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PROCESSAMENTO DE ARQUIVOS CLIMÁTICOS PARA SIMULAÇÃO DO DESEMPENHO ENERGÉTICO DE EDIFICAÇÕES

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RESUMO

Dados horários registrando condições climáticas para criação de arquivos climáticos com o objetivo de simular o desempenho térmico de edificações costumam ser escassos e de baixa qualidade. Há poucas estações automáticas no território brasileiro que fornecem dados horários de temperatura de bulbo seco, temperatura de bulbo úmido ou umidade relativa, direção do vento, velocidade do vento, nebulosidade e pressão. Há menos ainda estações que medem a radiação solar, dado necessário para completar a série de dados mínimos utilizados para compilar um arquivo climático.

A partir de arquivos climáticos já existentes, obtidos da INFRAERO na década de 1990, foi realizada uma revisão e correção de dados, preparando-os para novas compilações. Os arquivos climáticos existentes em formatos texto (*.try) e em um formato específico para o programa de simulação de desempenho térmico DOE 2.1-E (*.bin) foram comparados, ajustando os erros encontrados entre estes e que fossem incompatíveis com a realidade climática do local a que o arquivo se referia. Como não havia dados horários medidos de radiação solar, estes foram estimados após avaliação do melhor método a ser adotado para estimativa da radiação global horizontal horária.

Dois métodos foram avaliados, um originado de pesquisas realizadas para criação de arquivos com dados climáticos internacionais, arquivos IWECC, e outro originado de pesquisa realizada na Universidade Federal de Santa Catarina. Os dois métodos foram testados para cinco cidades brasileiras, Belém, Recife, Brasília, São Paulo e Porto Alegre, e comparados com médias mensais de totais diários de irradiação solar de bibliografia existente, tanto nacional com internacional. O primeiro método, o método de Kasten, apresentou maiores distorções em relação à principal fonte de dados, o *Atlas de Irradiação solar do Brasil*. O segundo método, método LabEEE, foi então aplicado nos arquivos climáticos referentes às 14 cidades brasileiras com dados disponíveis, Belém, São Luís, Fortaleza, Recife, Natal, Maceió, Salvador, Vitória, Rio de Janeiro, Brasília, São Paulo, Curitiba, Florianópolis e Porto Alegre. Após obtida a radiação global horizontal horária, foram estimadas as radiações direta e difusa horizontais e, a partir dessas, a radiação direta normal. Correções foram realizadas na estimativa deste último dado.

Por fim, três tipos de arquivos climáticos foram produzidos. Os arquivos do tipo bin, para o programa DOE 2.1-E foram renovados, contendo a partir de então dados pré-calculados de radiação solar. Os arquivos tipo epw foram gerados pela primeira vez para simulação do desempenho térmico de edificações no programa EnergyPlus. Foram também criados arquivos climáticos para consulta de dados, no formato texto, csv, de forma que o usuário possa não somente consultar mas manipular os dados horário caso seja de seu interesse. Acompanhando estes arquivos, foram também gerados os arquivos estatísticos dos arquivos bin e epw, e planilhas com um resumo dos dados do arquivo csv.



SUMÁRIO

| | |
|--|-----------|
| 1. INTRODUÇÃO | 1 |
| 2. FONTE DE DADOS: ARQUIVOS CLIMÁTICOS EXISTENTES | 2 |
| 2.1. LIMITAÇÕES NOS ARQUIVOS | 5 |
| 3. REVISÃO | 6 |
| 4. RADIAÇÃO SOLAR | 9 |
| 4.1. RADIAÇÃO SOLAR GLOBAL HORIZONTAL | 9 |
| 4.1.1. AJUSTE DO MODELO DE KASTEN: MÉTODO KASTEN ADAPTADO | 11 |
| 4.1.2. AJUSTE DO MODELO DE PITTA: MÉTODO LABEEE | 12 |
| 4.1.3. RESULTADOS PARCIAIS | 13 |
| 4.1.4. CONCLUSÃO | 17 |
| 4.1. RADIAÇÃO SOLAR DIRETA NORMAL | 18 |
| 5. RESULTADOS | 20 |
| 5.1 RADIAÇÃO SOLAR | 20 |
| 5.2. FORMATO DOS ARQUIVOS CLIMÁTICOS | 21 |
| 6. CONCLUSÃO | 25 |
| REFERÊNCIAS BIBLIOGRÁFICAS | 26 |
| ANEXOS | 28 |



1 INTRODUÇÃO

O desempenho térmico de uma edificação está diretamente relacionado às condicionantes externas do tempo, como temperatura do ar, umidade e radiação. A representação do fenômeno em modelos matemáticos exige então o registro destes dados do clima, razão pela qual os programas computacionais que simulam o desempenho térmico de edificações necessitam dos dados climáticos. Quanto mais detalhado for o programa, mais detalhamento deverá ter um arquivo climático, chegando atualmente ao estágio de ser necessário o registro horário de dados climáticos para atender a programas computacionais como o DOE-2.1E e EnergyPlus. Um ano completo com as quatro estações representadas é composto por 8760 horas, resultando em um grande número de dados, salientando que cada hora contém registrados: temperatura de bulbo seco, temperatura de bulbo úmido, velocidade de vento, direção do vento, etc. Dados climáticos horários são registrados em estações automáticas, mais freqüentes em aeroportos e em estações climáticas que, assim como os aeroportos, geralmente se localizam fora da zona urbana. A localização destas estações implica em uma imprecisão por não registrar os efeitos da cidade no microclima e, portanto, no desempenho térmico de uma edificação. Além disso, deve-se considerar a possibilidade de falhas nos equipamentos ou interrupção nas medições para manutenção, gerando lacunas sem registros nos arquivos.

A dificuldade de obtenção de dados de qualidade é ainda prejudicada pela escassez de estações que meçam a radiação solar, essencial para uma análise de desempenho térmico em um país tropical que tem alta incidência de radiação em todo o seu território. Entretanto, é um fator de difícil obtenção, com poucas estações distribuídas irregularmente em um território de grande variação de latitudes, de condições de céu e de turbidez do ar, relacionadas à localização geográfica, topografia, níveis de poluição, dentre outros. Estas limitações exigem que a geração de arquivos climáticos para a simulação do desempenho térmico de edificações não se restrinja a compilar dados para o formato do programa a ser utilizado, mas que envolva o tratamento dos dados com ajustes de possíveis falhas nos registros e desenvolvimento de modelos que representem os fenômenos cujos dados não foram medidos.

Este relatório apresenta a metodologia usada para revisão de arquivos climáticos, ajustes de modelos para estimativa de dados de radiação e compilação de arquivos em formatos para consulta e compatíveis com dois programas computacionais de simulação de desempenho térmico, o DOE 2.1-E e EnergyPlus. O item 2 deste relatório apresenta um histórico dos arquivos climáticos e dados já existentes, mostrando a necessidade de atualização dos dados. O item 3 apresenta a metodologia de revisão e correção dos arquivos e o item 4 a metodologia de estimativa dos dados de radiação solar. Os resultados da compilação dos novos formatos são apresentados no item 5 e a conclusão, no item 6. Os anexos apresentam gráficos com dados horários estimadas para a radiação global horizontal, os arquivos estatísticos dos novos formatos para simulação e as planilhas diagnóstico dos dados horários.



2 FONTE DE DADOS: ARQUIVOS CLIMÁTICOS EXISTENTES

Os dados utilizados são oriundos de arquivos climáticos existentes no LabEEE, disponibilizados na página eletrônica do laboratório (www.labeee.ufsc.br). Os dados foram medidos em aeroportos em 14 capitais brasileiras e obtidos em fitas magnéticas através da Associação Brasileira de Refrigeração, Ar-condicionado, Ventilação e Aquecimento - Instituto Brasileiro do Frio, ABRAVA/IBF junto ao Centro Técnico Aeroespacial - Instituto de Aeronáutica e Espaço, CTA/IAE INFRAERO (GOULART, 1993).

Estes dados foram tratados, gerando dois tipos de arquivos climáticos: os arquivos cuja extensão é try e os arquivos cuja extensão é bin. Os arquivos climáticos com extensão try são arquivos texto, utilizados pelo programa Analysis Bio, para avaliação das condições de conforto térmico de ambientes internos utilizando uma carta psicrométrica. Os arquivos climáticos .bin são utilizados para simulação do desempenho térmico de edificações no programa DOE - 2.1E. Os arquivos bin não permitem que a simulação se realize no DOE - 2.1E caso as 8760 horas de cada dado não estejam completas, ao contrário dos arquivos com extensão try para o programa Analysis Bio.

É importante não confundir um arquivo com extensão try com um arquivo TRY, *Test Reference Year*, traduzido como Ano Climático de Referência. Um arquivo climático TRY é formado através de uma metodologia baseada na eliminação de anos cujos dados contêm temperaturas médias mensais extremas (altas ou baixas) até que se obtenha apenas um ano de dados médios (GOULART et al, 1997). É um ano sem extremos de temperatura. O TRY é então uma série de dados climáticos tratados segundo uma metodologia e representa uma situação referencial do clima do local em questão, enquanto o arquivo com extensão try é um formato para uso específico em um programa computacional, sendo de difícil visualização.

A figura 1 apresenta o formato de um arquivo com extensão try. Os dados são seguidos, sem espaçamento ou vírgulas separando vários fatores climáticos. Os espaçamentos existentes referem-se a algum dado nulo, além de dados que simplesmente não existem no arquivo, como as camadas de cobertura de nuvens, representadas pelo grande espaço em branco da figura. As separações das casas decimais foram também excluídas. A descrição de cada fator climático existente nos arquivos com extensão try, incluindo sua localização, número de dígitos e unidade, está disponível em Goulart et al (1997) e orienta a consulta dos dados para objetivos distintos ao uso no programa Analysis Bio.



| | | |
|------------------------------------|-----------|-----------|
| 83780174159 15120 21 9250 13 16050 | | 54 1 1 0 |
| 83780174159 15160 15 9250 0 | | 54 1 1 1 |
| 83780172161 15170 10 9240 0 | | 54 1 1 2 |
| 83780172162 15 0 0 9234 0 | | 54 1 1 3 |
| 83780164159 15 70 10 9234 88 77021 | | 54 1 1 4 |
| 83780160156 15 50 77 9234100 87020 | | 54 1 1 5 |
| 83780164158 15 30 72 9244100 87020 | | 54 1 1 6 |
| 83780168160 15 30 51 9244 75 67020 | | 54 1 1 7 |
| 83780178167 16 30 41 9244 38 37020 | | 54 1 1 8 |
| 83780195175 16 50 51 9242 13 16025 | | 54 1 1 9 |
| 83780222188 17 20 10 9242 0 | | 54 1 1 10 |
| 83780250196 17 30 15 9240 13 18080 | | 54 1 1 11 |
| 83780259200 17330 36 9230 63 58080 | | 54 1 1 12 |
| 83780277205 17340 15 9220 75 68080 | | 54 1 1 13 |

Figura 1. Catorze horas de dados climáticos existentes em um arquivo com extensão try.

Os arquivos bin são gravados em código binário, ou seja, não é possível visualizar seus dados em um editor de texto comum, e são acompanhados de arquivos texto com análises estatísticas dos dados, com extensão sta. Os dados são compostos em unidades inglesas, como temperaturas em *Farenheint* e velocidade do vento em 'nós'. São arquivos exclusivos para uso no programa computacional DOE - 2.1E.

Os arquivos TRY disponíveis na página eletrônica do LabEEE (www.labeee.ufsc.br), em formato try e bin, referem-se às seguintes capitais: Belém, Brasília, Curitiba, Florianópolis, Fortaleza, Maceió, Natal, Porto Alegre, Recife, Rio de Janeiro, Salvador, São Luis, São Paulo e Vitória. Além dos Anos Climáticos de Referência (TRY), há também arquivos com anos reais, ou seja, arquivos climáticos medidos em um ano qualquer, sem ter passado por qualquer tipo de seleção quanto à sua representatividade. Pode ser, então, um conjunto de registros de dados climáticos ocorrido em um ano atípico.

Além destas fontes, foram utilizadas outras fontes de dados para conferência. O *National Climatic Data Center, NCDC* do *Department of Energy, DOE*, dos Estados Unidos reuniu uma base de dados climáticos horários de estações de aeroportos brasileiros. Os dados foram tratados de acordo com a metodologia de criação de um TMY2, *Test Meteorological Year*, versão 2. Enquanto o TRY é um arquivo sem extremos de temperatura de um ano, o TMY2 é uma compilação de meses sem extremos de temperatura provenientes de diferentes anos, gerando um ano climático que nunca existiu mas que apresenta temperaturas sem extremos para cada mês (NREL, 1995). O TMY2 apresenta dados que não existem no formato original do TRY, como dados de radiação solar global horizontal e direta normal, também existentes no formato TMY, porém com séries de longo termo desenvolvidas pelo *National Renewable Energy Laboratory* (CRAWLEY e HUANG, 1997). Os arquivos climáticos IWEC¹,

¹ Deve-se cuidar para não confundir os arquivos IWEC, *International Weather for Energy Calculations*, com arquivos WYEC, *Weather Years for Energy Calculations*. Os arquivos WYEC surgiram em 1980 como uma continuidade do TRY, porém com dados de radiação solar



International Weather for Energy Calculations, resultado do trabalho do NCDC, foram gerados com base no formato TMY2 para depois serem convertidos em outros formatos, como o epw. Os formatos do Energy Plus (epw) são também baseados no formato TMY2. Devido à baixa qualidade dos dados climáticos brasileiros fornecidos ao NCDC, somente quatro cidades brasileiras tiveram processados o seu arquivo IWEC, *International Weather for Energy Calculations*: Belém, Brasília, Recife e São Paulo. Estes arquivos são disponibilizados na página eletrônica do DOE em formato epw, para simulação no *Energy Plus* e foram utilizados para comparação das estimativas de radiação solar.

medidos, quando disponíveis, ou calculados, se preciso, para 51 localidades norte americanas. Uma década depois, o método de cálculo da radiação foi melhorado e novos WYEC foram desenvolvidos a partir de arquivos TMY, porém incluindo iluminância do céu, concomitantemente à geração dos arquivos TMY2 (CRAWLEY e HUANG, 1997).



2.1 LIMITAÇÕES NOS ARQUIVOS

A utilização dos arquivos ao longo dos anos revelou alguns problemas. A visualização dos dados para análise sem uso do programa Analysis Bio é uma limitação, devido ao formato texto contínuo (sem espaçamento dos dados) dos arquivos com extensão try e devido à impossibilidade de visualização dos arquivos com extensão bin. Os arquivos com extensão sta, que acompanham o bin, adotam as unidades de medida inglesas e portanto requerem um tratamento (conversão para sistema internacional) antes de serem analisados. Alguns arquivos apresentaram registros vazios de nebulosidade, outros, as horas a que se referiam estavam defasadas em 3 horas (hora GMT x hora local), e outros apresentavam temperaturas incompatíveis com a realidade climática da cidade. Estas situações indicaram a necessidade de revisão dos arquivos, identificando e corrigindo os possíveis erros.

Além da qualidade dos arquivos climáticos, foi também identificado que a radiação solar era responsável por distorções nos dados. A fonte de dados dos aeroportos não continha radiação solar, somente registros horários de cobertura de nuvens. Os arquivos TRY foram então compilados de duas formas: os com extensão try não continham a radiação solar por serem desnecessários na versão da época do Analysis Bio, e os com extensão bin continham dados horários de cobertura de nuvens que eram utilizados pelo programa DOE-2.1E para calcular a radiação solar horária. Entretanto, em 1999, Krüger e Lamberts compararam a radiação solar horária gerada pelo programa com a radiação solar horária medida na estação do LABSOLAR/UFSC, encontrando um baixo coeficiente de determinação, R^2 , de 0,58 para a cidade de Florianópolis, com uma grande dispersão da nuvem de pontos (KRUGER e LAMBERTS, 1999). O estudo mostrou que os dados calculados pelo DOE 2.1-E, cujos algoritmos foram desenvolvidos com dados de radiação do hemisfério norte, não são apropriados para aplicação no Brasil. Como não há radiação solar medida disponível, foi necessário o desenvolvimento de algoritmos próprios com dados medidos locais.

Uma das primeiras iniciativas para desenvolver algoritmos para estimativa da radiação solar adequada ao clima brasileiro resultou nas equações para cálculo dos totais diários de radiação global horizontal para Florianópolis, desenvolvidos por Pitta (2001). No mesmo ano, este método foi adaptado por Carlo e Lamberts (2001) para estimar a radiação global horizontal horária nas cidades do Rio de Janeiro e Manaus, e desmembrar a radiação global nas suas parcelas direta e difusa. Estes métodos fundamentam os atuais estudos para a radiação solar descritos no item 4 deste relatório.



3 REVISÃO

Os arquivos climáticos existentes na página eletrônica do LabEEE foram revisados a fim de se identificar a qualidade de seus dados e a existência de possíveis erros. Foi conferido se todos possuíam as 8760 linhas que formam um ano completo de dados horários e se havia ausência de dados, como temperatura de bulbo seco, TBS, temperatura de bulbo úmido, TBU, nebulosidade e pressão.

Foi usada uma planilha com um resumo dos dados que indicou possíveis erros, cujo exemplo, para a cidade de Florianópolis, é mostrado na figura 2.

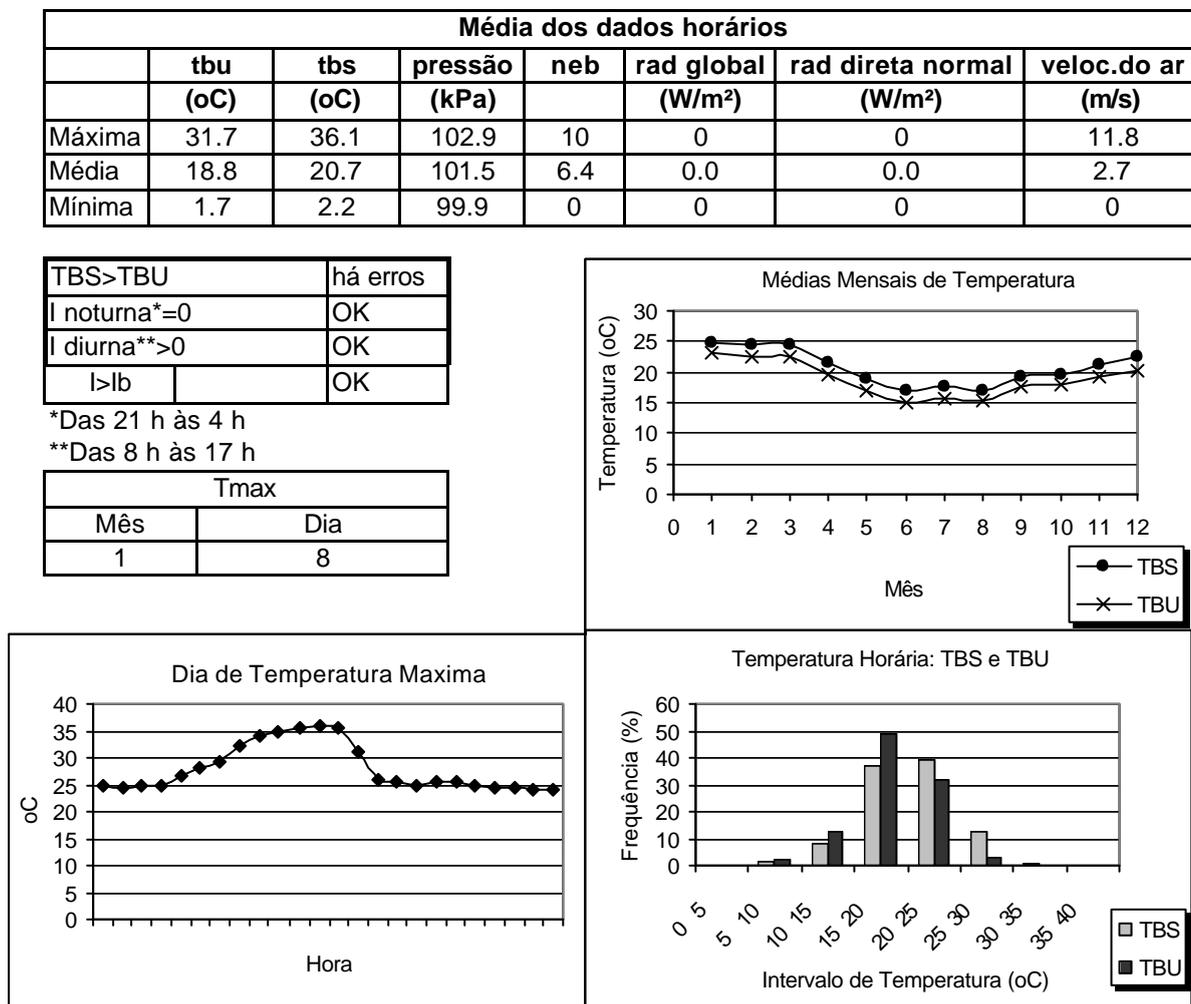


Figura 2. Planilha de análise de dados climáticos, com resumo do TRY de Florianópolis.

Na figura 2, os dados de radiação estão em branco pois ainda não existiam no arquivo climático analisado. As máximas e mínimas apresentam os limites que devem ser compatíveis com a realidade climática da cidade em questão. A planilha também indica os dados com valor zero, que podem significar uma situação de céu claro no caso da nebulosidade, ou ausentes, como no caso da radiação solar. É também necessário que a temperatura de bulbo úmido seja



obrigatoriamente menor que a temperatura de bulbo seco e que haja radiação solar zero no período noturno. A planilha também apresenta as médias mensais de temperatura, indica o dia e mostra a variação horária em que a temperatura máxima ocorre e apresenta a frequência de ocorrência de temperaturas. Também detalha a variação horária do dia de radiação global máxima e a frequência de ocorrência da radiação global, como no caso das temperaturas, porém estes gráficos não são mostrados na figura 2 devido à ausência de dados de radiação no arquivo climático.

Foram encontrados erros em três arquivos de extensão TRY e em doze arquivos de extensão BIN, sendo necessário então efetuar a sua correção. A tabela 1 apresenta o total de erros encontrados em cada arquivo. O arquivo climático que mais possuía erros foi o ano real do Rio de Janeiro, com 15,0% de dados incorretos, seguido do ano real de Fortaleza, com 13,4%. O TRY de Salvador já havia sido corrigido em etapa anterior, e não foi incluído na contagem, mas este simplesmente não apresentava dados de nebulosidade no seu formato bin.

Tabela 1. Total de erros encontrados nos arquivos climáticos

| Nome do arquivo | Total de erros | Percentual de erros no arquivo (%) | Tipo de arquivo |
|---------------------------|----------------|------------------------------------|-----------------|
| Rio de Janeiro | 24 | 0,3 | try |
| Salvador | 48 | 0,5 | try |
| Maceió | 50 | 0,6 | try |
| Belém | 7 | 0,1 | bin |
| Brasília | 12 | 0,1 | bin |
| Curitiba | 189 | 2,2 | bin |
| Florianópolis | 25 | 0,3 | bin |
| Fortaleza – Ano real | 1175 | 13,4 | bin |
| Maceió | 7 | 0,1 | bin |
| Petrolina – Ano real | 32 | 0,4 | bin |
| Porto Alegre – Ano real | 80 | 0,9 | bin |
| Porto Alegre | 80 | 0,9 | bin |
| Rio de Janeiro – Ano Real | 1316 | 15,0 | bin |
| Rio de Janeiro | 5 | 0,1 | bin |
| São Paulo | 24 | 0,3 | bin |



Identificados os erros, os dados foram corrigidos a fim de se completar as 8760 horas necessárias para formar um ano completo. Em caso de dados ausentes em que o número de horas sem dados não ultrapassou 6 horas consecutivas, o procedimento consistiu em interpolar os valores ausentes. Em casos que o número de horas de dados ausentes foi superior a 6 horas, a tendência do gráfico contendo três dias antes e três dias depois do intervalo ausente foi estudada. Quando necessário, mais dias foram acrescentados. De acordo com a tendência da curva, foram copiadas as horas correspondentes de um dia anterior ou posterior.

