	,00149	,00157	,00164	,00170	,00176	,00180	,00185	,00189	,00222	6597,36 *
* 2,15	,00123	,00125	,00127	,00129	,00131	,00132	,00146	,00156	,00165	,00172	,00178	,00184	,00189	,00194	,00198	,00232	6754,44 *
* 2,20	,00128	,00130	,00133	,00135	,00137	,00138	,00153	,00164	,00173	,00180	,00187	,00193	,00198	,00203	,00208	,00243	6911,52 *
* 2,25	,00134	,00136	,00138	,00141	,00143	,00145	,00160	,00171	,00180	,00188	,00195	,00201	,00207	,00212	,00217	,00254	7068,60 *
* 2,30	,00140	,00142	,00145	,00147	,00149	,00151	,00167	,00179	,00188	,00197	,00204	,00210	,00216	,00222	,00227	,00266	7225,68 *
* 2,35	,00145	,00148	,00151	,00153	,00155	,00157	,00174	,00187	,00197	,00205	,00213	,00220	,00226	,00232	,00237	,00278	7382,76 *
* 2,40	,00151	,00154	,00157	,00159	,00162	,00164	,00182	,00194	,00205	,00214	,00222	,00229	,00235	,00241	,00247	,00289	7539,84 *
* 2,45	,00158	,00161	,00163	,00166	,00168	,00171	,00189	,00203	,00214	,00223	,00231	,00239	,00245	,00252	,00257	,00302	7696,92 *
* 2,50	,00164	,00167	,00170	,00173	,00175	,00178	,00197	,00211	,00222	,00232	,00241	,00248	,00255	,00262	,00268	,00314	7854,00 *
* 2,55	,00170	,00174	,00177	,00179	,00182	,00185	,00205	,00219	,00231	,00241	,00250	,00258	,00266	,00272	,00279	,00327	8011,08 *
* 2,60	,00177	,00180	,00183	,00186	,00189	,00192	,00213	,00228	,00240	,00251	,00260	,00269	,00276	,00283	,00290	,00340	8168,16 *
* 2,65	,00183	,00187	,00190	,00193	,00196	,00199	,00221	,00237	,00250	,00261	,00270	,00279	,00287	,00294	,00301	,00353	8325,24 *
* 2,70	,00190	,00194	,00197	,00200	,00204	,00206	,00229	,00246	,00259	,00270	,00280	,00290	,00298	,00305	,00312	,00366	8482,32 *
* 2,75	,00197	,00201	,00204	,00208	,00211	,00214	,00237	,00255	,00269	,00281	,00291	,00300	,00309	,00317	,00324	,00380	8639,40 *
* 2,80	,00204	,00208	,00212	,00215	,00218	,00222	,00246	,00264	,00278	,00291	,00302	,00311	,00320	,00328	,00336	,00394	8796,48 *
* 2,85	,00211	,00215	,00219	,00223	,00226	,00229	,00255	,00273	,00288	,00301	,00312	,00322	,00332	,00340	,00348	,00408	8953,56 *
* 2,90	,00218	,00223	,00227	,00230	,00234	,00237	,00264	,00283	,00299	,00312	,00323	,00334	,00343	,00352	,00360	,00422	9110,64 *
* 2,95	,00226	,00230	,00234	,00238	,00242	,00245	,00273	,00293	,00309	,00323	,00335	,00345	,00355	,00364	,00373	,00437	9267,72 *
* 3,00	,00233	,00238	,00242	,00246	,00250	,00254	,00282	,00303	,00319	,00334	,00346	,00357	,00367	,00377	,00385	,00452	9424,80 *

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