As figuras 3 e 4 mostram o preenchimento de 10 horas de temperaturas ausentes, das 12h às 24h do dia 8 de janeiro. A tendência das curvas de temperatura mostrou ser mais adequado copiar os dados da mesma hora do dia 9 de janeiro devido a uma queda nas temperaturas nos dois dias anteriores.

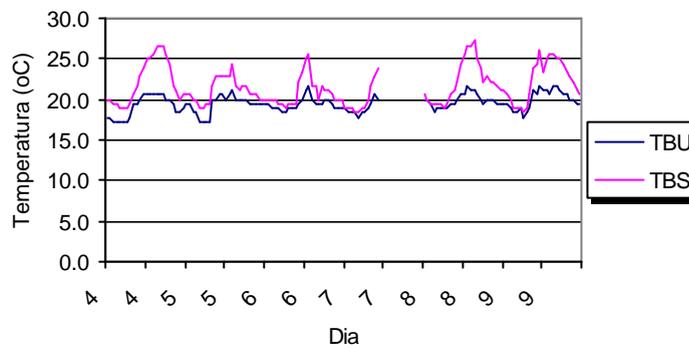


Figura 3. Horas ausentes nos primeiros dias do mês de janeiro para o TRY de Brasília.

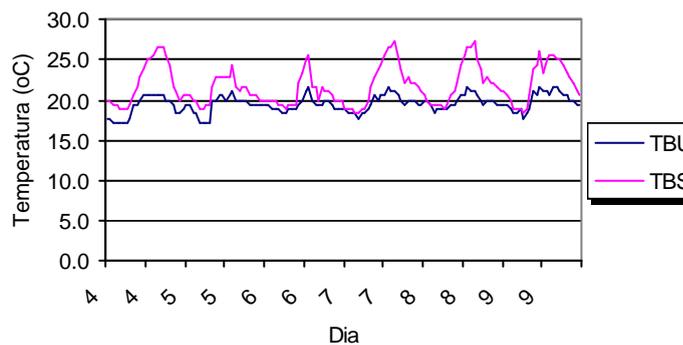


Figura 4. Correção: as horas ausentes são completadas com os dados de horas equivalentes de um dia anterior ou posterior.



4 RADIAÇÃO SOLAR

Quando Kruger e Lamberts (1999) apontaram uma baixa correlação entre a radiação global horizontal calculada pelo programa DOE-2.1E para a cidade de Florianópolis e os dados de radiação solar medidos na cidade pelo LABSOLAR/UFSC, com coeficiente de determinação, R^2 , de 0,58, percebeu-se uma necessidade de desenvolver método próprio, ou adaptar metodologias já existentes para as condições de céu do Brasil. Kruger e Lamberts (1999) mostraram que a radiação global calculada pelo programa é estatisticamente diferente do medido, assim como outros algoritmos baseados na cobertura de nuvens desenvolvidos no hemisfério norte e testados sem ajustes em seus coeficientes para o céu do Brasil. As estimativas de radiação solar global com o uso de dados horários de nebulosidade do DOE 2.1-E mostraram-se fiéis à realidade somente em situações extremas: com cobertura total de nuvens e com céu claro.

Assim, a carência de dados de radiação solar nos arquivos climáticos, a sua importância nas simulações e a imprecisão dos cálculos por programas computacionais que utilizam dados do hemisfério norte motivaram o estudo de algumas metodologias de estimativa de dados de radiação solar. Os itens a seguir apresentam as metodologias selecionadas dentre diversas estudadas para a estimativa da radiação solar global horizontal, e os procedimentos adotados para a estimativa das radiações direta e difusa horizontais e radiação direta normal.

4.1 RADIAÇÃO SOLAR GLOBAL HORIZONTAL

Dois métodos para a estimativa da Radiação Solar foram estudados, o método Kasten, descrito em Thevenard e Brunger (2001), e o método LabEEE, desenvolvido por Pitta (2001) no Laboratório de Eficiência Energética em Edificações. Esses dois métodos foram, inicialmente, adaptados a quatro diferentes cidades, de modo a se avaliar sua viabilidade. Para isso foi necessário estimar novos coeficientes para os dois métodos, trabalho este que foi feito com base nas médias mensais dos totais diários de radiação global horizontal expressos em Colle e Pereira (1998) do Laboratório de Energia Solar, LABSOLAR, da UFSC.

O modelo de Kasten (THEVENARD e BRUNGER, 2001) é considerado, por vários pesquisadores, um modelo relativamente simples e de fácil utilização. Foi utilizado parcialmente para a geração dos arquivos IWEC, *International Weather for Energy Calculations*, pois, outro modelo, Metstat (THEVENARD e BRUNGER, 2001), foi adotado para cálculos de céu claro e a radiação horária para céu claro encontrada foi aplicada no modelo para céu com nuvens de Kasten (equação 2). A equação 1 apresenta a equação para céu claro, não utilizada na geração dos arquivos IWEC, enquanto a equação 2 apresenta o modelo para céu nublado e parcialmente nublado, que possui somente a cobertura total de nuvens como dado de entrada, não levando em consideração o tipo das mesmas.



A radiação para céu claro é dada por:

$$I'g = I_0 A \exp(-BT_1 m) \quad (\text{equação 1})$$

e a radiação global é calculada por:

$$Ig = I'g(1 - aCA^b) \quad (\text{equação 2})$$

onde: I_0 = radiação extraterrestre [W/m^2];

T_1 = fator de turbidez de Linke;

m = massa de ar [adimensional]

C = nebulosidade [décimas];

a , b , A e B , coeficientes específicos para cada cidade.

O valor da massa de ar (m), é obtido pela expressão descrita em NREL (1995):

$$m = \frac{P}{P_{ref}} x \frac{1}{\cos q + 0,50572x(96,07995 - q)^{-1,6364}} \quad (\text{equação 3})$$

onde: P = pressão atmosférica local [Pa];

P_{ref} = 101325 [Pa];

q = ângulo zenital [graus ou radianos].

O cálculo do ângulo zenital foi feito com base em Duffie e Beckman (1991), página 16:

$$\cos q = \sin f \sin d + \cos f \cos d \cosh \quad (\text{equação 4})$$

onde : f = latitude [graus ou radianos];

d = declinação [graus ou radianos];

h = ângulo horário [graus ou radianos].

Já o modelo de Pitta (2001) consiste em uma equação para estimar os totais diários de radiação global horizontal (H_g) em Florianópolis a partir da média diária da cobertura total de nuvens e dos totais diários de radiação global horizontal medidos na estação do LABSOLAR-UFSC. A equação possui a nebulosidade média diária e a radiação solar extraterrestre como dados de entrada, tendo ainda os coeficientes a , b e c , que se alteram de mês a mês, em razão do ciclo anual do sol. Estes coeficientes são determinados para cada cidade em estudo.

A estimativa da radiação solar é dada por:

$$Hg = (c + b(C/10) + a(C/10)^2) x H_0 \quad (\text{equação 5})$$

sendo: H_g = totais diários de radiação global horizontal;

H_0 = totais diários da radiação global extraterrestre [W/m^2];

C = média diária da cobertura total de nuvens [adimensional];

a , b e c , coeficientes mensais.



A estimativa dos totais diários de radiação global horizontal de Pitta (2001) foi avaliada por Carlo e Lamberts (2001) e Carlo (2002) para estimativa da radiação global horizontal horária. A equação 6 é semelhante à equação 5, porém com dados de radiação diária substituídos pelos dados de radiação horária, sendo que a cobertura de nuvens deve ser um dado registrado de hora a hora.

$$I_g = (c + b(N/10) + a(N/10)^2) \times I_0 \quad (\text{equação 6})$$

sendo: I_g = radiação global horizontal horária
 I_0 = radiação global horizontal extraterrestre horária [W/m^2];
 N = nebulosidade horária [adimensional];
 a , b e c , coeficientes mensais.

Após comprovar o uso da equação 6 para estimativa da radiação horária para Florianópolis, Carlo e Lamberts (2001) ajustaram o coeficiente c para a cidade do Rio de Janeiro. Calcularam a radiação global horizontal de hora a hora para obter as médias mensais dos totais diários que foram comparadas às médias mensais de Colle e Pereira (1998). O coeficiente c foi ajustado iterativamente de forma a se obter a menor diferença entre as médias estimadas e as médias de Colle e Pereira (1998).

4.1.1. Ajuste do Modelo de Kasten: método Kasten adaptado

Para utilizar o modelo de Kasten sob as condições brasileiras, os coeficientes A e B , da equação 1 e os coeficientes a e b da equação 2 foram ajustados utilizando quatro cidades como referência, selecionadas de acordo com a sua distribuição pelo território brasileiro: Belém, Brasília, Recife e São Paulo.

Os valores mensais de fator de turbidez de Linke foram obtidos de mapas providos pelo sítio www.helioclim.net/linke baseado em KASTEN (1996). Outros dados necessários para a estimativa são: ângulo horário, declinação, e radiação extraterrestre; que foram calculados com base na latitude da cidade em questão e época do ano.

Com estes dados, o modelo Kasten foi implementado e foi obtida a radiação horizontal horária, sendo estes dados convertidos em médias mensais. Os coeficientes foram ajustados empiricamente baseados nas médias mensais de radiação de Colle e Pereira (1998). Em algumas cidades, foi necessário o acréscimo de uma constante C , para correção das médias mensais. Os resultados são apresentados na tabela 2.



Tabela 2.- Coeficientes estimados para o Método Kasten.

| | a | B | A | B | C |
|-----------|-------|-------|-------|-------|-------|
| Belém | 0,016 | 0,009 | 0,300 | 0,010 | -4400 |
| Brasília | 0,020 | 0,012 | 3,150 | 0,020 | -1800 |
| Recife | 0,010 | 0,009 | 3,600 | 0,028 | -2000 |
| São Paulo | 0,034 | 0,082 | 7,000 | 0,034 | |

É interessante notar que a constante C é mais alta nas cidades de baixas latitudes. À medida que a latitude cai, a constante C se reduz, sendo que em São Paulo não foi necessária. Este aspecto pode ter relação com o local onde os dados que originaram o modelo foram medidos, a Europa. O método exige então grandes ajustes para as baixas latitudes, como para cidades como Belém e Recife.

4.1.2. Ajuste do Modelo de Pitta: método LabEEE

A metodologia adotada por Carlo e Lamberts (2001) para o Rio de Janeiro e por Carlo (2002) para Manaus fundamentou o ajuste dos coeficientes mensais da equação de Pitta (2001) para as demais cidades em estudo. Primeiramente, notou-se que os coeficientes \underline{a} e \underline{b} de Pitta (2001) subestimavam a radiação horária em situações de baixa nebulosidade nos meses de janeiro e fevereiro para as outras cidades. Foi identificado que não ocorreu dias de céu claro, ou seja, nebulosidade zero, nos referidos meses em Florianópolis. Utilizando dados de nebulosidade zero, os coeficientes a e b foram ajustados em função do índice kt (PITTA, 2001), fator inicial de análise para o desenvolvimento da equação 5. Na tabela 3 estão apresentados os coeficientes \underline{a} e \underline{b} para todos os meses do ano com os devidos ajustes para os meses de janeiro e fevereiro.

Tabela 3. Coeficientes mensais \underline{a} e \underline{b} do método LabEEE

| | jan | fev | mar | abr | mai | jun | jul | ago | set | out | nov | dez |
|---|------|------|------|-------|-------|-------|-------|-------|-------|-------|------|------|
| a | -0,5 | -0,5 | -0,5 | -0,39 | -0,26 | -0,46 | -0,64 | -0,66 | -0,58 | -0,77 | -0,6 | -0,4 |
| b | 0,1 | 0,1 | 0,1 | -0,04 | -0,08 | 0,03 | 0,14 | 0,23 | 0,15 | 0,29 | 0,2 | -0,1 |

Tabela 4. Coeficiente \underline{c} para cidades brasileiras

| | jan | fev | mar | abr | mai | jun | jul | ago | set | out | nov | dez |
|--------------|------|------|-------|-------|------|------|------|------|------|-------|-------|------|
| Belém | 0,86 | 0,85 | 0,825 | 0,855 | 0,72 | 0,71 | 0,70 | 0,69 | 0,84 | 0,73 | 0,67 | 0,83 |
| Brasília | 0,95 | 0,91 | 0,81 | 0,80 | 0,77 | 0,77 | 0,65 | 0,81 | 0,83 | 0,955 | 0,815 | 1,01 |
| Porto Alegre | 0,71 | 0,75 | 0,73 | 0,81 | 0,70 | 0,86 | 0,79 | 0,68 | 0,80 | 0,76 | 0,64 | 0,80 |
| Recife | 0,67 | 0,73 | 0,78 | 0,79 | 0,75 | 0,79 | 0,68 | 0,60 | 0,71 | 0,66 | 0,71 | 0,84 |
| São Paulo | 0,77 | 0,80 | 0,78 | 0,83 | 0,81 | 0,84 | 0,81 | 0,77 | 0,73 | 0,85 | 0,71 | 0,90 |

Em seguida, a radiação solar horária gerada pela equação 6, cujos coeficientes mensais \underline{a} e \underline{b} já estavam ajustados para os meses de janeiro e fevereiro, foi convertida em médias mensais de totais diários e foram comparados com as médias mensais de Colle e



Pereira (1998), procedendo conforme realizado por Carlo (2002). Os coeficientes mensais α obtidos para as quatro cidades piloto são mostrados na tabela 4.

4.1.3. Resultados Parciais

As médias mensais de totais diários de radiação global horizontal obtidas pelos dois métodos para as quatro cidades estudadas foram então comparadas com outras fontes além de Colle e Pereira (1998), provenientes de arquivos IVEC – radiação calculada por Thevernard e Brunger (2001) e de uma das fontes para o cálculo dos arquivos IVEC, a radiação fornecida pela NASA Langley Research Center (NASA, 2003). Desta, forma, espera-se que as radiações destas últimas duas fontes sejam semelhantes.

Na figura 4, onde é abordado o caso referente à cidade de Belém, as médias do método LabEEE coincidem com as médias de LABSOLAR em todos os meses do ano. As médias dos totais diários de radiação global horizontal calculadas pelo método Kasten aproximam-se às médias do LABSOLAR (COLLE e PEREIRA, 1998) nos meses de fevereiro a agosto e dezembro. Já nos meses de janeiro, setembro, outubro e novembro, houve uma diferença de cerca de 500Wh/m^2 entre estas médias. As médias dos totais diários fornecidos pela NASA Langley Research Center e as médias calculadas pela radiação existentes nos arquivos climáticos IVEC se assemelham entre si, como esperado, mas diferem significativamente das médias do LABSOLAR nos meses de janeiro a abril e em setembro.

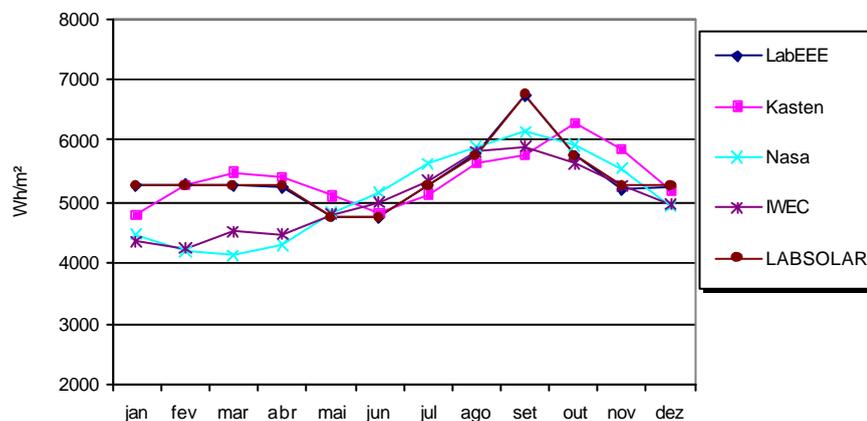


Figura 4. Médias mensais dos totais diários de radiação global horizontal calculadas para Belém

Já as médias calculadas pelo método de Kasten para a cidade do Recife acompanharam melhor a curva das médias do LABSOLAR (COLLE e PEREIRA, 1998). Ainda assim, a figura 5 mostra que as médias mensais dos totais diários de radiação global calculadas pelo método LabEEE melhor se ajustaram às médias do LABSOLAR do que as médias de Kasten. Esta última, entretanto, apresentou diferenças significativas apenas nos meses de julho e agosto, de cerca de 1000Wh/m^2 e 700Wh/m^2 , respectivamente. Em geral,



todas as fontes apresentam uma configuração semelhante, com máximos no verão e mínimos no inverno.

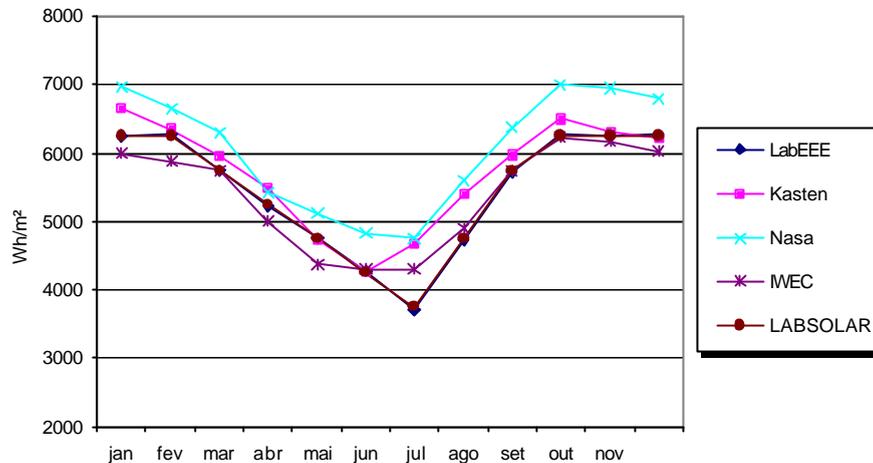


Figura 5. Médias mensais de totais diários de radiação global horizontal calculadas para a cidade do Recife

A figura 6 apresenta as médias de totais diários de radiação global horizontal para a cidade de Brasília, onde se percebe um bom ajuste entre as médias calculadas pelo método LabEEE e as médias do LABSOLAR (COLLE e PEREIRA, 1998) durante todo o ano, porém diferenças grandes entre as médias de Kasten e a do LABSOLAR (COLLE e PEREIRA, 1998). De fevereiro a abril, em julho e nos dois meses finais do ano as médias são semelhantes. Nos meses de maio até o outubro, com exceção de julho, a diferença entre as médias variou de cerca de 500Wh/m^2 (maio) a cerca de 1200Wh/m^2 (agosto e setembro). Novamente, estes dados se diferenciam muito dos dados dos arquivos IVEC e do NASA Langley Research Center, principalmente no período do verão, com diferenças extremas nos meses de janeiro e dezembro de até 2500Wh/m^2 em relação a LABSOLAR (COLLE e PEREIRA, 1998). Esta diferença dá-se pela configuração das curvas das médias de radiação global calculadas com os arquivos IVEC e obtidas do NASA Langley Research Center serem relativamente estáveis durante todo o ano, enquanto as demais curvas, LabEEE, Kasten e LABSOLAR, apresentam médias mais altas no período do verão e mais baixas no inverno.

Para a cidade de São Paulo, a figura 7 mostra novamente que as médias mensais dos totais diários de radiação global calculadas pelo método LabEEE coincidem com as médias de LABSOLAR, fornecidas por Colle e Pereira (1998). Kasten apresenta relativa semelhança com LABSOLAR (COLLE e PEREIRA, 1998), sendo que as maiores diferenças ocorrem nos meses de abril a junho, em setembro e em novembro. A diferença média é cerca de 500Wh/m^2 , sendo a máxima de aproximadamente 1000Wh/m^2 no mês de novembro.

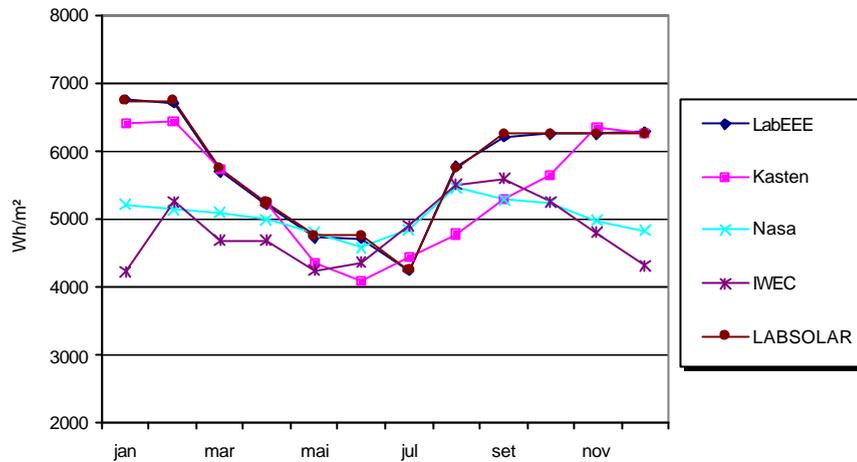


Figura 6. Médias mensais de totais diários de radiação global horizontal para Brasília

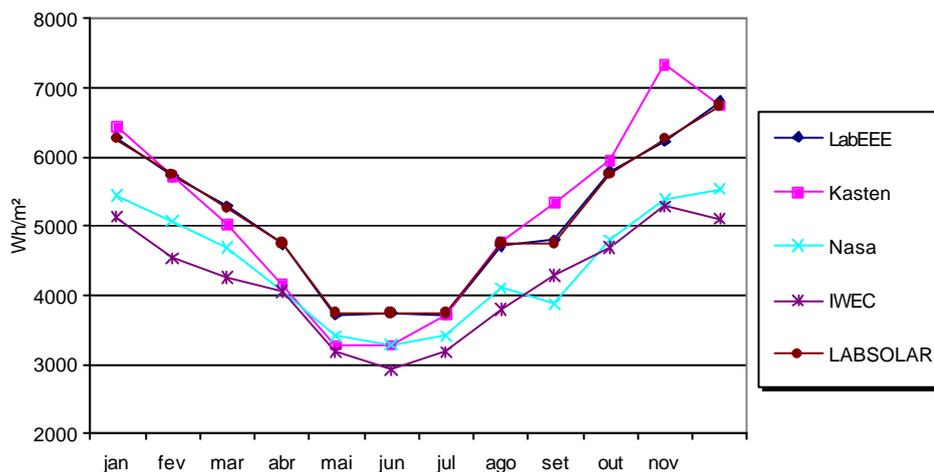


Figura 7. Médias mensais de totais diários de radiação global horizontal calculadas para a cidade de São Paulo

A cidade de Porto Alegre não possui arquivo IVEC, sendo então comparado com as médias do LABSOLAR somente. Na figura 8 observa-se como novamente foi possível a calibração do método LabEEE de forma a se conseguir médias mensais coincidentes com as de LABSOLAR. As médias de Kasten apresentam-se equivalentes às de LABSOLAR durante quase todos os meses do ano, diferindo significativamente apenas em agosto e novembro, este com a diferença máxima de pouco mais de 1200Wh/m^2 .

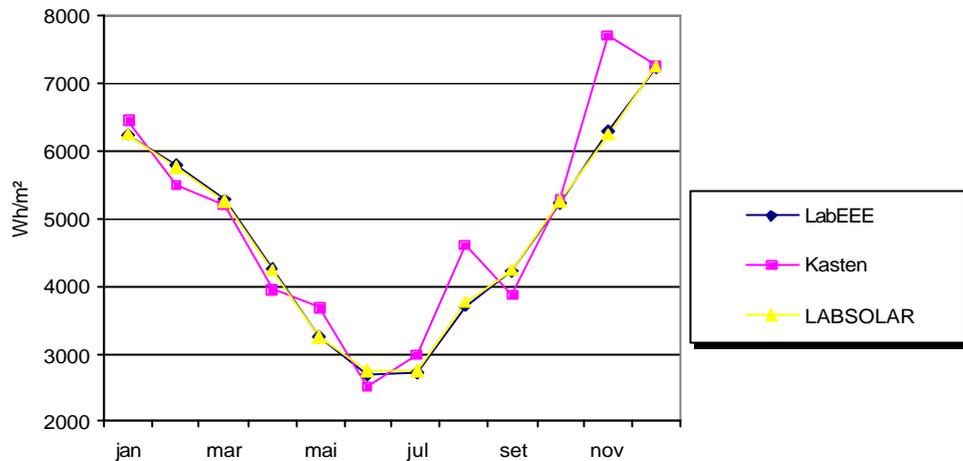


Figura 8. Médias mensais de totais diários de radiação global horizontal para Porto Alegre.

Outra forma de análise foi também efetuada ao estimar a radiação solar através dos métodos LabEEE e Kasten com os dados de nebulosidade e pressão oriundos do arquivo IWEC. Neste caso, os coeficientes não foram ajustados, tendo sido mantidos o que foi obtido no método anterior. A figura 9 apresenta as médias estimadas para a cidade do Recife. Como no caso do uso de nebulosidades diferentes, a configuração para Recife é semelhante, com médias mensais de totais diários de radiação global horizontal mais altas no verão e mais baixas no inverno.

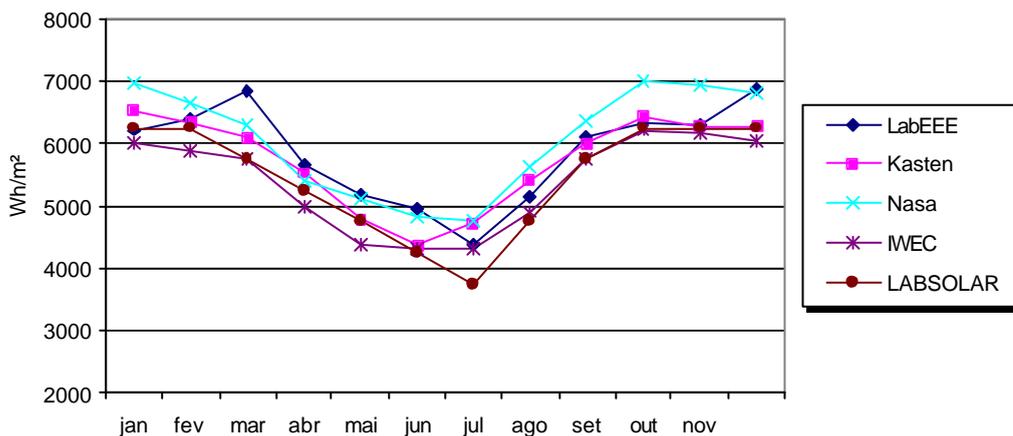


Figura 9. Médias mensais de radiação em Recife, com dados TMY2

Neste caso, as médias de LabEEE apresentam um desvio de LABSOLAR, principalmente nos meses de março a julho e também em dezembro, sendo a maior variação na ordem de 1000Wh/m^2 , no mês de março. Kasten apresentou médias coincidentes com LABSOLAR nos meses de janeiro, fevereiro e de setembro a dezembro, com diferenças pequenas nos demais meses, sendo a maior de 1000Wh/m^2 em julho. Em relação ao arquivo



IWEC do Recife, as diferenças usando o método LabEEE ou o método de Kasten são variáveis, sendo a concordância ora melhor com um método, ora melhor com outro.

4.1.4. Conclusão

O método Kasten, em relação aos dados de LABSOLAR de Colle e Pereira (1998), apresenta bons resultados para Belém e Recife e resultados regulares para Brasília e São Paulo. No caso de Porto Alegre, os resultados obtidos pelo método de Kasten são satisfatórios, com exceção dos meses de agosto e novembro. Não foi possível estabelecer um padrão para o comportamento da estimativa por Kasten visto que, em todos os casos, houve uma ocorrência mínima de 2 meses em que a radiação foi diferente das médias fornecidas por LABSOLAR (COLLE e PEREIRA, 1998).

As médias mensais dos totais diários estimados pelo método LabEEE foram perfeitamente ajustadas às médias mensais do LABSOLAR (COLLE e PEREIRA, 1998) para as cinco cidades avaliadas. A diferença entre estas médias foi de, no máximo, 50Wh/m^2 .

Quando foram usados dados de nebulosidade e pressão dos arquivos climáticos IWEC, as médias estimadas pelo método Kasten se aproximaram mais às do LABSOLAR do que às do LabEEE nos meses de abril, junho e julho. No restante, ou as médias mensais dos totais diários coincidiram ou as estimadas pelo método LabEEE aproximaram-se mais das médias fornecidas pelo LABSOLAR (COLLE e PEREIRA, 1998).

Os resultados encontrados levaram à escolha do método LabEEE para estimativa da radiação global horizontal horária em todas as capitais brasileiras. Deve-se ressaltar que o método LabEEE foi desenvolvido com constantes mensais, o que torna mais precisa sua calibração, enquanto o método Kasten é baseado em constantes anuais.

A tabela 5 contém os valores da constante c de todos os meses do ano ajustados para as 9 cidades restantes em estudo. Vale lembrar que as constantes a e b foram mantidas iguais para todas as cidades estudadas, por não ter sido necessário o seu ajuste para a obtenção de bons resultados entre as médias mensais dos totais diários do LabEEE e as do LABSOLAR (COLLE e PEREIRA, 1998).

Tabela 5. Constante c para nove capitais brasileiras

| | jan | fev | mar | abr | mai | jun | jul | ago | set | out | nov | dez |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Curitiba | 0,76 | 0,75 | 0,71 | 0,83 | 0,68 | 0,79 | 0,76 | 0,80 | 0,71 | 0,79 | 0,79 | 0,89 |
| Florianópolis | 0,76 | 0,75 | 0,67 | 0,71 | 0,69 | 0,69 | 0,70 | 0,68 | 0,68 | 0,70 | 0,68 | 0,75 |
| Fortaleza | 0,74 | 0,77 | 0,81 | 0,82 | 0,75 | 0,73 | 0,71 | 0,67 | 0,69 | 0,62 | 0,73 | 0,79 |
| Maceió | 0,73 | 0,70 | 0,79 | 0,79 | 0,79 | 0,86 | 0,76 | 0,72 | 0,76 | 0,76 | 0,78 | 0,87 |
| Natal | 0,85 | 0,78 | 0,79 | 0,85 | 0,77 | 0,85 | 0,81 | 0,70 | 0,71 | 0,72 | 0,76 | 0,88 |
| Rio de Janeiro | 0,73 | 0,79 | 0,61 | 0,70 | 0,61 | 0,75 | 0,59 | 0,76 | 0,56 | 0,78 | 0,70 | 0,77 |
| Salvador | 0,78 | 0,71 | 0,80 | 0,80 | 0,72 | 0,71 | 0,82 | 0,74 | 0,71 | 0,77 | 0,76 | 0,88 |
| São Luis | 0,71 | 0,82 | 0,78 | 0,84 | 0,83 | 0,81 | 0,80 | 0,75 | 0,74 | 0,70 | 0,76 | 0,90 |
| Vitória | 0,83 | 0,82 | 0,73 | 0,69 | 0,67 | 0,80 | 0,81 | 0,76 | 0,71 | 0,83 | 0,69 | 0,91 |



4.2. RADIAÇÃO SOLAR DIRETA NORMAL

A radiação solar direta normal incide sobre uma superfície receptora que se encontra alinhada em ângulo reto com a direção de incidência, formando um ângulo de incidência de 0° com a normal à superfície. Esse dado é necessário à compilação de arquivos climáticos do tipo bin, utilizados pelo programa DOE 2.1-E. Da mesma forma que a radiação solar global horizontal, são raras as estações que mantêm medições de radiação direta de forma constante, restando a utilização de modelos analíticos para sua estimativa.

A radiação solar direta normal é estimada a partir de dados de radiação solar direta horizontal que, por sua vez, é estimada a partir da radiação global horizontal. Em DUFFIE e BECKMAN (1991), a Radiação Direta Normal (I_{bn}) é expressa conforme a equação 7.

$$I_{bn} = \frac{I_b}{\cos(\mathbf{q})}, \quad (\text{equação 7})$$

onde I_b = Radiação Direta incidente na superfície horizontal [W/m^2]

\mathbf{q} = altitude solar [graus ou radianos].

O $\cos(\mathbf{q})$ é calculado pela equação 8:

$$\cos(\mathbf{q}) = (1 - \cos^2 \mathbf{d} * \sin^2 \mathbf{w})^{\frac{1}{2}} \quad (\text{equação 8})$$

onde \mathbf{d} = declinação [graus ou radianos]

\mathbf{w} = ângulo horário [graus ou radianos].

Para conferência e possível ajuste dos dados obtidos, foram utilizados como referência os valores máximos de radiação direta normal para dia de céu claro descritos no *ASHRAE Handbook of Fundamentals* (ASHRAE, 2001), segundo a equação 9.

$$I_{bn_{\max}} = \frac{A}{\exp\left(\frac{B}{\sin \mathbf{b}}\right)} \quad (\text{equação 9})$$

onde A e B = relacionadas a constantes;

\mathbf{b} = altitude solar [graus ou radianos]

A altitude solar pode ser encontrada com:

$$\sin \mathbf{b} = \cos L * \cos \mathbf{d} * \cos H + \sin L * \sin \mathbf{d} \quad (\text{equação 10})$$

onde L = latitude [graus ou radianos];



d = declinação [graus ou radianos];

H = hora solar até o meio-dia (minutos)

Sendo H dado por:

$$H = 0,25[720 - (HL * 60 - 4(90 - Long))] \quad (\text{equação 11})$$

onde HL = hora local [horas];

$Long$ = Longitude [graus].

As constantes A e B da equação 9 foram obtidas em ASHRAE (2001) e usadas para limitar possíveis distorções nos cálculos, bastante comuns devido ao efeito que o co-seno causa na radiação quando o sol está próximo ao horizonte, maximizando-a. Quando o valor da radiação direta normal foi superior em até 200Wh/m^2 ao valor máximo estimado pela equação 9, esta foi corrigida equiparando-se às máximas estimadas.

O exemplo da variação de radiação em um dia típico, para a cidade de São Paulo, é apresentado na figura 10.

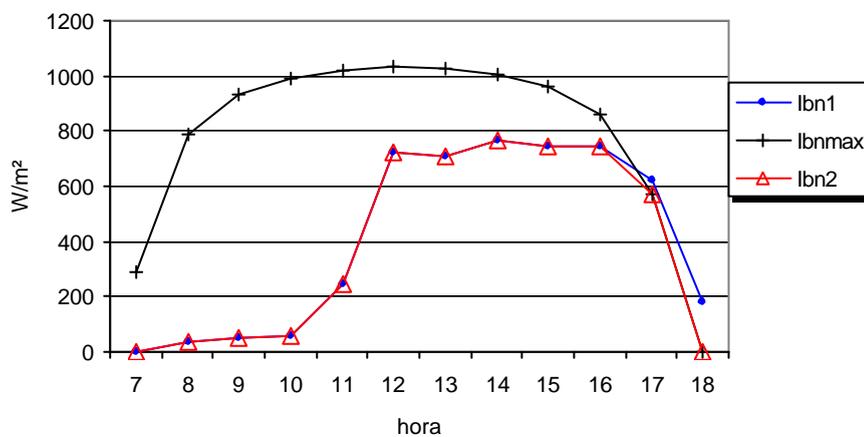


Figura 10. Correção da radiação direta normal no dia 25 de abril, na cidade de São Paulo.

Na figura 10, percebe-se que a radiação direta normal com nuvens (l_{bn1}) excedeu a radiação direta normal para céu claro (l_{bnmax}) nas duas últimas horas de sol, às 17 e 18h. Foi então corrigida (l_{bn2}) para estas horas, igualando-se à radiação direta normal máxima, para céu claro. Este método foi aplicado, em sua maior parte, nas penúltimas horas de sol do dia, e com menor frequência, nas segundas horas de sol do dia.



5 RESULTADOS

5.1 RADIAÇÃO SOLAR

A radiação global horizontal foi estimada hora a hora para todas as cidades envolvidas, bem como a radiação direta normal e, quando preciso, a radiação difusa horizontal. A figura 11 apresenta a nuvem de pontos que representam os dados de radiação global horizontal para a cidade de Florianópolis, no primeiro semestre, e a figura 12, a radiação para o segundo semestre do TRY de 1963. Cada dia do ano está representado por uma cor e/ou símbolo. Nos dois casos (figuras 11 e 12), os níveis de irradiação estão diretamente relacionados ao período do ano e à quantidade de nuvens na abóbada celeste. No primeiro semestre, figura 11, percebe-se que a radiação das 12h pode variar de 200Wh/m^2 a 1000Wh/m^2 , aproximadamente. Na figura 12, esta varia de 170Wh/m^2 a pouco mais de 1000Wh/m^2 . Ao observar um dia com pouca radiação, percebe-se que as horas de sol são menores que um dia em que a radiação solar é alta. No período do inverno, quando o dia é mais curto, a radiação solar deve atravessar uma camada atmosférica mais espessa, considerando a latitude de Florianópolis, refletindo então uma queda na intensidade da radiação solar que alcança a superfície terrestre. Está confirmado então que este fenômeno é bem representado pelas estimativas realizadas.

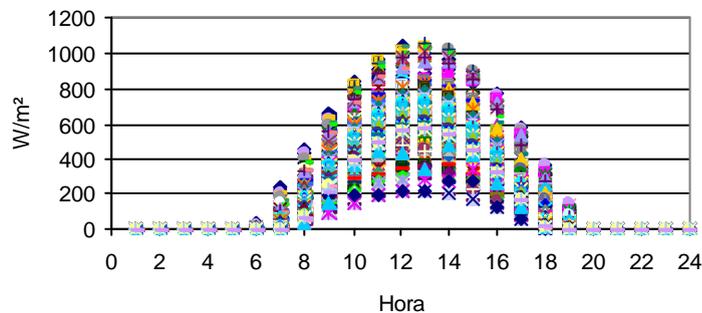


Figura 11. Radiação global horizontal de janeiro a junho para a cidade de Florianópolis, latitude $27^{\circ}40'S$.

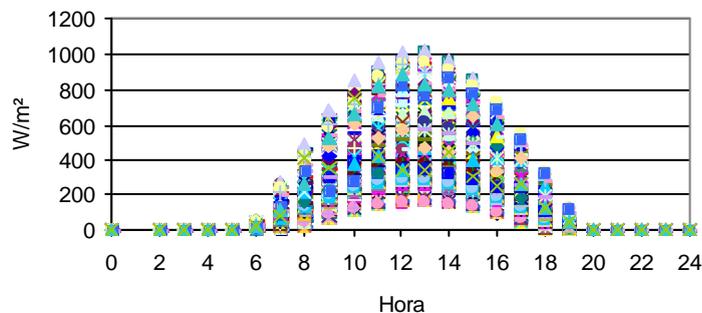


Figura 12. Radiação global horizontal de julho a dezembro para a cidade de Florianópolis, latitude $27^{\circ}40'S$.



Este fenômeno pode ser comparado à radiação solar de Belém, cidade de baixa latitude, $1^{\circ}33'S$, em que os solstícios de inverno e verão não são diferenciados. A figura 13 mostra a radiação global horizontal horária de janeiro a junho, estimados com a nebulosidade ocorrida no ano de 1954, enquanto a figura 14 mostra a radiação estimada de julho a dezembro. Nas duas figuras, percebe-se que as horas do nascer e do pôr do sol não se alteram, e os níveis mínimos da radiação global horizontal às 12h estão na ordem de 300Wh/m^2 no primeiro semestre e 350Wh/m^2 no segundo semestre. A redução da intensidade da radiação solar é então consequência exclusiva da cobertura de nuvens visto que a espessura da camada atmosférica que a radiação solar deve atravessar não se altera para esta latitude.

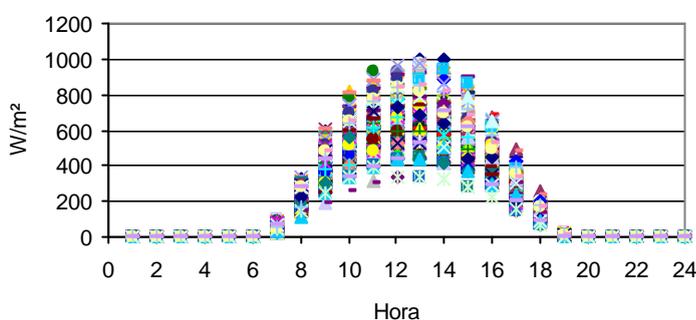


Figura 13. Radiação global horizontal de janeiro a junho para a cidade de Belém, latitude $1^{\circ}33'$.

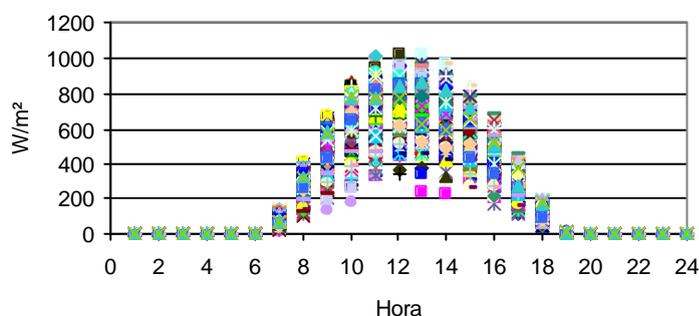


Figura 14. Radiação global horizontal de julho a dezembro para a cidade de Belém, latitude $1^{\circ}33'$.

As figuras 11 e 12 e as figuras 13 e 14 representam as situações extremas que podem ocorrer nas cidades estudadas. O aspecto da nuvem de pontos que representa a radiação global horizontal horária para as demais cidades é intermediário às situações de Belém e Florianópolis, como são as suas latitudes.

5.2 FORMATOS DOS ARQUIVOS CLIMÁTICOS

Após corrigidos ou estimados os dados climáticos das 8760 horas de cada arquivo, estes foram compilados para três formatos: um arquivo texto, de extensão csv, que reúne todos os dados climáticos disponíveis e utilizados para a compilação, um arquivo de extensão bin,



formato compatível com o programa DOE-2.1E, e um arquivo de extensão epw, formato compatível com o programa EnergyPlus.

Os dois últimos formatos ainda geram arquivos estatísticos para análise dos dados, e acompanham os arquivos climáticos propriamente ditos, embora possam ser utilizados independentemente. Os arquivos estatísticos que acompanham os bin estão apresentados no anexo 2, lembrando que estes se encontram em unidades inglesas, e os arquivos estatísticos dos arquivos epw formam o anexo 3. O formato csv foi utilizado para extrair dados para a planilha resumo, apresentada no anexo 4.

Cada tipo de arquivo climático apresenta um formato distinto. Os arquivos com extensão bin têm os dados em unidades inglesas, e não são possíveis de serem abertos em editor de texto. Seu cabeçalho, antes da conversão de dados para o formato bin, segue a ordem mostrada na tabela 6, porém todos na mesma linha. Cada nova linha corresponde a uma nova hora. Deve-se ressaltar, entretanto, que o cabeçalho é usado como referência, mas não é incluído no arquivo climático em si. Os arquivos climáticos compilados no formato bin não apresentam dados nas colunas de neve, chuva (pluviosidade) e na coluna referente ao tipo de nuvens, tendo sido sombreados na tabela 6. A ausência destes dados não impede a realização da simulação pelo programa DOE-2.1E.

Tabela 6. Cabeçalho dos dados que compõe os arquivos climáticos do formato bin.

| | | | | | | | |
|----------------------------|-------|------------------|------------------------|--------------------|----------------|---------------------|----------|
| mês | dia | hora | tbu | tbs | pressão | cobertura de nuvens | |
| | | | | | | | |
| neve | chuva | direção do vento | | umidade específica | | densidade do ar | entalpia |
| | | | | | | | |
| radiação global horizontal | | | radiação direta normal | | tipo de nuvens | velocidade do ar | |
| | | | | | | | |

Já os arquivos no formato epw apresentam uma série de novos dados, cujo cabeçalho é mostrado na tabela 7. Neste caso, o cabeçalho faz parte do formato do arquivo, e portanto está apresentado na língua original do formato epw, em inglês. A tradução para o português foi inserida na segunda linha da tabela 7.

Assim como na tabela 6, os dados não existentes nos arquivos climáticos compilados estão sombreados na tabela 7. O programa EnergyPlus também não necessita de todas as colunas com dados preenchidos para realizar a simulação. O formato do arquivo já inclui dados que serão de fácil medição no futuro, mesmo que atualmente estejam indisponíveis. A fonte de dados não está preenchida por se tratar de um código específico do *Department of Energy* americano.



Tabela 7. Cabeçalho presente nos arquivos climáticos de formato epw.

| Date | HH:MM | Datasource | Dry Bulb Temperature {C} | Dew Point Temperature {C} | Relative Humidity {%} | Atmospheric Pressure {Pa} | |
|---|--------------------|-----------------------------|--|---------------------------------|---|---------------------------|----------------------|
| Data | Hora:min | Fonte de dados | Temperatura de bulbo seco | Temperatura de ponto de orvalho | Umidade relativa | Pressão atmosférica | |
| Extraterrestrial Horizontal Radiation {Wh/m2} | | | Extraterrestrial Direct Normal Radiation {Wh/m2} | | Horizontal Infrared Radiation Intensity from Sky {Wh/m2} | | |
| Radiação global extraterrestre horizontal | | | Radiação direta normal extraterrestre | | Intensidade da radiação infravermelha horizontal vinda do céu | | |
| Global Horizontal Radiation {Wh/m2} | | | Direct Normal Radiation {Wh/m2} | | Diffuse Horizontal Radiation {Wh/m2} | | |
| Radiação global horizontal | | | Radiação direta normal | | Radiação difusa horizontal | | |
| Global Horizontal Illuminance {lux} | | | Direct Normal Illuminance {lux} | | Diffuse Horizontal Illuminance {lux} | | |
| Iluminância global horizontal | | | Iluminância direta normal | | Iluminância difusa horizontal | | |
| Zenith Luminance {Cd/m2} | | Wind Direction {deg} | Wind Speed {m/s} | Total Sky Cover {.1} | Opaque Sky Cover {.1} | | |
| Luminância no zênite | | Direção do vento | Velocidade do vento | Cobertura total de nuvens | Cobertura opaca de nuvens | | |
| Visibility {km} | Ceiling Height {m} | Present Weather Observation | Present Weather Codes | Precipitable Water {mm} | Aerosol Optical Depth {.001} | Snow Depth {cm} | Days Since Last Snow |
| Visibilidade | Altura da abóbada | Tempo presente | Código de tempo presente | Precipitação | Profundidade óptica de aerossóis | Qdade de neve | Dias sem nevar |

Por fim, o formato para consulta de dados, com extensão csv, possui um cabeçalho como mostrado na tabela 8. Todos os dados estão completos e podem ser consultados para conhecer os dados correspondentes nos arquivos de outros formatos ou podem ser manipulados para outros fins.



Tabela 8. Cabeçalho presente no arquivo climático de formato csv.

| Mês | Dia | Hora | TBS {C} | TBU {C} | T _d {C} | Pressão Atmosferica {kPa} |
|---|---|----------|---|--------------------------------|--|--|
| | | | | | | |
| Umidade Relativa {%} | Densidade do ar | Entalpia | Velocidade do Vento {m/s} | Direção do Vento {graus} | Cobertura Total de Nuvens | Radiação Global Horizontal Extraterreste {Wh/m ² } |
| | | | | | | |
| Radiação Global Horizontal {Wh/m ² } | Radiação Direta {Wh/m ² } | | Radiação Direta Normal {Wh/m ² } | | Radiação Difusa Horizontal {Wh/m ² } | |
| | | | | | | |

Foram gerados 3 formatos de arquivos climáticos: bin, epw e csv; para 14 cidades, totalizando 42 arquivos climáticos disponibilizados. Foram ainda gerados arquivos contendo informações sobre o conteúdo dos primeiros, informações estatísticas ou de resumo dos dados, totalizando outros 42 arquivos.



6 CONCLUSÃO

A etapa de processamento dos arquivos climáticos consistiu na revisão, tratamento e compilação de arquivos climáticos e na estimativa de dados de radiação solar. Alguns formatos tiveram seus dados atualizados, como o formato com extensão bin usado para simulação de desempenho térmico no programa DOE-2.1E; outros formatos foram criados, como o formato com extensão epw para simulação no programa EnergyPlus.

A estimativa de dados de radiação solar consistiu em selecionar dois métodos de cálculo de radiação global horizontal, chamados de método LabEEE e método Kasten, ajustar suas constantes e testar as médias mensais de seus totais diários para cinco cidades, comparando seus resultados a bibliografias existentes. Dos métodos avaliados, constatou-se que o método LabEEE fornecia médias mensais mais precisas quando comparadas ao Atlas de Irradiação Solar do Brasil, principal fonte de referência. Após obtidas as radiações globais horárias, a radiação direta normal foi estimada corrigindo suas distorções com dados limite da radiação direta normal para dias de céu claro.

No total, foram gerados arquivos climáticos para 14 cidades: Belém, Brasília, Recife, São Luís, Salvador, Fortaleza, Maceió, Natal, São Paulo, Vitória, Rio de Janeiro, Curitiba, Florianópolis, e Porto Alegre. Foram também gerados arquivos informativos, com dados estatísticos e com resumo. Os produtos gerados podem ser utilizados por dois programas computacionais para simulação do desempenho térmico de edificações, podem ser consultados em tabelas e gráficos resumindo as principais características ou podem ser manipulados para outros fins no formato texto. Ao todo, foram disponibilizados 84 arquivos do processamento de dados para criação de arquivos climáticos para simulação de desempenho de edificações.



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ANEXO 1
Arquivos Estatísticos do DOE-2.1E

BELÉM

BelemTRY1964_05.sta
DOE-2.1E-W74 WEATHER UTILITY PROGRA

INPUT VERIFICATION

RUN TYPE STAT

Belem -TRY MONTHLY WEATHER DATA SUMMARY

DOE-2.1E-W7

LATITUDE = -1.38

LONGITUDE = -48.48

TIME ZONE = 3

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|--------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| AVG. TEMP. (F) (DRYBULB) | 78.0 | 77.6 | 77.9 | 78.0 | 78.4 | 79.4 | 80.0 | 80.1 | 78.8 | 79.1 | 79.7 | 79.2 | 78.9 |
| AVG. TEMP. (F) (WETBULB) | 75.5 | 75.3 | 75.5 | 75.4 | 75.5 | 75.1 | 75.3 | 75.4 | 74.6 | 74.3 | 74.3 | 74.7 | 75.1 |
| AVG. DAILY MAX. TEMP. | 86.5 | 85.0 | 86.6 | 86.1 | 87.5 | 88.5 | 89.9 | 90.4 | 89.2 | 89.0 | 90.1 | 89.2 | 88.2 |
| AVG. DAILY MIN. TEMP. | 73.5 | 73.4 | 73.5 | 73.4 | 73.6 | 73.1 | 72.9 | 72.4 | 72.0 | 71.2 | 71.4 | 72.3 | 72.7 |
| HEATING DEG. DAYS (BASE 65) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 55) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 50) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| COOLING DEG. DAYS (BASE 80) | 21.5 | 7.5 | 14.5 | 11.5 | 27.5 | 27.0 | 43.5 | 44.0 | 21.0 | 9.5 | 26.0 | 24.5 | 278.0 |
| (BASE 75) | 157.5 | 118.5 | 156.0 | 143.0 | 171.0 | 173.5 | 198.5 | 199.0 | 168.5 | 157.5 | 173.0 | 179.0 | 1995.0 |
| (BASE 70) | 311.5 | 258.5 | 311.0 | 293.0 | 326.0 | 323.5 | 353.5 | 354.0 | 318.5 | 312.5 | 323.0 | 334.0 | 3819.0 |
| (BASE 65) | 466.5 | 398.5 | 466.0 | 443.0 | 481.0 | 473.5 | 508.5 | 509.0 | 468.5 | 467.5 | 473.0 | 489.0 | 5644.0 |
| HEATING DEG. HRS./24 (BASE 65) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

BelemTRY1964_05.sta

(BASE 55) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
 (BASE 50) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

COOLING DEG. HRS./24 (BASE 80) 37.3 25.0 32.8 32.1 43.0 66.2 81.6 90.0 63.6 70.6 77.2 67.4 686.9
 (BASE 75) 102.9 83.9 99.2 100.0 115.0 142.5 168.0 173.0 133.8 152.2 161.3 147.5 1579.3
 (BASE 70) 247.8 214.0 245.0 240.4 261.8 281.3 310.4 311.6 262.6 282.6 292.3 286.1 3235.9
 (BASE 65) 402.8 354.0 400.0 390.4 416.8 431.3 465.4 466.6 412.6 437.6 441.9 441.1 5060.4

MAXIMUM TEMP. 95 89 89 90 91 91 92 93 92 91 94 92 95
 MINIMUM TEMP. 71 71 71 72 71 70 71 71 70 69 68 71 68

NO. DAYS MAX. 90 AND ABOVE 6 0 0 1 4 6 19 24 11 12 21 9 113
 NO. DAYS MAX. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

NO. DAYS MIN. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0
 NO. DAYS MIN. 0 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

AVG. WIND SPEED (MPH) 0.7 0.8 0.7 0.7 0.6 0.8 1.0 1.2 1.2 1.1 1.2 1.1 0.9

AVG. WIND SPEED (DAY) 0.8 0.8 0.7 0.7 0.6 0.8 1.1 1.3 1.2 1.2 1.2 1.1 1.0
 AVG. WIND SPEED (NIGHT) 7.0 6.9 9.3 0.6 4.0 0.4 8.2 7.6 0.9 2.6 0.2 3.2 2.8

AVG. TEMP. (DAY) 81.0 80.7 80.9 81.0 81.4 82.4 83.1 83.0 81.6 81.9 82.5 82.1 81.8
 AVG. TEMP. (NIGHT) 395.2 1917.1 488.1 247.3 219.9 275.2 421.2 333.1 193.9 151.2 148.2 183.4 234.7

AVG. SKY COVER 6.4 6.8 6.7 6.7 6.4 4.9 3.6 3.4 4.0 3.2 3.2 4.6 5.0

AVG. SKY COVER (DAY) 6.7 7.1 7.0 7.1 6.7 5.2 3.7 3.6 4.2 3.3 3.3 4.8 5.2

AVG. REL. HUM. AT 4AM 97.1 97.2 98.0 97.9 97.4 96.8 95.8 95.9 96.0 95.4 94.6 94.9 96.4
 10AM 85.5 87.8 86.4 86.6 83.6 80.4 79.0 78.8 77.2 74.1 71.7 76.0 80.5
 4PM 81.0 82.1 84.1 79.7 77.0 66.2 62.7 63.1 67.7 67.0 66.5 68.3 72.1
 10PM 94.5 93.9 95.6 94.7 94.8 90.9 88.0 88.8 91.7 86.3 84.5 88.7 91.0

Belem -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -1.38

LONGITUDE = -48.48

TIME ZONE = 3

BelemTRY1964_05.sta

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC YEAR

| | | | | | | | | | | | | | |
|-----------------------------------|--------|--------|--------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|
| AVG. DAILY DIRECT NORMAL SOLAR | 337.0 | 408.0 | 300.5 | 310.3 | 277.2 | 349.4 | 490.1 | 580.6 | 793.6 | 610.6 | 463.8 | 455.8 | 448.1 |
| AVG. DAILY TOTAL HORIZNTL SOLAR | 781.9 | 941.9 | 756.3 | 772.8 | 723.9 | 725.2 | 810.5 | 907.3 | 1099.1 | 984.8 | 884.9 | 840.1 | 851.4 |
| MAX. DAILY DIRECT NORMAL SOLAR | 915.0 | 1018.0 | 851.0 | 912.0 | 810.0 | 777.0 | 732.0 | 803.0 | 1042.0 | 929.0 | 735.0 | 834.0 | 1042.0 |
| MAX. DAILY TOTAL HORIZNTL SOLAR | 1114.0 | 1328.0 | 1094.0 | 1127.0 | 1041.0 | 1009.0 | 965.0 | 1058.0 | 1250.0 | 1179.0 | 1062.0 | 1069.0 | 1328.0 |
| MIN. DAILY DIRECT NORMAL SOLAR | 169.0 | 160.0 | 124.0 | 129.0 | 72.0 | 32.0 | 35.0 | 205.0 | 180.0 | 105.0 | 213.0 | 118.0 | 32.0 |
| MIN. DAILY TOTAL HORIZNTL SOLAR | 645.0 | 652.0 | 619.0 | 643.0 | 550.0 | 435.0 | 402.0 | 648.0 | 701.0 | 627.0 | 683.0 | 596.0 | 402.0 |
| MAX. HRLY DIRECT NORMAL SOLAR | 238.0 | 248.0 | 226.0 | 246.0 | 220.0 | 209.0 | 207.0 | 222.0 | 269.0 | 239.0 | 181.0 | 211.0 | 269.0 |
| MAX. HRLY TOTAL HORIZNTL SOLAR | 295.0 | 311.0 | 296.0 | 305.0 | 280.0 | 271.0 | 270.0 | 290.0 | 324.0 | 303.0 | 269.0 | 270.0 | 324.0 |
| AVG. MAX. HRLY DIRECT NORML SOLAR | 96.9 | 118.5 | 99.3 | 100.3 | 90.6 | 107.2 | 149.4 | 174.4 | 215.5 | 173.1 | 130.9 | 144.7 | 133.5 |
| AVG. MAX. HRLY TOTAL HRZNTL SOLAR | 212.2 | 226.3 | 214.8 | 215.6 | 199.9 | 196.2 | 228.1 | 247.6 | 273.8 | 249.3 | 219.4 | 220.0 | 225.2 |

AVG. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
| N | 364.1 | 449.1 | 411.0 | 539.2 | 613.8 | 659.1 | 716.0 | 667.0 | 573.9 | 431.6 | 388.2 | 366.5 | 515.2 |
| E | 364.3 | 444.2 | 351.8 | 365.2 | 349.1 | 331.1 | 349.7 | 380.4 | 431.6 | 410.8 | 388.2 | 366.5 | 377.2 |
| S | 664.1 | 695.5 | 429.3 | 377.8 | 349.1 | 331.0 | 349.5 | 382.4 | 488.3 | 621.1 | 700.5 | 733.8 | 509.1 |
| W | 1038.3 | 1328.0 | 1025.1 | 1065.6 | 979.3 | 960.1 | 1111.7 | 1289.0 | 1591.3 | 1398.8 | 1196.5 | 1112.8 | 1173.1 |

MAX. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| N | 476.9 | 549.1 | 489.2 | 727.2 | 928.2 | 939.5 | 896.5 | 819.7 | 766.6 | 511.1 | 451.3 | 434.9 | 939.5 |
| E | 477.1 | 545.4 | 424.8 | 441.1 | 429.2 | 416.8 | 401.3 | 427.4 | 485.5 | 476.8 | 451.3 | 434.9 | 545.4 |
| S | 988.8 | 999.0 | 536.4 | 454.7 | 429.2 | 416.7 | 401.0 | 444.9 | 613.3 | 845.1 | 828.5 | 948.7 | 999.0 |
| W | 1586.5 | 2068.2 | 1639.3 | 1720.2 | 1560.3 | 1486.0 | 1405.1 | 1610.1 | 1950.6 | 1829.9 | 1592.1 | 1487.0 | 2068.2 |

MAX. HRLY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| N | 149.5 | 174.2 | 177.4 | 246.6 | 297.8 | 301.5 | 297.6 | 275.2 | 248.7 | 167.1 | 142.6 | 141.1 | 301.5 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|

BelemTRY1964_05.sta

| | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| E | 149.5 | 170.8 | 150.9 | 157.0 | 145.8 | 141.1 | 139.1 | 149.6 | 167.9 | 159.3 | 142.6 | 141.1 | 170.8 |
| S | 322.2 | 308.4 | 195.3 | 163.1 | 145.8 | 141.1 | 139.1 | 157.1 | 205.8 | 257.6 | 259.7 | 296.7 | 322.2 |
| W | 577.6 | 673.3 | 602.5 | 632.2 | 555.7 | 528.1 | 522.9 | 591.3 | 690.7 | 632.4 | 524.0 | 514.3 | 690.7 |

Belem -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

DESIGN TEMPERATURES ----- SUMMER ----- WINTER

| PER CENT | T(DRY) | T(WET) | T(DRY) |
|----------|--------|--------|--------|
| 1.0 | 90 | 80 | 72 |
| 2.5 | 89 | 79 | 72 |
| 5.0 | 87 | 79 | |

MONTHLY AVERAGE TEMPERATURES AS A FUNCTION OF HOUR OF THE DAY

| HOUR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 75.1 | 75.2 | 75.2 | 75.4 | 75.3 | 75.4 | 75.7 | 74.9 | 74.6 | 74.6 | 75.2 | 75.1 | 75.1 |
| 1 | 74.8 | 75.0 | 74.7 | 75.0 | 75.2 | 75.0 | 75.1 | 74.5 | 74.1 | 74.2 | 74.4 | 74.7 | 74.7 |
| 2 | 74.6 | 74.6 | 74.5 | 74.5 | 74.8 | 74.6 | 74.5 | 74.1 | 73.6 | 73.3 | 73.5 | 74.0 | 74.2 |
| 3 | 74.4 | 74.2 | 74.3 | 74.1 | 74.5 | 74.1 | 74.0 | 73.5 | 73.3 | 72.7 | 73.1 | 73.6 | 73.8 |
| 4 | 74.2 | 74.0 | 74.2 | 73.9 | 74.3 | 73.8 | 73.7 | 73.1 | 72.7 | 72.1 | 72.6 | 73.3 | 73.5 |
| 5 | 73.9 | 73.9 | 73.9 | 73.8 | 74.2 | 73.5 | 73.4 | 72.8 | 72.4 | 71.6 | 72.0 | 72.9 | 73.2 |
| 6 | 73.9 | 73.8 | 73.7 | 73.6 | 73.9 | 73.2 | 73.0 | 72.4 | 72.1 | 71.2 | 71.5 | 72.6 | 72.9 |
| 7 | 74.4 | 74.1 | 74.2 | 74.3 | 74.5 | 74.2 | 74.1 | 73.3 | 73.2 | 72.9 | 73.1 | 73.5 | 73.8 |
| 8 | 76.6 | 76.3 | 76.6 | 76.2 | 77.2 | 77.6 | 77.7 | 77.3 | 77.4 | 77.9 | 78.4 | 78.1 | 77.3 |
| 9 | 79.4 | 78.7 | 79.3 | 78.9 | 80.5 | 81.3 | 81.4 | 81.3 | 81.4 | 81.7 | 82.7 | 82.1 | 80.7 |
| 10 | 81.7 | 80.5 | 81.4 | 81.5 | 82.7 | 84.3 | 84.2 | 84.6 | 83.9 | 84.3 | 85.2 | 84.3 | 83.2 |
| 11 | 83.5 | 82.2 | 83.8 | 83.2 | 84.1 | 85.5 | 86.5 | 87.0 | 86.0 | 86.4 | 87.0 | 86.3 | 85.1 |
| 12 | 84.1 | 83.0 | 84.3 | 84.0 | 84.7 | 86.1 | 87.5 | 88.3 | 87.3 | 87.6 | 88.8 | 87.4 | 86.1 |
| 13 | 84.2 | 83.4 | 84.7 | 83.6 | 85.7 | 87.2 | 88.4 | 89.5 | 88.3 | 88.3 | 89.1 | 88.5 | 86.8 |
| 14 | 83.1 | 82.7 | 82.8 | 83.8 | 84.6 | 87.1 | 88.8 | 89.7 | 88.6 | 87.9 | 88.9 | 88.0 | 86.4 |
| 15 | 82.5 | 81.7 | 81.1 | 82.6 | 83.7 | 86.2 | 89.0 | 89.3 | 86.6 | 86.5 | 86.7 | 86.3 | 85.2 |
| 16 | 81.3 | 80.4 | 80.8 | 81.7 | 81.9 | 85.1 | 86.7 | 88.0 | 83.8 | 85.3 | 86.4 | 83.6 | 83.8 |

BelemTRY1964_05.sta

| | | | | | | | | | | | | | |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 17 | 79.9 | 79.5 | 79.5 | 80.3 | 79.9 | 83.8 | 84.6 | 85.4 | 81.4 | 83.4 | 84.2 | 81.8 | 82.0 |
| 18 | 78.5 | 78.2 | 78.6 | 78.7 | 78.8 | 81.8 | 82.5 | 83.6 | 79.7 | 81.4 | 81.9 | 80.4 | 80.4 |
| 19 | 77.5 | 77.4 | 77.6 | 77.7 | 77.7 | 79.3 | 80.5 | 80.6 | 77.3 | 78.8 | 79.9 | 78.6 | 78.6 |
| 20 | 76.7 | 76.9 | 76.9 | 77.2 | 76.9 | 77.5 | 78.6 | 78.6 | 76.4 | 77.9 | 78.5 | 77.6 | 77.5 |
| 21 | 76.3 | 76.2 | 76.2 | 76.4 | 76.2 | 76.7 | 77.6 | 77.3 | 75.9 | 77.2 | 77.7 | 76.8 | 76.7 |
| 22 | 75.8 | 75.9 | 75.8 | 76.1 | 75.9 | 76.1 | 76.6 | 76.3 | 75.3 | 76.2 | 76.8 | 76.3 | 76.1 |
| 23 | 75.4 | 75.5 | 75.6 | 75.8 | 75.5 | 75.6 | 76.1 | 75.7 | 74.8 | 75.3 | 75.9 | 75.7 | 75.6 |

GROUND TEMPERATURES 537.4 537.0 537.3 537.4 537.8 538.8 539.4 539.4 538.1 538.6 539.1 538.6
CLEARNESS NUMBERS 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00

BRASÍLIA

BrasiliaTRY1962_05.sta
DOE-2.1E-W74 WEATHER UTILITY PROGRA

INPUT VERIFICATION

RUN TYPE STAT

Brasilia -TRY MONTHLY WEATHER DATA SUMMARY

DOE-2.1E-W7

LATITUDE = -15.77

LONGITUDE = -47.91

TIME ZONE = 3

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR | |
|--------------------------------|-----|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|--------|
| AVG. TEMP. (F) (DRYBULB) | | 70.9 | 71.6 | 70.9 | 70.4 | 66.6 | 63.8 | 64.0 | 68.8 | 72.7 | 70.5 | 71.5 | 69.6 | 69.2 |
| AVG. TEMP. (F) (WETBULB) | | 67.2 | 67.2 | 66.4 | 64.7 | 61.0 | 57.6 | 55.8 | 59.3 | 63.1 | 64.7 | 65.0 | 66.3 | 63.2 |
| AVG. DAILY MAX. TEMP. | | 78.7 | 81.6 | 80.8 | 81.6 | 78.3 | 76.8 | 77.8 | 82.2 | 84.6 | 79.8 | 82.0 | 76.9 | 80.1 |
| AVG. DAILY MIN. TEMP. | | 65.1 | 64.9 | 63.5 | 60.7 | 56.1 | 52.3 | 50.7 | 55.5 | 62.7 | 63.1 | 63.7 | 65.1 | 60.2 |
| HEATING DEG. DAYS (BASE 65) | | | 0.0 | 0.0 | 0.0 | 0.0 | 13.0 | 36.0 | 35.0 | 6.0 | 0.0 | 0.0 | 0.0 | 90.0 |
| (BASE 60) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 | |
| (BASE 55) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| (BASE 50) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| COOLING DEG. DAYS (BASE 80) | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 75) | | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 18.5 | 1.0 | 1.5 | 0.0 | 23.0 | |
| (BASE 70) | | 65.0 | 90.5 | 73.5 | 39.0 | 18.0 | 0.0 | 0.0 | 20.0 | 116.0 | 59.5 | 86.0 | 45.5 | 613.0 |
| (BASE 65) | | 214.0 | 230.5 | 221.0 | 184.5 | 80.5 | 22.0 | 11.0 | 124.5 | 260.0 | 200.0 | 236.0 | 186.0 | 1970.0 |
| HEATING DEG. HRS./24 (BASE 65) | | 1.0 | 2.2 | 7.0 | 26.2 | 87.4 | 131.6 | 144.1 | 74.3 | 14.8 | 11.9 | 5.2 | 1.2 | 506.8 |
| (BASE 60) | | 0.0 | 0.0 | 0.0 | 3.2 | 31.9 | 57.8 | 70.3 | 27.4 | 1.6 | 0.2 | 0.2 | 0.0 | 192.5 |

BrasiliaTRY1962_05.sta

(BASE 55) 0.0 0.0 0.0 0.0 4.9 13.0 21.5 6.0 0.0 0.0 0.0 0.0 45.3
 (BASE 50) 0.0 0.0 0.0 0.0 0.0 0.9 2.5 0.5 0.0 0.0 0.0 0.0 3.9

COOLING DEG. HRS./24 (BASE 80) 2.0 7.0 8.5 8.7 1.7 0.1 0.3 13.5 32.3 8.4 12.1 1.2 95.8
 (BASE 75) 22.8 35.2 39.8 42.0 23.3 10.2 13.1 50.0 77.3 34.7 45.5 12.0 406.0
 (BASE 70) 74.8 90.9 93.0 99.4 67.0 42.8 53.8 110.2 146.5 87.7 102.3 49.9 1018.2
 (BASE 65) 183.3 187.8 189.3 187.5 136.5 97.0 114.0 191.4 247.0 181.5 199.0 142.8 2056.9

MAXIMUM TEMP. 83 85 88 85 85 81 82 88 91 87 88 84 91
 MINIMUM TEMP. 63 63 60 55 50 46 43 47 56 59 57 63 43

NO. DAYS MAX. 90 AND ABOVE 0 0 0 0 0 0 0 0 3 0 0 0 3
 NO. DAYS MAX. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

NO. DAYS MIN. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0
 NO. DAYS MIN. 0 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

AVG. WIND SPEED (MPH) 1.2 1.0 1.2 0.7 1.1 1.1 0.8 1.0 1.0 1.2 0.8 1.2 1.0

AVG. WIND SPEED (DAY) 1.2 1.0 1.3 0.7 1.1 1.1 0.9 1.1 1.1 1.3 0.8 1.2 1.1
 AVG. WIND SPEED (NIGHT) 2.5 2.1 12.5 14.4 -3.8 0.4 -1.1 -4.0 2.7 2.7 0.8 2.0 3.7

AVG. TEMP. (DAY) 73.4 74.3 73.6 72.2 66.6 64.0 64.2 69.0 75.4 72.9 73.7 72.0 71.0
 AVG. TEMP. (NIGHT) 141.0 226.3 451.5 1954.5 60.6 58.8 58.4 46.7 219.0 121.4 108.2 112.2 182.5

AVG. SKY COVER 6.9 6.6 5.4 3.9 3.3 2.3 1.7 3.0 4.7 6.5 5.7 7.3 4.8

AVG. SKY COVER (DAY) 7.1 6.9 5.6 4.0 3.3 2.3 1.8 3.1 4.9 6.8 5.9 7.6 5.0

AVG. REL. HUM. AT 4AM 93.0 92.9 92.5 91.9 90.8 88.7 80.1 78.5 76.3 89.4 89.1 95.0 88.2

10AM 84.6 83.8 82.6 79.0 77.6 73.9 68.7 63.2 65.3 75.6 69.7 84.8 75.7

4PM 73.1 68.4 65.6 55.9 57.1 51.8 42.0 41.4 43.4 60.0 53.7 75.2 57.3

10PM 87.9 85.2 86.8 80.6 77.8 75.7 64.2 62.3 64.4 79.6 81.4 89.7 77.9

Brasilia -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -15.77

LONGITUDE = -47.91

TIME ZONE = 3

BrasiliaTRY1962_05.sta

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC YEAR

AVG. DAILY DIRECT NORMAL SOLAR 853.2 875.1 634.1 597.1 445.4 482.2 387.1 712.4 840.6 657.7 699.3 615.3 648.1
 AVG. DAILY TOTAL HORIZNTL SOLAR 1242.7 1216.2 927.2 804.5 710.2 717.9 630.4 868.5 978.4 984.5 1046.2 1175.7 940.2

MAX. DAILY DIRECT NORMAL SOLAR 1535.0 1584.0 1363.0 1124.0 844.0 715.0 595.0 1113.0 1395.0 1748.0 1530.0 1153.0 1748.0
 MAX. DAILY TOTAL HORIZNTL SOLAR 1614.0 1546.0 1367.0 1100.0 909.0 847.0 739.0 1075.0 1278.0 1652.0 1464.0 1406.0 1652.0
 MIN. DAILY DIRECT NORMAL SOLAR 582.0 460.0 140.0 83.0 109.0 95.0 36.0 137.0 106.0 297.0 169.0 471.0 36.0
 MIN. DAILY TOTAL HORIZNTL SOLAR 959.0 1021.0 591.0 485.0 510.0 448.0 304.0 509.0 549.0 768.0 735.0 1083.0 304.0

MAX. HRLY DIRECT NORMAL SOLAR 309.0 311.0 268.0 259.0 223.0 206.0 148.0 253.0 281.0 323.0 301.0 301.0 323.0
 MAX. HRLY TOTAL HORIZNTL SOLAR 364.0 370.0 321.0 309.0 268.0 247.0 218.0 302.0 336.0 408.0 360.0 351.0 408.0
 AVG. MAX. HRLY DIRECT NORML SOLAR 184.5 203.3 156.4 155.7 133.1 161.6 117.1 207.2 214.5 159.3 157.4 137.2 165.2
 AVG. MAX. HRLY TOTAL HRZNTL SOLAR 276.5 289.9 240.9 224.5 206.4 216.3 187.2 257.0 273.8 253.1 252.1 249.5 243.6

AVG. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

N 507.3 537.1 550.8 636.1 708.3 801.5 656.9 781.8 641.1 478.5 436.8 527.3 605.6
 E 504.0 501.8 392.9 335.7 331.6 344.3 293.9 367.4 390.3 407.3 428.2 525.6 401.4
 S 904.6 739.0 453.4 339.0 331.6 344.3 293.8 367.6 418.7 527.2 695.7 939.6 528.7
 W 1724.6 1803.8 1368.1 1213.6 1086.0 1132.2 939.7 1388.3 1525.9 1393.9 1424.1 1601.4 1380.7

MAX. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

N 570.8 635.7 714.9 842.2 963.5 956.6 761.2 949.6 824.7 674.4 529.6 611.5 963.5
 E 567.3 565.0 543.9 406.9 415.9 403.9 339.1 412.7 463.6 585.5 526.4 608.7 608.7
 S 1070.7 965.6 708.6 414.8 415.8 403.8 339.0 412.6 520.2 812.1 925.4 1140.9 1140.9
 W 2363.3 2425.7 2216.6 1789.3 1515.8 1385.3 1133.7 1746.7 2079.6 2564.0 2155.5 2030.5 2564.0

MAX. HRLY TOTAL VERTICAL SOLAR

AZIMUTH

N 194.9 196.3 214.6 255.0 291.2 295.1 237.4 296.1 259.0 221.6 183.4 191.7 296.1

BrasiliaTRY1962_05.sta

E 194.9 195.9 172.1 159.6 142.3 132.3 115.6 156.9 173.8 210.9 183.4 191.7 210.9
 S 429.0 327.1 258.3 168.5 142.3 132.3 115.6 157.7 203.6 324.8 353.3 418.5 429.0
 W 748.5 790.3 688.7 653.8 558.7 503.0 415.5 636.7 716.9 843.1 731.7 736.5 843.1

Brasilia -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

DESIGN TEMPERATURES ----- SUMMER ----- WINTER

| PER CENT | T(DRY) | T(WET) | T(DRY) |
|----------|--------|--------|--------|
| 1.0 | 84 | 72 | 48 |
| 2.5 | 83 | 72 | 50 |
| 5.0 | 81 | 71 | |

MONTHLY AVERAGE TEMPERATURES AS A FUNCTION OF HOUR OF THE DAY

| HOUR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 67.7 | 67.6 | 66.6 | 65.8 | 61.6 | 58.8 | 58.2 | 63.3 | 68.5 | 66.7 | 66.9 | 66.8 | 64.9 |
| 1 | 67.2 | 67.0 | 66.1 | 64.7 | 60.5 | 57.5 | 56.4 | 61.5 | 66.9 | 66.1 | 66.3 | 66.3 | 63.8 |
| 2 | 66.9 | 66.7 | 65.8 | 63.7 | 59.2 | 56.1 | 55.3 | 60.1 | 66.4 | 65.4 | 65.8 | 66.0 | 63.1 |
| 3 | 66.2 | 66.0 | 65.4 | 62.9 | 58.6 | 55.1 | 54.2 | 59.1 | 65.6 | 65.1 | 65.1 | 65.7 | 62.4 |
| 4 | 66.0 | 65.7 | 65.0 | 62.3 | 57.9 | 54.3 | 53.1 | 57.9 | 64.9 | 64.5 | 64.9 | 65.6 | 61.8 |
| 5 | 65.8 | 65.3 | 64.5 | 61.4 | 57.0 | 53.5 | 52.1 | 57.3 | 64.0 | 64.2 | 64.5 | 65.5 | 61.2 |
| 6 | 65.5 | 65.2 | 63.9 | 60.9 | 56.7 | 52.9 | 51.8 | 56.3 | 63.4 | 63.7 | 64.0 | 65.6 | 60.8 |
| 7 | 66.4 | 65.8 | 64.6 | 61.3 | 56.9 | 52.8 | 51.3 | 56.0 | 63.2 | 64.6 | 65.5 | 66.2 | 61.2 |
| 8 | 68.6 | 68.0 | 67.5 | 64.7 | 60.3 | 56.5 | 55.2 | 60.5 | 66.6 | 67.9 | 69.8 | 67.8 | 64.4 |
| 9 | 71.2 | 71.3 | 70.6 | 69.3 | 65.4 | 61.9 | 61.6 | 67.3 | 71.0 | 70.7 | 73.4 | 69.7 | 68.6 |
| 10 | 73.1 | 75.1 | 73.5 | 74.0 | 69.7 | 66.5 | 67.0 | 72.4 | 75.0 | 73.4 | 76.1 | 71.8 | 72.3 |
| 11 | 75.1 | 77.7 | 75.7 | 76.8 | 72.9 | 69.7 | 71.0 | 75.8 | 78.4 | 75.5 | 78.1 | 73.0 | 74.9 |
| 12 | 76.2 | 79.0 | 77.2 | 78.7 | 75.0 | 72.3 | 73.4 | 78.2 | 80.4 | 76.6 | 79.2 | 74.3 | 76.7 |
| 13 | 76.3 | 79.0 | 78.9 | 80.0 | 76.5 | 74.2 | 75.2 | 79.9 | 82.4 | 77.9 | 79.9 | 74.6 | 77.9 |
| 14 | 76.7 | 79.1 | 79.3 | 80.4 | 77.4 | 75.5 | 76.6 | 81.4 | 83.9 | 78.5 | 80.1 | 74.9 | 78.6 |
| 15 | 76.5 | 78.1 | 79.1 | 80.3 | 77.8 | 76.4 | 77.5 | 81.5 | 83.5 | 78.0 | 80.2 | 74.4 | 78.6 |
| 16 | 76.3 | 77.8 | 78.1 | 79.8 | 77.4 | 76.1 | 77.5 | 81.3 | 81.7 | 77.6 | 77.8 | 73.3 | 77.9 |

BrasiliaTRY1962_05.sta

| | | | | | | | | | | | | | |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 17 | 75.6 | 76.8 | 76.9 | 78.0 | 75.8 | 74.8 | 76.4 | 80.3 | 80.9 | 76.1 | 76.1 | 73.4 | 76.7 |
| 18 | 74.1 | 75.2 | 74.8 | 75.8 | 72.6 | 71.1 | 72.8 | 77.0 | 78.3 | 73.5 | 74.1 | 71.9 | 74.3 |
| 19 | 72.4 | 73.2 | 72.1 | 72.8 | 69.2 | 67.4 | 68.4 | 73.0 | 75.4 | 71.2 | 71.6 | 70.3 | 71.4 |
| 20 | 70.8 | 71.6 | 70.7 | 70.8 | 67.0 | 64.9 | 65.8 | 70.5 | 73.6 | 69.9 | 70.5 | 69.2 | 69.6 |
| 21 | 69.6 | 70.4 | 69.2 | 69.4 | 65.6 | 63.0 | 63.9 | 68.6 | 72.1 | 69.0 | 69.3 | 68.4 | 68.2 |
| 22 | 68.8 | 69.4 | 68.2 | 68.3 | 64.1 | 61.3 | 61.8 | 66.7 | 70.4 | 68.0 | 68.3 | 67.8 | 66.9 |
| 23 | 68.0 | 68.4 | 67.3 | 66.8 | 62.9 | 59.8 | 60.1 | 64.9 | 69.5 | 67.2 | 67.6 | 67.3 | 65.8 |

GROUND TEMPERATURES 530.3 531.0 530.3 529.8 526.0 523.2 523.4 528.2 532.1 529.9 530.9 529.0
CLEARNESS NUMBERS 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00

CURITIBA

CuritibaTRY1969_05.sta
DOE-2.1E-W74 WEATHER UTILITY PROGRA

INPUT VERIFICATION

RUN TYPE STAT

Curitiba -TRY MONTHLY WEATHER DATA SUMMARY

DOE-2.1E-W7

LATITUDE = -25.25

LONGITUDE = -49.16

TIME ZONE = 3

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR | | |
|--------------------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|
| AVG. TEMP. (F) (DRYBULB) | | 69.2 | 69.4 | 67.2 | 61.4 | 58.3 | 55.6 | 54.5 | 56.6 | 59.6 | 57.5 | 64.4 | 64.0 | 61.4 | |
| AVG. TEMP. (F) (WETBULB) | | 64.9 | 66.2 | 63.7 | 59.2 | 55.6 | 53.3 | 51.7 | 53.0 | 56.3 | 55.0 | 61.5 | 60.4 | 58.4 | |
| AVG. DAILY MAX. TEMP. | | 80.7 | 79.4 | 77.5 | 69.9 | 69.0 | 64.7 | 66.3 | 68.0 | 71.5 | 66.0 | 73.4 | 73.7 | 71.6 | |
| AVG. DAILY MIN. TEMP. | | 61.2 | 62.7 | 60.1 | 55.4 | 49.5 | 47.4 | 45.3 | 47.6 | 51.0 | 50.9 | 58.0 | 56.7 | 53.8 | |
| HEATING DEG. DAYS (BASE 65) | | | 1.5 | 17.5 | 1.5 | 78.5 | 179.5 | 268.5 | 285.5 | 228.5 | 134.0 | 219.5 | 58.5 | 47.0 | 1520.0 |
| (BASE 60) | | 0.0 | 1.5 | 0.0 | 6.5 | 60.0 | 135.0 | 152.0 | 119.0 | 42.0 | 97.5 | 15.0 | 5.0 | 633.5 | |
| (BASE 55) | | 0.0 | 0.0 | 0.0 | 0.0 | 16.0 | 52.5 | 70.5 | 51.5 | 5.0 | 26.5 | 0.0 | 0.0 | 222.0 | |
| (BASE 50) | | 0.0 | 0.0 | 0.0 | 0.0 | 2.5 | 14.0 | 37.0 | 10.0 | 0.0 | 5.0 | 0.0 | 0.0 | 68.5 | |
| COOLING DEG. DAYS (BASE 80) | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| (BASE 75) | | 1.5 | 9.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 12.0 | | |
| (BASE 70) | | 54.5 | 77.5 | 27.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 20.5 | 9.5 | 192.5 | | |
| (BASE 65) | | 186.0 | 187.5 | 120.0 | 9.0 | 0.5 | 0.0 | 0.0 | 5.5 | 22.0 | 17.0 | 79.5 | 54.5 | 681.5 | |
| HEATING DEG. HRS./24 (BASE 65) | | 28.0 | 29.2 | 44.1 | 138.0 | 236.8 | 302.6 | 350.4 | 304.0 | 205.2 | 258.2 | 99.1 | 98.8 | 2094.3 | |
| (BASE 60) | | 2.1 | 5.3 | 5.0 | 41.8 | 124.9 | 178.1 | 226.7 | 186.2 | 100.8 | 136.7 | 29.2 | 30.2 | 1067.0 | |

CuritibaTRY1969_05.sta

(BASE 55) 0.0 0.0 0.5 2.5 55.8 87.8 128.5 91.1 39.0 53.2 3.5 4.1 466.0
 (BASE 50) 0.0 0.0 0.0 0.0 25.2 37.5 62.9 31.5 14.0 10.3 0.0 0.0 181.4

COOLING DEG. HRS./24 (BASE 80) 7.3 8.4 4.5 0.0 0.0 0.0 0.0 0.0 1.1 1.5 3.7 1.0 27.6
 (BASE 75) 32.7 31.1 20.0 0.7 1.1 1.0 0.8 5.0 7.7 5.0 13.9 6.0 125.1
 (BASE 70) 79.3 73.7 51.7 7.1 8.0 7.5 8.1 19.2 20.1 12.5 37.7 22.9 347.9
 (BASE 65) 157.4 152.3 113.5 31.4 28.3 20.7 25.8 43.0 44.3 26.8 81.2 68.1 792.7

MAXIMUM TEMP. 88 88 87 78 79 77 79 80 83 85 87 86 88
 MINIMUM TEMP. 56 55 49 51 31 32 28 41 35 40 52 50 28

NO. DAYS MAX. 90 AND ABOVE 0 0 0 0 0 0 0 0 0 0 0 0 0
 NO. DAYS MAX. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

NO. DAYS MIN. 32 AND BELOW 0 0 0 0 1 2 2 0 0 0 0 0 5
 NO. DAYS MIN. 0 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

AVG. WIND SPEED (MPH) 2.1 1.9 1.7 1.8 1.6 2.0 1.5 1.8 2.0 2.2 2.4 2.7 2.0

AVG. WIND SPEED (DAY) 2.2 1.9 1.8 1.9 1.6 2.1 1.6 1.9 2.0 2.4 2.4 2.8 2.1
 AVG. WIND SPEED (NIGHT) 4.0 3.5 8.6 -12.1 0.0 1.7 0.7 -1.0 4.2 4.6 3.2 4.6 6.1

AVG. TEMP. (DAY) 71.4 71.8 69.7 62.4 58.3 55.7 54.7 56.7 61.8 59.4 66.3 65.9 63.0
 AVG. TEMP. (NIGHT) 103.8 135.3 223.4 -357.4 55.2 52.5 50.6 52.4 155.9 87.7 86.9 86.1 132.2

AVG. SKY COVER 6.0 6.2 5.3 5.6 4.6 4.8 4.3 5.1 5.4 6.4 6.8 5.4 5.5

AVG. SKY COVER (DAY) 6.3 6.6 5.5 5.7 4.6 4.7 4.3 5.1 5.7 6.7 7.2 5.7 5.7

AVG. REL. HUM. AT 4AM 96.6 97.7 97.9 98.9 98.5 97.6 97.8 96.6 97.5 97.4 96.7 96.2 97.4
 10AM 80.8 85.7 89.4 92.6 92.6 92.9 93.7 89.2 87.1 85.0 84.8 77.7 87.6
 4PM 60.4 70.4 62.3 71.2 67.7 72.2 63.9 61.4 63.5 73.9 73.4 64.7 67.0
 10PM 91.2 95.2 94.2 96.4 94.2 93.4 92.8 90.5 92.7 95.2 94.3 92.9 93.6

Curitiba -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -25.25

LONGITUDE = -49.16

TIME ZONE = 3

CuritibaTRY1969_05.sta

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC YEAR

| | | | | | | | | | | | | | |
|-----------------------------------|--------|--------|--------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|
| AVG. DAILY DIRECT NORMAL SOLAR | 652.5 | 620.9 | 371.1 | 305.6 | 202.0 | 143.3 | 275.4 | 381.9 | 363.6 | 364.9 | 545.8 | 764.5 | 415.1 |
| AVG. DAILY TOTAL HORIZNTL SOLAR | 1104.8 | 1030.6 | 703.5 | 593.3 | 400.7 | 201.5 | 416.2 | 586.6 | 614.6 | 718.1 | 1052.2 | 1247.9 | 721.1 |
| MAX. DAILY DIRECT NORMAL SOLAR | 1576.0 | 1189.0 | 1116.0 | 866.0 | 631.0 | 325.0 | 698.0 | 866.0 | 1054.0 | 1521.0 | 1752.0 | 2027.0 | 2027.0 |
| MAX. DAILY TOTAL HORIZNTL SOLAR | 1599.0 | 1420.0 | 1323.0 | 898.0 | 731.0 | 296.0 | 719.0 | 859.0 | 1026.0 | 1415.0 | 1749.0 | 1996.0 | 1996.0 |
| MIN. DAILY DIRECT NORMAL SOLAR | 103.0 | 98.0 | 33.0 | 89.0 | 14.0 | 11.0 | 2.0 | 50.0 | 19.0 | 32.0 | 132.0 | 153.0 | 2.0 |
| MIN. DAILY TOTAL HORIZNTL SOLAR | 779.0 | 703.0 | 407.0 | 436.0 | 131.0 | 124.0 | 89.0 | 358.0 | 364.0 | 462.0 | 697.0 | 862.0 | 89.0 |
| MAX. HRLY DIRECT NORMAL SOLAR | 271.0 | 265.0 | 232.0 | 233.0 | 154.0 | 151.0 | 184.0 | 214.0 | 209.0 | 282.0 | 301.0 | 334.0 | 334.0 |
| MAX. HRLY TOTAL HORIZNTL SOLAR | 335.0 | 321.0 | 292.0 | 276.0 | 213.0 | 156.0 | 222.0 | 267.0 | 272.0 | 342.0 | 352.0 | 393.0 | 393.0 |
| AVG. MAX. HRLY DIRECT NORML SOLAR | 162.4 | 163.9 | 105.7 | 98.7 | 64.9 | 68.4 | 106.9 | 119.9 | 95.2 | 101.3 | 130.9 | 195.8 | 117.7 |
| AVG. MAX. HRLY TOTAL HRZNTL SOLAR | 248.8 | 253.1 | 193.1 | 176.9 | 134.7 | 107.3 | 144.9 | 187.3 | 177.1 | 193.2 | 230.6 | 265.3 | 192.4 |

AVG. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|
| N | 507.5 | 537.8 | 482.1 | 525.7 | 412.4 | 242.8 | 474.8 | 576.1 | 472.6 | 423.9 | 513.7 | 561.1 | 477.5 |
| E | 478.5 | 457.8 | 329.5 | 286.9 | 199.3 | 85.1 | 206.6 | 279.6 | 283.2 | 331.5 | 473.9 | 541.8 | 329.0 |
| S | 754.9 | 624.2 | 367.7 | 288.7 | 199.3 | 85.1 | 206.6 | 279.7 | 297.7 | 402.8 | 714.6 | 909.5 | 426.8 |
| W | 1507.6 | 1517.5 | 1033.4 | 893.7 | 606.1 | 258.6 | 684.2 | 950.1 | 933.8 | 1016.3 | 1452.4 | 1704.3 | 1044.4 |

MAX. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|--------|
| N | 613.0 | 704.8 | 772.0 | 852.8 | 756.7 | 377.8 | 827.0 | 879.7 | 760.1 | 718.8 | 699.9 | 715.3 | 879.7 |
| E | 569.1 | 529.0 | 558.2 | 371.8 | 363.9 | 112.4 | 367.4 | 431.4 | 394.1 | 492.8 | 651.8 | 704.8 | 704.8 |
| S | 1027.6 | 802.5 | 687.3 | 371.8 | 363.9 | 112.4 | 367.4 | 431.4 | 426.6 | 697.2 | 1171.7 | 1388.7 | 1388.7 |
| W | 2329.4 | 2119.6 | 2182.9 | 1533.4 | 1241.2 | 414.3 | 1262.6 | 1497.4 | 1686.9 | 2167.0 | 2693.3 | 2927.9 | 2927.9 |

MAX. HRLY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| N | 179.0 | 169.0 | 195.9 | 255.5 | 218.5 | 198.6 | 255.0 | 265.6 | 210.5 | 185.8 | 190.9 | 208.8 | 265.6 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|

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| | | | | | | | | | | | | | |
|----------|-------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|-------|
| E | 179.0 | 166.1 | 159.3 | 147.4 | 115.8 | 77.9 | 120.0 | 142.4 | 143.6 | 175.2 | 190.9 | 208.8 | 208.8 |
| S | 360.5 | 305.4 | 230.5 | 153.5 | 115.8 | 77.9 | 120.0 | 142.4 | 164.5 | 295.4 | 405.0 | 473.0 | 473.0 |
| W | 662.0 | 645.5 | 633.5 | 593.4 | 431.3 | 255.0 | 460.9 | 558.7 | 567.1 | 707.6 | 725.5 | 797.0 | 797.0 |
| Curitiba | -TRY | MONTHLY WEATHER DATA SUMMARY | | | | | | | | | | DOE-2.1E-W7 | |

DESIGN TEMPERATURES ----- SUMMER ----- WINTER

| PER CENT | T(DRY) | T(WET) | T(DRY) |
|----------|--------|--------|--------|
| 1.0 | 85 | 73 | 35 |
| 2.5 | 83 | 72 | 37 |
| 5.0 | 81 | 71 | |

MONTHLY AVERAGE TEMPERATURES AS A FUNCTION OF HOUR OF THE DAY

| HOUR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 64.8 | 65.4 | 63.2 | 58.2 | 54.6 | 52.6 | 50.4 | 52.5 | 55.3 | 54.0 | 60.5 | 59.9 | 57.6 |
| 1 | 64.4 | 65.0 | 62.8 | 58.1 | 54.1 | 52.0 | 50.0 | 52.2 | 54.6 | 53.5 | 60.2 | 59.2 | 57.1 |
| 2 | 63.9 | 64.8 | 62.3 | 57.8 | 53.8 | 51.7 | 49.7 | 51.6 | 54.3 | 53.4 | 60.2 | 59.0 | 56.8 |
| 3 | 63.4 | 64.3 | 62.1 | 57.7 | 53.1 | 51.3 | 49.1 | 51.3 | 54.0 | 53.1 | 59.9 | 58.5 | 56.4 |
| 4 | 62.8 | 64.1 | 61.7 | 57.4 | 52.6 | 50.9 | 48.5 | 50.5 | 53.5 | 52.9 | 59.5 | 58.1 | 56.0 |
| 5 | 62.2 | 63.9 | 61.4 | 57.0 | 52.1 | 50.2 | 47.8 | 50.0 | 53.2 | 52.7 | 59.1 | 57.5 | 55.5 |
| 6 | 61.6 | 63.6 | 61.0 | 56.8 | 51.3 | 49.7 | 47.1 | 49.5 | 52.5 | 52.6 | 59.2 | 57.8 | 55.2 |
| 7 | 63.5 | 64.6 | 61.7 | 57.1 | 51.1 | 49.4 | 46.7 | 49.5 | 52.9 | 53.6 | 60.8 | 59.8 | 55.8 |
| 8 | 66.1 | 66.6 | 63.8 | 58.5 | 52.5 | 50.5 | 47.7 | 50.6 | 54.8 | 55.2 | 62.8 | 62.4 | 57.6 |
| 9 | 68.7 | 69.1 | 66.0 | 60.3 | 55.2 | 53.2 | 50.2 | 53.1 | 57.8 | 57.6 | 65.2 | 65.0 | 60.0 |
| 10 | 72.1 | 71.7 | 69.1 | 62.7 | 58.9 | 56.5 | 54.0 | 56.9 | 61.7 | 59.5 | 67.0 | 67.5 | 63.1 |
| 11 | 74.9 | 74.3 | 71.4 | 64.9 | 62.4 | 59.7 | 58.4 | 60.6 | 64.1 | 61.5 | 68.8 | 69.4 | 65.8 |
| 12 | 76.5 | 75.9 | 73.3 | 66.5 | 64.8 | 61.7 | 61.4 | 63.2 | 66.2 | 62.7 | 69.3 | 70.7 | 67.6 |
| 13 | 78.5 | 76.7 | 74.8 | 68.0 | 66.9 | 63.0 | 63.3 | 65.4 | 68.1 | 64.4 | 70.9 | 71.6 | 69.3 |
| 14 | 79.5 | 76.9 | 76.1 | 69.0 | 67.7 | 63.7 | 64.4 | 66.3 | 69.4 | 64.5 | 71.3 | 72.0 | 70.0 |
| 15 | 78.7 | 76.9 | 76.5 | 68.7 | 68.0 | 63.7 | 64.8 | 66.5 | 69.2 | 64.2 | 71.3 | 72.3 | 70.0 |
| 16 | 77.0 | 76.4 | 76.2 | 67.8 | 67.5 | 63.0 | 64.2 | 66.0 | 68.6 | 63.7 | 70.9 | 70.9 | 69.3 |

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| | | | | | | | | | | | | | |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 17 | 74.4 | 75.0 | 73.8 | 66.4 | 65.8 | 61.4 | 62.9 | 64.4 | 66.7 | 62.1 | 69.4 | 69.2 | 67.6 |
| 18 | 72.9 | 72.9 | 71.2 | 64.1 | 62.5 | 58.8 | 60.3 | 61.6 | 64.2 | 60.5 | 67.4 | 66.8 | 65.2 |
| 19 | 69.2 | 69.8 | 67.0 | 61.2 | 59.4 | 56.3 | 56.2 | 58.1 | 60.5 | 57.7 | 64.6 | 64.1 | 62.0 |
| 20 | 67.4 | 68.1 | 65.6 | 60.1 | 57.4 | 55.1 | 54.5 | 56.3 | 58.9 | 56.6 | 63.1 | 62.4 | 60.4 |
| 21 | 66.5 | 66.9 | 64.8 | 59.2 | 56.3 | 54.3 | 53.3 | 54.7 | 57.7 | 55.4 | 61.9 | 61.1 | 59.3 |
| 22 | 65.8 | 66.5 | 64.2 | 58.8 | 55.8 | 53.3 | 52.3 | 54.0 | 56.8 | 54.8 | 61.7 | 60.7 | 58.7 |
| 23 | 65.3 | 66.0 | 63.7 | 58.3 | 55.1 | 52.5 | 51.5 | 53.0 | 56.2 | 54.5 | 61.0 | 60.4 | 58.1 |

GROUND TEMPERATURES 528.5 528.7 526.6 520.8 517.7 515.0 513.9 515.9 518.9 517.0 523.8 523.4
CLEARNESS NUMBERS 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00

FLORIANÓPOLIS

FlorianopolisTRY1963_05.sta
DOE-2.1E-W74 WEATHER UTILITY PROGRA

INPUT VERIFICATION

RUN TYPE STAT

Florianopolis -TRY MONTHLY WEATHER DATA SUMMARY

DOE-2.1E-W7

LATITUDE = -27.40

LONGITUDE = -48.33

TIME ZONE = 3

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|--------------------------------|-------|-------|-------|-------|------|-------|-------|-------|------|-------|-------|-------|--------|
| AVG. TEMP. (F) (DRYBULB) | 76.6 | 75.7 | 75.8 | 70.7 | 66.2 | 62.6 | 63.5 | 62.8 | 66.4 | 67.5 | 70.4 | 72.7 | 69.2 |
| AVG. TEMP. (F) (WETBULB) | 73.4 | 72.8 | 72.3 | 67.1 | 62.3 | 59.2 | 60.5 | 59.6 | 63.9 | 64.4 | 66.9 | 68.7 | 65.9 |
| AVG. DAILY MAX. TEMP. | 84.7 | 82.7 | 82.8 | 80.5 | 75.7 | 72.4 | 72.0 | 70.1 | 72.9 | 74.0 | 77.4 | 80.2 | 77.1 |
| AVG. DAILY MIN. TEMP. | 71.1 | 70.2 | 70.7 | 63.0 | 58.5 | 54.7 | 56.8 | 56.9 | 61.5 | 62.6 | 64.4 | 66.4 | 63.0 |
| HEATING DEG. DAYS (BASE 65) | 0.0 | 0.0 | 0.0 | 0.0 | 14.5 | 92.0 | 74.5 | 84.5 | 21.5 | 17.0 | 1.0 | 0.0 | 305.0 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 0.0 | 37.0 | 23.0 | 33.0 | 3.0 | 3.0 | 0.0 | 0.0 | 99.0 | |
| (BASE 55) | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 | 7.0 | 11.5 | 0.0 | 0.0 | 0.0 | 0.0 | 22.5 | |
| (BASE 50) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 3.5 | |
| COOLING DEG. DAYS (BASE 80) | 32.5 | 6.5 | 18.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 58.0 |
| (BASE 75) | 112.0 | 62.5 | 86.0 | 8.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 8.5 | 31.0 | 309.0 | |
| (BASE 70) | 245.0 | 181.0 | 211.0 | 66.5 | 11.0 | 6.5 | 4.0 | 2.0 | 3.0 | 27.0 | 61.5 | 119.0 | 937.5 |
| (BASE 65) | 400.0 | 321.0 | 364.0 | 202.5 | 80.5 | 49.5 | 56.5 | 38.0 | 87.5 | 119.5 | 177.5 | 257.5 | 2154.0 |
| HEATING DEG. HRS./24 (BASE 65) | 0.0 | 0.3 | 0.3 | 15.0 | 64.5 | 127.2 | 106.8 | 112.1 | 37.8 | 33.5 | 12.3 | 6.1 | 516.0 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 1.0 | 20.0 | 58.4 | 37.2 | 47.0 | 7.3 | 6.1 | 1.5 | 0.2 | 178.9 |

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(BASE 55) 0.0 0.0 0.0 0.0 2.8 23.5 13.4 19.5 0.0 0.1 0.0 0.0 59.4
 (BASE 50) 0.0 0.0 0.0 0.0 0.0 6.1 4.2 8.5 0.0 0.0 0.0 0.0 18.8

COOLING DEG. HRS./24 (BASE 80) 37.7 18.4 25.6 5.2 0.6 0.6 0.8 0.0 0.2 0.9 3.5 10.3 103.9
 (BASE 75) 96.8 63.5 81.8 30.5 7.8 3.1 6.3 0.7 3.2 7.9 20.7 41.5 363.7
 (BASE 70) 211.8 164.4 191.7 88.8 36.1 17.0 24.2 10.5 22.5 32.6 68.6 122.1 990.4
 (BASE 65) 360.6 299.4 335.5 185.8 100.4 54.5 61.3 43.6 78.4 109.6 174.3 246.0 2049.5

MAXIMUM TEMP. 97 94 96 85 85 85 83 79 82 83 87 91 97
 MINIMUM TEMP. 65 62 64 55 50 39 41 36 54 54 55 57 36

NO. DAYS MAX. 90 AND ABOVE 8 1 4 0 0 0 0 0 0 0 0 1 14
 NO. DAYS MAX. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

NO. DAYS MIN. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0
 NO. DAYS MIN. 0 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

AVG. WIND SPEED (MPH) 2.0 1.5 1.8 1.4 1.5 1.5 1.6 1.8 1.7 2.0 2.0 2.0 1.7

AVG. WIND SPEED (DAY) 2.2 1.6 1.9 1.4 1.6 1.5 1.6 1.8 1.7 2.1 2.0 2.2 1.8
 AVG. WIND SPEED (NIGHT) 3.7 2.5 10.7 0.3 0.4 1.2 0.9 -0.5 3.6 4.1 2.3 3.5 5.9

AVG. TEMP. (DAY) 79.2 78.5 78.7 70.9 66.3 62.8 63.7 62.9 68.6 69.8 72.6 75.0 70.9
 AVG. TEMP. (NIGHT) 116.1 153.1 322.5 49.6 62.6 58.8 61.1 59.2 194.7 106.4 96.6 99.3 168.8

AVG. SKY COVER 5.8 5.7 5.9 3.2 3.0 3.3 4.2 5.5 6.4 6.3 6.1 5.5 5.1

AVG. SKY COVER (DAY) 6.1 6.0 6.2 3.3 3.0 3.3 4.2 5.5 6.6 6.5 6.4 5.7 5.3

AVG. REL. HUM. AT 4AM 92.5 94.0 93.2 95.7 91.9 94.0 94.5 92.5 96.0 92.6 91.9 90.7 93.3
 10AM 81.8 83.3 82.4 80.9 82.3 83.8 87.2 81.8 89.6 81.0 81.1 78.4 82.8
 4PM 79.7 81.0 74.1 68.9 65.1 66.1 69.6 70.9 79.5 78.6 75.7 74.7 73.6
 10PM 90.3 89.4 89.8 90.7 88.4 90.0 90.3 88.7 91.5 90.4 88.9 86.3 89.6

Florianopolis -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -27.40

LONGITUDE = -48.33

TIME ZONE = 3

FlorianopolisTRY1963_05.sta

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC YEAR

| | | | | | | | | | | | | | |
|-----------------------------------|--------|--------|--------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|
| AVG. DAILY DIRECT NORMAL SOLAR | 754.0 | 680.2 | 352.8 | 521.0 | 272.7 | 133.5 | 246.9 | 252.3 | 198.8 | 295.2 | 370.3 | 466.5 | 377.0 |
| AVG. DAILY TOTAL HORIZNTL SOLAR | 1162.6 | 1064.4 | 690.3 | 695.2 | 415.9 | 177.8 | 381.7 | 461.9 | 486.9 | 601.9 | 891.0 | 985.5 | 665.8 |
| MAX. DAILY DIRECT NORMAL SOLAR | 1688.0 | 1598.0 | 1095.0 | 831.0 | 631.0 | 236.0 | 543.0 | 632.0 | 899.0 | 1245.0 | 1385.0 | 1680.0 | 1688.0 |
| MAX. DAILY TOTAL HORIZNTL SOLAR | 1681.0 | 1534.0 | 1237.0 | 854.0 | 717.0 | 246.0 | 617.0 | 701.0 | 944.0 | 1248.0 | 1557.0 | 1699.0 | 1699.0 |
| MIN. DAILY DIRECT NORMAL SOLAR | 101.0 | 83.0 | 15.0 | 25.0 | 17.0 | 4.0 | 2.0 | 9.0 | 4.0 | 10.0 | 31.0 | 19.0 | 2.0 |
| MIN. DAILY TOTAL HORIZNTL SOLAR | 687.0 | 667.0 | 348.0 | 332.0 | 133.0 | 86.0 | 65.0 | 255.0 | 300.0 | 337.0 | 620.0 | 567.0 | 65.0 |
| MAX. HRLY DIRECT NORMAL SOLAR | 280.0 | 271.0 | 193.0 | 188.0 | 156.0 | 111.0 | 148.0 | 173.0 | 187.0 | 230.0 | 232.0 | 265.0 | 280.0 |
| MAX. HRLY TOTAL HORIZNTL SOLAR | 337.0 | 327.0 | 276.0 | 246.0 | 211.0 | 131.0 | 194.0 | 230.0 | 256.0 | 296.0 | 301.0 | 323.0 | 337.0 |
| AVG. MAX. HRLY DIRECT NORML SOLAR | 155.1 | 158.3 | 85.7 | 131.7 | 90.8 | 70.1 | 79.2 | 73.8 | 55.0 | 79.2 | 81.3 | 121.1 | 98.1 |
| AVG. MAX. HRLY TOTAL HRZNTL SOLAR | 248.7 | 246.5 | 174.3 | 202.4 | 145.8 | 96.8 | 126.4 | 141.9 | 137.8 | 157.4 | 183.3 | 223.1 | 173.3 |

AVG. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|-------|--------|-------|-------|-------|-------|-------|-------|--------|--------|-------|
| N | 512.9 | 552.6 | 469.5 | 640.1 | 451.2 | 223.6 | 439.4 | 452.0 | 379.9 | 360.7 | 462.2 | 473.0 | 450.9 |
| E | 476.0 | 454.6 | 317.7 | 305.9 | 193.5 | 75.5 | 186.0 | 222.3 | 238.5 | 272.9 | 421.1 | 449.7 | 300.3 |
| S | 743.0 | 613.9 | 355.3 | 307.5 | 193.5 | 75.5 | 186.0 | 222.3 | 249.0 | 325.9 | 613.1 | 709.5 | 381.8 |
| W | 1552.2 | 1520.5 | 987.2 | 1103.3 | 631.6 | 233.6 | 602.8 | 702.4 | 698.5 | 816.4 | 1202.2 | 1298.3 | 942.5 |

MAX. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|--------|
| N | 611.4 | 742.0 | 773.6 | 788.3 | 762.6 | 316.3 | 734.1 | 730.7 | 713.6 | 648.3 | 667.3 | 622.7 | 788.3 |
| E | 576.8 | 537.2 | 501.6 | 350.4 | 318.5 | 95.5 | 284.0 | 310.0 | 421.9 | 438.0 | 592.6 | 596.6 | 596.6 |
| S | 1074.4 | 844.0 | 615.9 | 360.1 | 318.5 | 95.5 | 284.0 | 310.0 | 427.9 | 601.9 | 1022.5 | 1119.1 | 1119.1 |
| W | 2381.0 | 2314.9 | 1966.4 | 1426.1 | 1227.2 | 337.1 | 1061.9 | 1220.0 | 1517.0 | 1817.7 | 2303.8 | 2428.2 | 2428.2 |

MAX. HRLY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| N | 176.5 | 171.9 | 165.1 | 222.4 | 219.8 | 166.6 | 227.0 | 219.2 | 196.2 | 169.1 | 162.5 | 171.1 | 227.0 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|

FlorianopolisTRY1963_05.sta

| | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| E | 176.5 | 171.9 | 149.9 | 132.3 | 114.6 | 59.4 | 105.4 | 122.3 | 134.6 | 152.7 | 162.5 | 171.1 | 176.5 |
| S | 388.1 | 326.5 | 214.1 | 142.0 | 114.6 | 59.4 | 105.4 | 122.3 | 151.8 | 253.7 | 335.7 | 382.4 | 388.1 |
| W | 675.2 | 681.9 | 560.6 | 507.1 | 429.7 | 207.0 | 387.8 | 472.2 | 521.4 | 601.3 | 606.2 | 645.7 | 681.9 |

Florianopolis -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

DESIGN TEMPERATURES ----- SUMMER ----- WINTER

| PER CENT | T(DRY) | T(WET) | T(DRY) |
|----------|--------|--------|--------|
| 1.0 | 91 | 82 | 44 |
| 2.5 | 88 | 81 | 46 |
| 5.0 | 85 | 79 | |

MONTHLY AVERAGE TEMPERATURES AS A FUNCTION OF HOUR OF THE DAY

| HOUR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 73.0 | 73.2 | 73.0 | 67.0 | 62.8 | 59.1 | 61.0 | 60.4 | 64.0 | 64.6 | 67.3 | 69.6 | 66.2 |
| 1 | 72.8 | 72.8 | 72.7 | 66.8 | 62.1 | 58.4 | 60.5 | 60.0 | 64.0 | 64.4 | 67.2 | 69.2 | 65.9 |
| 2 | 72.7 | 72.2 | 72.5 | 66.3 | 61.8 | 58.3 | 60.0 | 59.6 | 63.5 | 64.3 | 66.8 | 68.9 | 65.5 |
| 3 | 72.6 | 72.1 | 72.2 | 66.1 | 61.6 | 58.1 | 59.7 | 59.8 | 63.2 | 64.1 | 66.9 | 68.5 | 65.4 |
| 4 | 72.5 | 71.8 | 72.1 | 65.7 | 61.1 | 57.9 | 59.2 | 58.9 | 63.0 | 64.0 | 66.4 | 68.2 | 65.0 |
| 5 | 72.3 | 71.2 | 71.7 | 65.2 | 60.3 | 57.5 | 58.7 | 58.7 | 62.9 | 63.8 | 66.2 | 68.1 | 64.7 |
| 6 | 72.4 | 70.8 | 71.7 | 64.7 | 60.1 | 57.0 | 58.2 | 58.6 | 63.3 | 63.9 | 66.6 | 67.9 | 64.6 |
| 7 | 74.2 | 72.0 | 72.7 | 64.2 | 59.9 | 56.9 | 58.1 | 59.0 | 63.8 | 65.4 | 68.4 | 70.3 | 65.4 |
| 8 | 76.3 | 74.9 | 74.8 | 67.7 | 62.5 | 58.1 | 59.1 | 60.3 | 65.0 | 67.0 | 70.3 | 72.7 | 67.4 |
| 9 | 78.2 | 77.0 | 76.7 | 71.4 | 65.8 | 61.5 | 62.4 | 62.7 | 66.2 | 69.0 | 72.1 | 74.5 | 69.8 |
| 10 | 80.3 | 79.2 | 78.8 | 74.4 | 69.3 | 64.9 | 65.1 | 65.2 | 68.5 | 70.9 | 73.4 | 76.5 | 72.2 |
| 11 | 81.9 | 80.3 | 80.2 | 77.0 | 72.1 | 67.6 | 67.7 | 66.7 | 69.8 | 71.8 | 74.7 | 78.0 | 74.0 |
| 12 | 83.1 | 81.2 | 81.2 | 78.3 | 73.9 | 69.8 | 69.4 | 68.3 | 70.7 | 72.4 | 75.4 | 78.4 | 75.1 |
| 13 | 83.4 | 80.8 | 81.6 | 79.6 | 74.8 | 71.3 | 70.5 | 69.1 | 71.2 | 72.3 | 75.6 | 78.5 | 75.7 |
| 14 | 83.2 | 81.0 | 81.6 | 79.3 | 74.8 | 71.5 | 71.1 | 69.0 | 71.3 | 71.7 | 75.1 | 77.9 | 75.6 |
| 15 | 82.2 | 80.5 | 81.1 | 78.3 | 74.2 | 71.2 | 70.6 | 68.7 | 70.8 | 71.4 | 75.0 | 77.5 | 75.1 |
| 16 | 80.2 | 79.2 | 79.6 | 77.3 | 72.8 | 69.3 | 69.6 | 67.0 | 70.6 | 70.5 | 74.1 | 76.5 | 73.9 |

FlorianopolisTRY1963_05.sta

| | | | | | | | | | | | | | |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 17 | 79.0 | 78.2 | 78.3 | 75.1 | 70.3 | 66.8 | 67.6 | 65.5 | 69.0 | 69.4 | 73.3 | 75.8 | 72.3 |
| 18 | 76.5 | 76.2 | 76.5 | 71.5 | 67.0 | 63.6 | 64.7 | 63.4 | 67.1 | 67.9 | 71.9 | 74.8 | 70.1 |
| 19 | 75.5 | 75.5 | 75.1 | 69.9 | 65.5 | 61.9 | 63.5 | 62.1 | 65.9 | 66.7 | 69.9 | 72.5 | 68.6 |
| 20 | 74.9 | 74.6 | 74.4 | 68.7 | 64.4 | 61.5 | 62.5 | 61.5 | 65.2 | 66.3 | 68.9 | 71.0 | 67.8 |
| 21 | 74.4 | 74.3 | 73.9 | 67.9 | 64.0 | 60.5 | 62.3 | 60.9 | 64.8 | 65.8 | 68.4 | 70.5 | 67.3 |
| 22 | 74.0 | 74.0 | 73.6 | 67.2 | 63.5 | 59.8 | 61.8 | 60.8 | 64.5 | 65.7 | 67.8 | 70.1 | 66.9 |
| 23 | 73.5 | 73.5 | 73.4 | 66.9 | 63.2 | 59.4 | 61.5 | 60.5 | 64.0 | 65.5 | 67.8 | 69.8 | 66.5 |

GROUND TEMPERATURES 536.0 535.1 535.2 530.1 525.5 522.0 522.9 522.2 525.6 527.0 529.8 532.1
CLEARNESS NUMBERS 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00

FORTALEZA

FortalezaTRY1962_05.sta
DOE-2.1E-W74 WEATHER UTILITY PROGRA

INPUT VERIFICATION

RUN TYPE STAT

Fortaleza -TRY MONTHLY WEATHER DATA SUMMARY

DOE-2.1E-W7

LATITUDE = -3.71

LONGITUDE = -38.53

TIME ZONE = 3

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|--------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| AVG. TEMP. (F) (DRYBULB) | 80.8 | 81.1 | 79.7 | 78.9 | 79.0 | 78.5 | 78.6 | 78.9 | 79.4 | 80.4 | 80.5 | 81.6 | 79.8 |
| AVG. TEMP. (F) (WETBULB) | 74.9 | 75.7 | 75.3 | 75.3 | 75.0 | 73.5 | 73.4 | 72.4 | 73.6 | 73.4 | 73.9 | 75.4 | 74.3 |
| AVG. DAILY MAX. TEMP. | 86.8 | 87.1 | 86.0 | 85.7 | 86.0 | 85.5 | 85.7 | 86.2 | 85.9 | 86.6 | 86.4 | 87.6 | 86.3 |
| AVG. DAILY MIN. TEMP. | 74.5 | 75.8 | 74.4 | 73.5 | 73.2 | 72.2 | 71.7 | 71.9 | 73.9 | 75.5 | 75.7 | 76.7 | 74.1 |
| HEATING DEG. DAYS (BASE 65) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 55) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 50) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| COOLING DEG. DAYS (BASE 80) | 26.5 | 42.0 | 27.0 | 10.5 | 6.0 | 0.5 | 1.5 | 2.5 | 10.0 | 34.0 | 32.5 | 67.0 | 260.0 |
| (BASE 75) | 176.0 | 180.5 | 161.0 | 139.5 | 143.5 | 116.0 | 115.5 | 126.0 | 147.5 | 187.5 | 180.5 | 222.0 | 1895.5 |
| (BASE 70) | 331.0 | 320.5 | 316.0 | 288.0 | 298.5 | 266.0 | 270.5 | 281.0 | 297.5 | 342.5 | 330.5 | 377.0 | 3719.0 |
| (BASE 65) | 486.0 | 460.5 | 471.0 | 438.0 | 453.5 | 416.0 | 425.5 | 436.0 | 447.5 | 497.5 | 480.5 | 532.0 | 5544.0 |
| HEATING DEG. HRS./24 (BASE 65) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

FortalezaTRY1962_05.sta

(BASE 55) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
 (BASE 50) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

COOLING DEG. HRS./24 (BASE 80) 63.2 59.0 52.2 42.9 45.9 37.1 39.7 42.4 40.4 53.8 49.9 70.0 596.5
 (BASE 75) 183.3 171.0 152.3 125.9 134.0 120.0 128.0 131.7 136.5 168.8 166.9 205.3 1823.8
 (BASE 70) 334.5 310.1 301.6 266.8 279.6 254.4 266.8 275.0 283.1 322.5 315.9 360.0 3570.2
 (BASE 65) 489.5 450.1 456.6 416.8 434.6 404.2 421.3 429.8 433.1 477.5 465.9 515.0 5394.4

MAXIMUM TEMP. 90 89 90 88 89 88 88 88 89 89 89 89 90
 MINIMUM TEMP. 71 73 72 71 71 68 67 68 71 71 72 73 67

NO. DAYS MAX. 90 AND ABOVE 1 0 1 0 0 0 0 0 0 0 0 0 0 2
 NO. DAYS MAX. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0 0

NO. DAYS MIN. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 NO. DAYS MIN. 0 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0 0

AVG. WIND SPEED (MPH) 1.6 1.4 1.2 1.0 1.1 1.4 1.5 2.0 2.6 2.5 2.3 2.3 1.7

AVG. WIND SPEED (DAY) 1.7 1.5 1.3 1.0 1.2 1.4 1.5 2.0 2.7 2.6 2.3 2.4 1.8
 AVG. WIND SPEED (NIGHT) 0.2 0.9 -0.1 0.4 -0.6 0.8 0.3 0.4 2.3 -2.6 1.4 -0.2 0.3

AVG. TEMP. (DAY) 80.9 81.2 79.9 79.0 79.2 78.6 78.7 79.0 79.5 80.4 80.6 81.7 79.9
 AVG. TEMP. (NIGHT) 78.6 78.9 77.2 75.9 75.7 75.7 76.0 76.5 77.5 78.0 78.2 79.4 77.1

AVG. SKY COVER 3.8 4.6 5.6 5.3 4.3 3.4 2.9 2.3 2.4 2.4 4.0 4.0 3.8

AVG. SKY COVER (DAY) 3.9 4.7 5.7 5.4 4.4 3.4 2.9 2.3 2.4 2.4 4.0 4.0 3.8

AVG. REL. HUM. AT 4AM 87.8 87.9 91.6 96.7 96.5 93.4 91.8 87.8 88.7 83.9 82.5 83.4 89.3
 10AM 70.9 76.5 79.6 83.3 78.1 73.9 71.4 65.9 70.2 64.7 67.0 71.0 72.7
 4PM 65.8 68.2 71.2 74.1 68.8 65.1 65.6 60.6 65.7 62.1 62.8 65.6 66.3
 10PM 80.5 80.4 85.8 90.0 90.6 86.0 85.0 82.9 82.1 79.4 80.5 80.3 83.6

Fortaleza -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -3.71

LONGITUDE = -38.53

TIME ZONE = 3

FortalezaTRY1962_05.sta

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC YEAR

| | | | | | | | | | | | | | |
|-----------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| AVG. DAILY DIRECT NORMAL SOLAR | 561.5 | 529.8 | 636.4 | 555.5 | 590.1 | 704.0 | 681.5 | 795.2 | 942.6 | 712.6 | 659.8 | 625.3 | 666.8 |
| AVG. DAILY TOTAL HORIZNTL SOLAR | 1010.0 | 987.4 | 1040.9 | 993.3 | 990.9 | 998.6 | 956.5 | 1076.5 | 1214.1 | 1147.5 | 1121.1 | 1059.6 | 1049.9 |
| MAX. DAILY DIRECT NORMAL SOLAR | 1148.0 | 1324.0 | 1398.0 | 1147.0 | 1127.0 | 1111.0 | 1120.0 | 1070.0 | 1298.0 | 1027.0 | 1211.0 | 1263.0 | 1398.0 |
| MAX. DAILY TOTAL HORIZNTL SOLAR | 1320.0 | 1390.0 | 1443.0 | 1308.0 | 1248.0 | 1210.0 | 1225.0 | 1241.0 | 1397.0 | 1318.0 | 1418.0 | 1412.0 | 1443.0 |
| MIN. DAILY DIRECT NORMAL SOLAR | 71.0 | 108.0 | 176.0 | 129.0 | 167.0 | 78.0 | 39.0 | 13.0 | 291.0 | 108.0 | 85.0 | 43.0 | 13.0 |
| MIN. DAILY TOTAL HORIZNTL SOLAR | 646.0 | 706.0 | 788.0 | 724.0 | 749.0 | 573.0 | 402.0 | 449.0 | 821.0 | 593.0 | 694.0 | 603.0 | 402.0 |
| MAX. HRLY DIRECT NORMAL SOLAR | 260.0 | 270.0 | 299.0 | 293.0 | 243.0 | 220.0 | 219.0 | 210.0 | 227.0 | 183.0 | 264.0 | 275.0 | 299.0 |
| MAX. HRLY TOTAL HORIZNTL SOLAR | 316.0 | 326.0 | 354.0 | 344.0 | 291.0 | 272.0 | 276.0 | 282.0 | 296.0 | 273.0 | 314.0 | 323.0 | 354.0 |
| AVG. MAX. HRLY DIRECT NORML SOLAR | 158.5 | 152.0 | 159.0 | 157.6 | 148.2 | 172.4 | 168.3 | 172.1 | 211.6 | 166.0 | 192.3 | 181.4 | 169.9 |
| AVG. MAX. HRLY TOTAL HRZNTL SOLAR | 250.2 | 248.5 | 251.8 | 247.2 | 232.2 | 238.2 | 231.0 | 253.1 | 284.3 | 261.1 | 266.7 | 257.9 | 251.8 |

AVG. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| N | 446.9 | 444.7 | 531.1 | 701.9 | 856.0 | 950.5 | 877.6 | 820.8 | 675.9 | 526.2 | 507.1 | 467.6 | 651.6 |
| E | 447.6 | 436.9 | 444.2 | 444.8 | 434.2 | 418.4 | 399.3 | 437.9 | 497.0 | 495.1 | 507.8 | 468.2 | 452.6 |
| S | 845.6 | 690.9 | 546.6 | 457.0 | 433.9 | 418.3 | 399.1 | 439.2 | 557.1 | 718.1 | 914.7 | 936.2 | 612.7 |
| W | 1349.2 | 1330.5 | 1426.2 | 1395.3 | 1363.4 | 1375.7 | 1337.0 | 1539.4 | 1815.0 | 1650.8 | 1609.1 | 1444.0 | 1469.9 |

MAX. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| N | 520.3 | 513.3 | 735.7 | 913.7 | 1116.8 | 1180.8 | 1119.2 | 964.2 | 816.9 | 598.0 | 584.4 | 558.6 | 1180.8 |
| E | 521.2 | 510.6 | 542.7 | 535.7 | 504.9 | 475.4 | 465.2 | 501.1 | 541.8 | 545.7 | 585.1 | 559.8 | 585.1 |
| S | 1085.1 | 993.2 | 764.1 | 573.0 | 504.5 | 475.4 | 465.2 | 513.0 | 648.7 | 885.9 | 1194.7 | 1243.7 | 1243.7 |
| W | 1839.7 | 1961.5 | 2172.8 | 2037.3 | 1828.7 | 1734.6 | 1768.1 | 1810.0 | 2069.4 | 1890.6 | 2142.3 | 1980.1 | 2172.8 |

MAX. HRLY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| N | 163.4 | 168.1 | 217.3 | 295.6 | 317.9 | 315.2 | 307.0 | 269.8 | 228.3 | 166.9 | 169.3 | 171.7 | 317.9 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|

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| | | | | | | | | | | | | | |
|-----------|-----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|
| E | 163.4 | 168.1 | 183.3 | 181.6 | 156.1 | 146.1 | 146.3 | 150.1 | 156.6 | 147.7 | 169.3 | 171.7 | 183.3 |
| S | 353.3 | 302.7 | 263.2 | 197.2 | 156.1 | 146.1 | 146.3 | 156.5 | 199.0 | 236.1 | 345.7 | 374.8 | 374.8 |
| W | 639.7 | 678.2 | 755.8 | 747.7 | 612.9 | 553.8 | 562.1 | 583.5 | 622.3 | 555.3 | 673.8 | 667.4 | 755.8 |
| Fortaleza | -TRY MONTHLY WEATHER DATA SUMMARY | | | | | | | | | | | | DOE-2.1E-W7 |

DESIGN TEMPERATURES ----- SUMMER ----- WINTER

| PER CENT | T(DRY) | T(WET) | T(DRY) |
|----------|--------|--------|--------|
| 1.0 | 88 | 79 | 70 |
| 2.5 | 88 | 78 | 71 |
| 5.0 | 87 | 78 | |

MONTHLY AVERAGE TEMPERATURES AS A FUNCTION OF HOUR OF THE DAY

| HOUR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 78.5 | 78.9 | 77.0 | 75.8 | 75.6 | 75.9 | 75.9 | 76.5 | 77.5 | 77.9 | 78.2 | 79.3 | 77.2 |
| 1 | 78.0 | 78.8 | 76.7 | 75.6 | 75.4 | 75.2 | 75.5 | 76.3 | 76.9 | 77.6 | 77.9 | 78.9 | 76.9 |
| 2 | 77.5 | 78.1 | 76.4 | 75.3 | 75.0 | 74.6 | 75.0 | 75.9 | 76.4 | 77.3 | 77.7 | 78.7 | 76.5 |
| 3 | 76.7 | 77.5 | 76.0 | 74.6 | 74.4 | 74.1 | 74.4 | 75.2 | 75.8 | 76.8 | 77.4 | 78.3 | 75.9 |
| 4 | 76.4 | 77.0 | 75.5 | 74.3 | 74.3 | 73.4 | 73.5 | 74.5 | 75.1 | 76.6 | 76.9 | 77.7 | 75.4 |
| 5 | 75.5 | 76.4 | 75.4 | 74.1 | 74.0 | 73.0 | 72.5 | 73.1 | 74.7 | 75.9 | 76.3 | 77.3 | 74.8 |
| 6 | 75.0 | 76.2 | 75.1 | 74.3 | 73.4 | 72.4 | 72.1 | 72.4 | 74.4 | 76.3 | 76.5 | 77.3 | 74.6 |
| 7 | 77.4 | 77.3 | 76.3 | 75.8 | 75.9 | 74.4 | 73.9 | 74.2 | 76.1 | 78.5 | 79.0 | 79.6 | 76.5 |
| 8 | 81.1 | 80.7 | 79.3 | 78.5 | 78.7 | 77.4 | 77.9 | 77.6 | 79.5 | 81.0 | 81.3 | 81.6 | 79.5 |
| 9 | 83.5 | 82.2 | 81.1 | 80.2 | 81.4 | 79.9 | 80.5 | 80.4 | 81.2 | 83.0 | 83.1 | 84.0 | 81.7 |
| 10 | 84.5 | 83.2 | 82.5 | 82.1 | 83.6 | 81.8 | 82.9 | 82.9 | 83.1 | 85.0 | 84.2 | 85.5 | 83.5 |
| 11 | 85.4 | 84.7 | 84.4 | 83.5 | 84.3 | 83.6 | 84.6 | 85.0 | 84.4 | 86.0 | 84.8 | 86.5 | 84.8 |
| 12 | 85.9 | 85.8 | 85.0 | 84.4 | 85.0 | 84.4 | 84.6 | 85.3 | 85.0 | 86.3 | 85.5 | 86.8 | 85.3 |
| 13 | 85.8 | 86.3 | 84.8 | 84.7 | 85.1 | 84.7 | 85.1 | 85.5 | 85.3 | 86.0 | 85.9 | 87.2 | 85.5 |
| 14 | 85.7 | 86.5 | 84.7 | 84.6 | 85.1 | 84.8 | 84.8 | 85.1 | 85.0 | 85.5 | 85.3 | 86.7 | 85.3 |
| 15 | 85.3 | 86.0 | 84.2 | 83.9 | 84.6 | 84.0 | 84.1 | 84.0 | 83.9 | 84.3 | 84.5 | 85.9 | 84.5 |
| 16 | 84.3 | 84.6 | 83.1 | 83.0 | 83.1 | 82.9 | 82.7 | 82.5 | 82.5 | 83.0 | 83.1 | 84.5 | 83.3 |

FortalezaTRY1962_05.sta

| | | | | | | | | | | | | | |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 17 | 82.7 | 83.2 | 82.0 | 81.2 | 81.6 | 81.4 | 81.0 | 81.0 | 80.9 | 81.3 | 81.6 | 82.5 | 81.7 |
| 18 | 81.4 | 81.8 | 80.6 | 79.7 | 79.9 | 79.6 | 78.9 | 79.1 | 79.3 | 79.5 | 79.9 | 81.1 | 80.0 |
| 19 | 80.3 | 81.3 | 79.8 | 78.8 | 78.4 | 78.4 | 78.1 | 78.0 | 78.4 | 78.9 | 79.2 | 80.5 | 79.2 |
| 20 | 79.8 | 80.6 | 79.2 | 78.1 | 78.0 | 77.8 | 77.6 | 77.5 | 77.9 | 78.5 | 78.9 | 80.1 | 78.7 |
| 21 | 79.7 | 80.1 | 78.6 | 77.5 | 76.9 | 77.2 | 77.2 | 77.3 | 77.9 | 78.3 | 78.7 | 79.8 | 78.3 |
| 22 | 79.5 | 79.5 | 78.2 | 76.9 | 76.5 | 76.5 | 77.0 | 76.9 | 77.7 | 78.0 | 78.5 | 79.6 | 77.9 |
| 23 | 79.2 | 79.1 | 77.7 | 76.6 | 76.2 | 76.0 | 76.5 | 76.7 | 77.7 | 78.1 | 78.3 | 79.5 | 77.6 |

GROUND TEMPERATURES 540.2 540.5 539.1 538.3 538.4 537.9 538.0 538.2 538.9 539.8 539.8 541.0
 CLEARNESS NUMBERS 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00

MACEIÓ

MaceioTRY1962_05.sta
DOE-2.1E-W74 WEATHER UTILITY PROGRA

INPUT VERIFICATION

RUN TYPE STAT

Maceio -TRY MONTHLY WEATHER DATA SUMMARY

DOE-2.1E-W7

LATITUDE = -9.39

LONGITUDE = -35.44

TIME ZONE = 3

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR | |
|--------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|------|
| AVG. TEMP. (F) (DRYBULB) | | 78.6 | 78.7 | 78.0 | 76.6 | 75.2 | 73.2 | 72.1 | 72.2 | 73.2 | 75.7 | 76.8 | 77.8 | 75.7 |
| AVG. TEMP. (F) (WETBULB) | | 72.3 | 72.9 | 73.2 | 72.6 | 72.0 | 70.9 | 68.9 | 68.5 | 69.2 | 70.6 | 71.3 | 72.3 | 71.2 |
| AVG. DAILY MAX. TEMP. | | 88.9 | 88.4 | 86.3 | 84.7 | 82.4 | 78.8 | 79.4 | 79.8 | 81.0 | 84.5 | 86.2 | 86.8 | 83.9 |
| AVG. DAILY MIN. TEMP. | | 70.4 | 71.1 | 71.3 | 70.3 | 69.7 | 68.9 | 66.2 | 65.8 | 66.6 | 68.1 | 69.4 | 70.8 | 69.0 |
| HEATING DEG. DAYS (BASE 65) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| (BASE 55) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| (BASE 50) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| COOLING DEG. DAYS (BASE 80) | | 17.5 | 8.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.5 | 1.5 | 33.5 |
| (BASE 75) | 143.0 | 132.5 | 117.0 | 74.5 | 40.0 | 6.0 | 0.0 | 0.5 | 6.5 | 41.0 | 83.0 | 118.0 | 762.0 | |
| (BASE 70) | 298.0 | 272.5 | 272.0 | 224.5 | 188.0 | 116.0 | 87.0 | 88.0 | 114.5 | 195.5 | 233.0 | 273.0 | 2362.0 | |
| (BASE 65) | 453.0 | 412.5 | 427.0 | 374.5 | 343.0 | 266.0 | 242.0 | 243.0 | 264.5 | 350.5 | 383.0 | 428.0 | 4187.0 | |
| HEATING DEG. HRS./24 (BASE 65) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 1.7 | 1.7 | 0.0 | 0.0 | 0.0 | 4.8 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |

MaceioTRY1962_05.sta

(BASE 55) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
 (BASE 50) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

COOLING DEG. HRS./24 (BASE 80) 69.5 58.8 45.9 28.4 15.3 1.9 1.8 2.3 7.3 26.5 39.5 48.2 345.3
 (BASE 75) 145.8 128.3 119.6 88.4 62.7 25.5 27.4 34.9 46.8 86.6 103.8 118.8 988.4
 (BASE 70) 269.4 244.5 249.6 198.3 163.5 105.3 94.0 101.0 119.3 185.0 209.2 241.2 2180.4
 (BASE 65) 423.0 384.2 404.3 347.2 315.8 247.2 221.2 225.4 247.5 330.3 355.4 395.7 3897.3

MAXIMUM TEMP. 95 92 92 88 87 84 84 84 84 87 91 91 95
 MINIMUM TEMP. 67 68 68 68 66 64 63 61 60 65 66 68 60

NO. DAYS MAX. 90 AND ABOVE 12 9 2 0 0 0 0 0 0 0 1 3 27
 NO. DAYS MAX. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

NO. DAYS MIN. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0
 NO. DAYS MIN. 0 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

AVG. WIND SPEED (MPH) 1.7 1.3 1.1 0.9 1.0 1.3 1.0 1.1 1.2 1.4 1.5 1.5 1.3

AVG. WIND SPEED (DAY) 1.8 1.4 1.2 1.0 1.1 1.4 1.1 1.2 1.3 1.4 1.6 1.5 1.3
 AVG. WIND SPEED (NIGHT) -0.2 0.1 -0.2 0.1 -0.1 0.5 0.1 0.0 0.1 -1.7 0.1 -1.3 -0.1

AVG. TEMP. (DAY) 78.9 79.0 78.3 76.8 75.4 73.4 72.4 72.5 73.4 75.8 76.9 77.9 75.9
 AVG. TEMP. (NIGHT) 73.1 73.8 73.8 72.4 71.7 71.1 68.3 68.5 69.1 70.7 71.8 73.0 71.2

AVG. SKY COVER 2.0 3.0 4.0 4.2 5.1 6.2 4.3 4.3 3.7 3.0 3.1 3.7 3.9

AVG. SKY COVER (DAY) 2.1 3.1 4.1 4.3 5.2 6.3 4.4 4.4 3.8 3.0 3.1 3.7 3.9

AVG. REL. HUM. AT 4AM 92.2 92.8 94.8 96.1 95.9 95.4 96.1 96.0 96.0 94.4 93.8 94.4 94.8
 10AM 65.2 68.4 71.9 76.9 80.1 83.9 82.2 76.2 73.3 66.7 67.1 67.5 73.3
 4PM 58.4 61.3 65.4 67.8 73.5 82.1 73.3 69.1 69.6 63.3 61.6 62.2 67.3
 10PM 83.9 85.3 89.0 92.1 93.5 93.6 92.5 91.4 90.9 89.7 87.2 88.2 89.8

Maceio -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -9.39

LONGITUDE = -35.44

TIME ZONE = 3

MaceioTRY1962_05.sta

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC YEAR

| | | | | | | | | | | | | | |
|-----------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| AVG. DAILY DIRECT NORMAL SOLAR | 985.3 | 753.6 | 823.0 | 562.9 | 492.5 | 366.6 | 429.5 | 467.1 | 729.5 | 880.3 | 932.6 | 857.0 | 689.9 |
| AVG. DAILY TOTAL HORIZNTL SOLAR | 1362.6 | 1184.9 | 1119.8 | 984.5 | 902.5 | 802.9 | 768.2 | 895.3 | 1064.4 | 1228.5 | 1333.3 | 1222.2 | 1071.8 |
| MAX. DAILY DIRECT NORMAL SOLAR | 1629.0 | 1278.0 | 1425.0 | 1187.0 | 985.0 | 990.0 | 893.0 | 1090.0 | 1454.0 | 1550.0 | 1512.0 | 1716.0 | 1716.0 |
| MAX. DAILY TOTAL HORIZNTL SOLAR | 1749.0 | 1559.0 | 1427.0 | 1308.0 | 1187.0 | 1082.0 | 1093.0 | 1233.0 | 1449.0 | 1617.0 | 1605.0 | 1760.0 | 1760.0 |
| MIN. DAILY DIRECT NORMAL SOLAR | 84.0 | 46.0 | 151.0 | 87.0 | 209.0 | 155.0 | 14.0 | 28.0 | 62.0 | 50.0 | 263.0 | 106.0 | 14.0 |
| MIN. DAILY TOTAL HORIZNTL SOLAR | 819.0 | 688.0 | 750.0 | 648.0 | 718.0 | 657.0 | 399.0 | 522.0 | 639.0 | 634.0 | 820.0 | 770.0 | 399.0 |
| MAX. HRLY DIRECT NORMAL SOLAR | 268.0 | 245.0 | 283.0 | 252.0 | 215.0 | 240.0 | 220.0 | 233.0 | 274.0 | 288.0 | 293.0 | 313.0 | 313.0 |
| MAX. HRLY TOTAL HORIZNTL SOLAR | 318.0 | 308.0 | 346.0 | 323.0 | 294.0 | 279.0 | 274.0 | 287.0 | 321.0 | 334.0 | 341.0 | 365.0 | 365.0 |
| AVG. MAX. HRLY DIRECT NORML SOLAR | 212.4 | 182.7 | 189.2 | 146.7 | 121.0 | 98.2 | 126.5 | 124.3 | 169.4 | 220.6 | 227.4 | 194.6 | 167.7 |
| AVG. MAX. HRLY TOTAL HRZNTL SOLAR | 273.0 | 257.5 | 274.5 | 240.4 | 209.2 | 196.7 | 195.5 | 221.5 | 249.4 | 281.9 | 299.3 | 274.3 | 247.7 |

AVG. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| N | 554.4 | 535.2 | 602.6 | 756.8 | 818.2 | 791.0 | 750.2 | 739.1 | 675.5 | 591.8 | 561.8 | 498.7 | 656.8 |
| E | 557.9 | 517.1 | 464.7 | 449.0 | 407.1 | 379.9 | 354.8 | 411.7 | 463.2 | 532.2 | 560.6 | 500.9 | 466.2 |
| S | 1068.1 | 787.4 | 533.0 | 453.8 | 406.5 | 379.4 | 353.9 | 410.9 | 502.3 | 714.9 | 982.1 | 986.0 | 630.8 |
| W | 1837.6 | 1640.3 | 1531.1 | 1367.5 | 1204.3 | 1040.1 | 1034.5 | 1192.3 | 1489.5 | 1738.3 | 1799.8 | 1593.3 | 1454.5 |

MAX. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| N | 636.2 | 670.3 | 842.4 | 991.3 | 1045.2 | 1037.3 | 1051.7 | 965.2 | 1016.4 | 846.4 | 790.0 | 814.5 | 1051.7 |
| E | 640.4 | 617.9 | 673.7 | 693.9 | 579.3 | 528.4 | 563.3 | 672.9 | 730.4 | 798.9 | 791.7 | 817.8 | 817.8 |
| S | 1388.2 | 1106.4 | 779.8 | 717.3 | 578.6 | 527.4 | 562.0 | 676.4 | 799.9 | 1094.8 | 1277.8 | 1424.5 | 1424.5 |
| W | 2465.9 | 2276.1 | 1968.8 | 1723.3 | 1587.0 | 1386.9 | 1444.2 | 1758.0 | 2012.3 | 2214.3 | 2227.0 | 2305.2 | 2465.9 |

MAX. HRLY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| N | 167.2 | 170.1 | 211.9 | 248.8 | 277.3 | 305.5 | 265.2 | 254.2 | 240.9 | 206.4 | 184.0 | 191.2 | 305.5 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|

MaceioTRY1962_05.sta

E 167.2 162.7 177.2 177.1 158.0 152.2 150.3 156.0 176.2 181.0 184.0 191.2 191.2
 S 359.8 301.5 255.3 193.8 158.0 152.2 150.3 160.1 207.0 286.9 348.0 399.4 399.4
 W 650.6 625.1 692.6 608.9 546.8 516.3 472.8 598.1 663.7 721.3 690.6 723.7 723.7

Maceio -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

DESIGN TEMPERATURES ----- SUMMER ----- WINTER

| PER CENT | T(DRY) | T(WET) | T(DRY) |
|----------|--------|--------|--------|
| 1.0 | 91 | 77 | 64 |
| 2.5 | 89 | 77 | 65 |
| 5.0 | 88 | 76 | |

MONTHLY AVERAGE TEMPERATURES AS A FUNCTION OF HOUR OF THE DAY

| HOUR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 73.1 | 73.9 | 73.8 | 72.3 | 71.8 | 71.0 | 68.4 | 68.4 | 69.0 | 70.7 | 71.6 | 73.0 | 71.4 |
| 1 | 72.6 | 73.1 | 73.3 | 72.0 | 71.4 | 70.9 | 68.1 | 68.0 | 68.6 | 70.3 | 71.0 | 72.5 | 71.0 |
| 2 | 72.1 | 72.7 | 72.9 | 71.6 | 71.0 | 70.6 | 68.0 | 67.5 | 68.3 | 69.9 | 70.5 | 72.1 | 70.6 |
| 3 | 71.5 | 72.2 | 72.5 | 71.3 | 70.9 | 70.3 | 67.6 | 67.0 | 67.7 | 69.4 | 70.2 | 71.7 | 70.2 |
| 4 | 70.9 | 71.8 | 72.0 | 71.0 | 70.4 | 69.9 | 67.5 | 66.6 | 67.3 | 68.9 | 69.9 | 71.4 | 69.8 |
| 5 | 70.4 | 71.3 | 71.8 | 70.6 | 70.3 | 69.5 | 67.1 | 66.3 | 67.1 | 68.5 | 69.5 | 71.2 | 69.5 |
| 6 | 72.0 | 72.0 | 72.0 | 70.6 | 70.2 | 69.4 | 67.2 | 66.6 | 67.6 | 70.3 | 72.2 | 72.4 | 70.2 |
| 7 | 75.5 | 75.4 | 74.5 | 73.3 | 72.5 | 71.0 | 69.3 | 68.9 | 70.7 | 74.2 | 75.8 | 76.2 | 73.1 |
| 8 | 80.3 | 80.0 | 79.2 | 77.2 | 76.1 | 73.4 | 72.2 | 72.7 | 74.9 | 78.5 | 79.7 | 79.7 | 77.0 |
| 9 | 82.7 | 82.4 | 82.1 | 80.3 | 78.6 | 75.9 | 74.8 | 76.2 | 77.9 | 80.4 | 81.1 | 81.9 | 79.5 |
| 10 | 85.1 | 84.7 | 83.5 | 81.9 | 79.8 | 76.6 | 76.5 | 77.5 | 79.4 | 82.4 | 83.5 | 84.0 | 81.2 |
| 11 | 87.0 | 86.2 | 84.6 | 83.0 | 80.9 | 77.2 | 78.1 | 79.1 | 80.2 | 83.4 | 84.7 | 85.3 | 82.5 |
| 12 | 88.0 | 87.3 | 84.9 | 83.9 | 81.4 | 77.5 | 78.5 | 79.2 | 80.2 | 83.6 | 85.4 | 85.9 | 83.0 |
| 13 | 88.4 | 87.8 | 85.5 | 83.8 | 81.2 | 77.5 | 78.5 | 79.0 | 80.1 | 83.5 | 85.2 | 85.7 | 83.0 |
| 14 | 88.0 | 87.2 | 84.9 | 83.7 | 80.8 | 77.4 | 77.9 | 78.4 | 79.5 | 83.0 | 85.1 | 85.3 | 82.6 |
| 15 | 86.7 | 85.9 | 84.2 | 82.8 | 80.4 | 76.6 | 77.4 | 77.9 | 78.7 | 82.1 | 83.6 | 84.0 | 81.7 |
| 16 | 84.7 | 84.5 | 83.0 | 81.1 | 79.0 | 76.0 | 76.1 | 76.8 | 77.5 | 80.6 | 81.6 | 82.4 | 80.3 |

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| | | | | | | | | | | | | | |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 17 | 82.3 | 82.2 | 81.0 | 79.3 | 77.1 | 74.2 | 74.5 | 74.7 | 75.6 | 78.2 | 79.4 | 80.4 | 78.2 |
| 18 | 79.4 | 79.8 | 79.0 | 77.1 | 75.3 | 73.0 | 72.6 | 72.5 | 73.5 | 75.5 | 76.7 | 78.0 | 76.0 |
| 19 | 77.1 | 77.2 | 77.4 | 75.7 | 74.2 | 72.5 | 71.4 | 71.1 | 71.8 | 74.0 | 75.0 | 76.2 | 74.5 |
| 20 | 76.2 | 76.5 | 76.1 | 74.8 | 73.7 | 72.3 | 70.7 | 70.4 | 71.1 | 73.1 | 74.1 | 75.3 | 73.7 |
| 21 | 75.2 | 75.7 | 75.5 | 74.1 | 73.0 | 72.1 | 69.9 | 69.9 | 70.5 | 72.3 | 73.5 | 74.6 | 73.0 |
| 22 | 74.4 | 75.1 | 75.0 | 73.6 | 72.5 | 71.6 | 69.4 | 69.4 | 70.0 | 71.7 | 72.9 | 73.9 | 72.4 |
| 23 | 73.8 | 74.4 | 74.3 | 73.0 | 72.1 | 71.4 | 68.6 | 69.1 | 69.6 | 71.2 | 72.2 | 73.3 | 71.9 |

GROUND TEMPERATURES 538.0 538.1 537.4 536.0 534.6 532.6 531.5 531.6 532.6 535.0 536.3 537.2
CLEARNESS NUMBERS 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00

NATAL

NatalTRY1954_05.sta
DOE-2.1E-W74 WEATHER UTILITY PROGRA

INPUT VERIFICATION

RUN TYPE STAT

Natal -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -5.47 LONGITUDE = -35.12 TIME ZONE = 3

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR | |
|--------------------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| AVG. TEMP. (F) (DRYBULB) | | 80.2 | 80.8 | 80.6 | 78.7 | 77.6 | 76.4 | 75.1 | 75.4 | 76.6 | 78.7 | 79.1 | 80.0 | 78.2 |
| AVG. TEMP. (F) (WETBULB) | | 74.5 | 75.0 | 75.4 | 74.6 | 73.7 | 72.9 | 71.2 | 71.7 | 71.9 | 72.3 | 72.6 | 73.3 | 73.2 |
| AVG. DAILY MAX. TEMP. | | 86.5 | 88.1 | 87.8 | 86.1 | 84.7 | 82.8 | 82.6 | 83.4 | 84.3 | 86.0 | 85.8 | 86.7 | 85.4 |
| AVG. DAILY MIN. TEMP. | | 75.3 | 74.6 | 74.2 | 72.9 | 72.3 | 71.4 | 69.5 | 68.9 | 70.2 | 72.8 | 73.6 | 74.6 | 72.5 |
| HEATING DEG. DAYS (BASE 65) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 60) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 55) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 50) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| COOLING DEG. DAYS (BASE 80) | | 32.5 | 39.0 | 37.5 | 7.5 | 2.0 | 0.0 | 0.0 | 0.0 | 0.5 | 5.0 | 8.5 | 26.0 | 158.5 |
| (BASE 75) | | 182.5 | 178.0 | 187.0 | 134.5 | 109.0 | 63.5 | 37.0 | 37.5 | 66.5 | 136.5 | 140.0 | 175.0 | 1447.0 |
| (BASE 70) | | 337.5 | 318.0 | 341.5 | 284.5 | 264.0 | 212.5 | 188.0 | 191.0 | 216.5 | 291.5 | 290.0 | 330.0 | 3265.0 |
| (BASE 65) | | 492.5 | 458.0 | 496.5 | 434.5 | 419.0 | 362.5 | 343.0 | 346.0 | 366.5 | 446.5 | 440.0 | 485.0 | 5090.0 |
| HEATING DEG. HRS./24 (BASE 65) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 60) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

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(BASE 55) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
 (BASE 50) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

COOLING DEG. HRS./24 (BASE 80) 52.1 63.2 69.7 43.2 32.2 17.5 14.8 17.8 24.8 42.7 42.8 56.8 477.6
 (BASE 75) 162.8 166.1 178.9 122.0 102.4 71.0 64.7 72.0 86.1 124.9 129.3 157.8 1438.2
 (BASE 70) 315.8 303.6 329.8 260.0 236.3 190.8 161.7 175.2 199.0 269.6 272.9 309.7 3024.2
 (BASE 65) 470.8 443.6 484.8 410.0 391.3 340.8 312.8 323.1 346.9 424.6 422.8 464.7 4835.9

MAXIMUM TEMP. 90 90 91 89 88 86 86 85 86 89 89 88 91
 MINIMUM TEMP. 72 71 72 71 71 70 66 66 67 69 68 71 66

NO. DAYS MAX. 90 AND ABOVE 1 2 3 0 0 0 0 0 0 0 0 0 6
 NO. DAYS MAX. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

NO. DAYS MIN. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0
 NO. DAYS MIN. 0 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

AVG. WIND SPEED (MPH) 2.1 1.8 1.8 1.9 2.3 2.1 2.5 2.1 2.5 2.3 2.5 2.2 2.2

AVG. WIND SPEED (DAY) 2.1 1.8 1.8 2.0 2.4 2.1 2.6 2.2 2.5 2.4 2.5 2.3 2.2
 AVG. WIND SPEED (NIGHT) 1.3 0.8 0.9 1.4 1.4 1.6 1.6 1.2 1.6 0.1 0.3 0.8 1.2

AVG. TEMP. (DAY) 80.3 81.0 80.8 78.8 77.8 76.6 75.4 75.7 77.0 80.4 80.8 81.4 78.8
 AVG. TEMP. (NIGHT) 77.7 78.3 78.1 75.9 74.4 73.5 71.5 72.0 68.8 25.0 12.8 43.7 68.2

AVG. SKY COVER 5.5 4.9 5.1 5.6 5.5 5.6 4.7 4.4 4.3 4.4 4.5 4.2 4.9

AVG. SKY COVER (DAY) 5.6 4.9 5.1 5.7 5.5 5.6 4.8 4.5 4.4 4.5 4.6 4.3 5.0

AVG. REL. HUM. AT 4AM 87.2 89.0 92.2 95.2 95.0 94.6 94.2 94.1 92.2 84.3 83.8 83.9 90.5
 10AM 72.7 71.4 74.4 80.0 79.1 81.5 79.6 79.4 74.6 65.1 66.7 64.5 74.1
 4PM 67.8 64.4 67.7 71.8 72.6 73.8 70.1 72.3 67.7 63.7 62.6 62.6 68.1
 10PM 81.6 81.2 82.9 87.8 89.1 90.4 90.1 89.2 86.7 80.3 80.2 81.6 85.1

Natal -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -5.47

LONGITUDE = -35.12

TIME ZONE = 3

NatalTRY1954_05.sta

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC YEAR

AVG. DAILY DIRECT NORMAL SOLAR 687.7 675.2 673.5 497.4 452.5 478.2 474.1 359.9 493.4 600.9 723.6 677.5 565.5
 AVG. DAILY TOTAL HORIZNTL SOLAR 1113.3 1077.0 1049.5 963.1 908.3 879.6 840.0 821.4 962.3 1084.1 1189.3 1128.1 1000.7

MAX. DAILY DIRECT NORMAL SOLAR 1298.0 1274.0 1454.0 1127.0 917.0 1281.0 1251.0 794.0 1249.0 1415.0 1324.0 1279.0 1454.0
 MAX. DAILY TOTAL HORIZNTL SOLAR 1467.0 1404.0 1416.0 1298.0 1135.0 1342.0 1305.0 1119.0 1325.0 1516.0 1492.0 1455.0 1516.0
 MIN. DAILY DIRECT NORMAL SOLAR 252.0 122.0 138.0 179.0 173.0 148.0 35.0 34.0 27.0 61.0 95.0 133.0 27.0
 MIN. DAILY TOTAL HORIZNTL SOLAR 865.0 730.0 745.0 772.0 722.0 678.0 500.0 515.0 540.0 655.0 749.0 788.0 500.0

MAX. HRLY DIRECT NORMAL SOLAR 307.0 284.0 283.0 287.0 234.0 261.0 251.0 226.0 224.0 262.0 279.0 301.0 307.0
 MAX. HRLY TOTAL HORIZNTL SOLAR 363.0 338.0 336.0 337.0 279.0 306.0 296.0 288.0 289.0 315.0 325.0 360.0 363.0
 AVG. MAX. HRLY DIRECT NORML SOLAR 177.8 194.1 173.1 136.8 109.4 123.5 131.4 106.9 149.1 164.1 200.6 188.2 154.3
 AVG. MAX. HRLY TOTAL HRZNTL SOLAR 267.4 280.3 258.8 228.5 207.2 205.7 208.2 205.5 243.7 254.4 275.8 260.8 241.1

AVG. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

N 457.7 458.1 539.0 685.4 782.7 832.2 769.5 646.5 591.3 513.6 520.1 473.4 606.4
 E 460.3 448.2 442.6 426.1 410.6 391.7 370.2 384.3 438.8 477.5 520.6 474.8 437.0
 S 877.3 710.0 522.7 433.3 409.8 390.9 369.1 383.7 484.4 666.3 934.1 938.3 592.7
 W 1414.0 1422.3 1401.1 1261.7 1186.0 1137.7 1090.9 1071.0 1311.3 1480.2 1650.9 1425.4 1320.0

MAX. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

N 556.7 546.5 695.9 1040.0 1059.5 1331.0 1279.7 870.6 818.2 633.0 582.4 549.0 1331.0
 E 558.5 508.4 512.5 524.1 466.1 493.7 473.4 486.7 501.6 552.3 583.5 550.8 583.5
 S 1249.2 923.6 665.9 522.5 464.6 492.5 472.2 490.4 589.8 883.6 1188.1 1251.3 1251.3
 W 2059.3 1905.0 1948.7 1952.1 1579.4 1891.6 1821.4 1652.2 1850.2 2202.9 2083.1 2017.8 2202.9

MAX. HRLY TOTAL VERTICAL SOLAR

AZIMUTH

N 184.2 177.2 205.6 317.0 316.3 362.3 346.1 262.5 223.9 182.0 170.9 169.5 362.3

NatalTRY1954_05.sta

| | | | | | | | | | | | | | |
|-------|-------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|-------|
| E | 184.2 | 169.9 | 170.2 | 176.7 | 147.5 | 161.1 | 155.1 | 150.3 | 151.4 | 165.9 | 170.9 | 169.5 | 184.2 |
| S | 396.0 | 317.3 | 239.5 | 176.7 | 147.5 | 161.1 | 155.1 | 155.1 | 189.6 | 275.4 | 356.3 | 370.9 | 396.0 |
| W | 721.1 | 690.2 | 704.6 | 714.1 | 569.5 | 619.4 | 596.8 | 596.8 | 600.0 | 675.6 | 686.3 | 661.9 | 721.1 |
| Natal | -TRY | MONTHLY WEATHER DATA SUMMARY | | | | | | | | | | DOE-2.1E-W7 | |

DESIGN TEMPERATURES ----- SUMMER ----- WINTER

| PER CENT | T(DRY) | T(WET) | T(DRY) |
|----------|--------|--------|--------|
| 1.0 | 89 | 78 | 67 |
| 2.5 | 88 | 78 | 68 |
| 5.0 | 87 | 77 | |

MONTHLY AVERAGE TEMPERATURES AS A FUNCTION OF HOUR OF THE DAY

| HOUR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 77.6 | 78.0 | 77.9 | 75.7 | 74.2 | 73.4 | 71.4 | 71.6 | 72.6 | 75.3 | 75.8 | 76.7 | 75.0 |
| 1 | 77.3 | 77.4 | 77.1 | 75.2 | 73.6 | 73.0 | 70.8 | 71.1 | 72.1 | 74.9 | 75.6 | 76.5 | 74.5 |
| 2 | 76.8 | 76.8 | 76.3 | 74.5 | 73.4 | 72.6 | 70.4 | 70.6 | 71.6 | 74.5 | 75.3 | 76.0 | 74.0 |
| 3 | 76.5 | 76.1 | 75.5 | 73.8 | 73.0 | 72.3 | 70.2 | 70.0 | 71.3 | 74.2 | 75.1 | 75.7 | 73.6 |
| 4 | 76.3 | 75.6 | 75.0 | 73.5 | 72.7 | 72.0 | 70.0 | 69.7 | 70.9 | 73.7 | 74.7 | 75.5 | 73.3 |
| 5 | 75.8 | 74.9 | 74.6 | 73.2 | 72.6 | 71.6 | 69.8 | 69.4 | 70.6 | 73.2 | 74.1 | 74.9 | 72.9 |
| 6 | 75.9 | 74.8 | 74.5 | 73.5 | 72.9 | 71.9 | 70.0 | 69.2 | 70.8 | 74.2 | 74.9 | 75.5 | 73.2 |
| 7 | 78.4 | 77.4 | 77.7 | 75.5 | 75.3 | 74.2 | 72.2 | 71.8 | 73.9 | 77.3 | 77.8 | 78.6 | 75.8 |
| 8 | 81.0 | 81.3 | 81.6 | 79.5 | 78.2 | 76.2 | 75.1 | 76.0 | 77.6 | 81.1 | 81.1 | 82.0 | 79.2 |
| 9 | 82.7 | 83.7 | 83.6 | 81.4 | 80.3 | 78.4 | 77.5 | 78.6 | 79.7 | 82.9 | 82.6 | 83.8 | 81.3 |
| 10 | 83.9 | 85.6 | 85.1 | 83.1 | 82.0 | 80.1 | 79.4 | 80.3 | 81.4 | 84.2 | 83.9 | 84.9 | 82.8 |
| 11 | 84.7 | 86.9 | 86.4 | 84.6 | 83.1 | 81.3 | 80.7 | 81.3 | 83.0 | 84.9 | 84.9 | 85.6 | 83.9 |
| 12 | 85.7 | 87.4 | 87.0 | 85.2 | 83.7 | 81.5 | 81.8 | 82.6 | 83.5 | 85.1 | 84.7 | 86.0 | 84.5 |
| 13 | 85.8 | 87.5 | 86.7 | 84.8 | 83.6 | 81.8 | 81.5 | 82.6 | 83.9 | 85.0 | 85.2 | 86.0 | 84.5 |
| 14 | 85.0 | 86.9 | 86.1 | 84.4 | 83.5 | 81.8 | 81.5 | 82.6 | 83.0 | 84.4 | 84.7 | 85.6 | 84.1 |
| 15 | 84.3 | 86.0 | 85.5 | 83.2 | 82.6 | 81.2 | 81.0 | 81.4 | 82.2 | 83.5 | 83.8 | 84.7 | 83.3 |
| 16 | 83.2 | 84.3 | 84.5 | 82.4 | 81.1 | 80.4 | 79.7 | 79.7 | 80.6 | 81.7 | 82.2 | 83.6 | 82.0 |

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| | | | | | | | | | | | | | |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 17 | 81.7 | 82.4 | 82.8 | 80.6 | 79.4 | 78.6 | 77.7 | 78.0 | 78.7 | 79.7 | 80.1 | 81.5 | 80.1 |
| 18 | 79.9 | 80.8 | 80.9 | 79.1 | 78.1 | 76.9 | 76.1 | 76.0 | 76.9 | 77.6 | 78.1 | 79.4 | 78.3 |
| 19 | 78.9 | 80.0 | 80.1 | 78.1 | 77.2 | 75.9 | 74.5 | 74.8 | 75.8 | 76.9 | 77.4 | 78.2 | 77.3 |
| 20 | 78.6 | 79.6 | 79.7 | 77.4 | 76.5 | 75.0 | 73.7 | 74.1 | 75.2 | 76.5 | 77.0 | 77.7 | 76.7 |
| 21 | 78.4 | 79.3 | 79.3 | 77.0 | 75.8 | 74.6 | 73.1 | 73.5 | 74.6 | 76.4 | 76.7 | 77.2 | 76.3 |
| 22 | 78.1 | 79.0 | 78.9 | 76.5 | 75.4 | 74.1 | 72.4 | 72.9 | 74.1 | 76.0 | 76.4 | 77.1 | 75.9 |
| 23 | 77.9 | 78.6 | 78.5 | 76.0 | 74.6 | 73.7 | 71.6 | 72.3 | 73.4 | 75.6 | 76.1 | 77.0 | 75.4 |

GROUND TEMPERATURES 539.6 540.2 540.0 538.1 537.0 535.8 534.5 534.8 536.0 538.1 538.5 539.4
 CLEARNESS NUMBERS 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00

PORTO ALEGRE

PortoAlegreTRY1954_05.sta
DOE-2.1E-W74 WEATHER UTILITY PROGRA

INPUT VERIFICATION

RUN TYPE STAT

PoA -TRY 19 MONTHLY WEATHER DATA SUMMARY

DOE-2.1E-W7

LATITUDE = -30.03

LONGITUDE = -51.22

TIME ZONE = 3

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|--------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|--------|
| AVG. TEMP. (F) (DRYBULB) | 76.3 | 75.8 | 74.2 | 67.7 | 58.0 | 58.8 | 56.7 | 61.3 | 62.5 | 65.0 | 70.3 | 73.8 | 66.6 |
| AVG. TEMP. (F) (WETBULB) | 71.1 | 71.2 | 69.4 | 63.9 | 54.7 | 56.7 | 54.3 | 57.8 | 59.7 | 61.0 | 64.2 | 66.5 | 62.5 |
| AVG. DAILY MAX. TEMP. | 86.9 | 85.0 | 83.9 | 76.9 | 69.9 | 66.3 | 64.6 | 72.4 | 70.2 | 73.9 | 81.4 | 86.0 | 76.4 |
| AVG. DAILY MIN. TEMP. | 67.4 | 68.7 | 66.4 | 59.5 | 48.0 | 52.7 | 50.4 | 51.9 | 55.9 | 57.2 | 60.4 | 61.9 | 58.3 |
| HEATING DEG. DAYS (BASE 65) | 0.0 | 0.0 | 0.0 | 14.5 | 205.5 | 168.0 | 239.0 | 145.5 | 79.5 | 57.5 | 6.5 | 1.5 | 917.5 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 4.5 | 103.0 | 58.5 | 120.5 | 58.0 | 18.5 | 10.5 | 0.0 | 0.0 | 373.5 |
| (BASE 55) | 0.0 | 0.0 | 0.0 | 0.0 | 36.5 | 14.0 | 35.5 | 11.5 | 0.0 | 0.0 | 0.0 | 0.0 | 97.5 |
| (BASE 50) | 0.0 | 0.0 | 0.0 | 0.0 | 5.5 | 1.5 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 9.5 |
| COOLING DEG. DAYS (BASE 80) | 30.0 | 4.5 | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.5 | 44.5 |
| (BASE 75) | 106.5 | 61.5 | 53.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 | 52.5 | 280.5 | |
| (BASE 70) | 230.0 | 191.5 | 161.5 | 33.5 | 1.0 | 0.0 | 0.0 | 13.5 | 1.5 | 16.0 | 62.0 | 148.5 | 859.0 |
| (BASE 65) | 376.5 | 331.5 | 315.0 | 110.5 | 17.5 | 2.5 | 6.5 | 57.0 | 21.0 | 75.0 | 182.5 | 278.5 | 1774.0 |
| HEATING DEG. HRS./24 (BASE 65) | 7.3 | 1.2 | 4.2 | 52.6 | 260.6 | 203.4 | 277.6 | 189.1 | 120.1 | 87.2 | 32.0 | 23.7 | 1259.0 |
| (BASE 60) | 1.3 | 0.0 | 0.2 | 16.5 | 159.0 | 92.7 | 149.5 | 93.4 | 43.2 | 33.3 | 7.7 | 7.8 | 604.5 |

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(BASE 55) 0.0 0.0 0.0 2.6 88.0 31.0 58.6 36.9 6.6 9.1 1.0 1.6 235.4
 (BASE 50) 0.0 0.0 0.0 0.4 44.7 8.9 18.7 11.7 0.5 1.4 0.0 0.1 86.3

COOLING DEG. HRS./24 (BASE 80) 63.0 31.5 31.8 4.2 0.6 0.0 0.1 8.5 0.1 2.5 16.8 55.9 214.8
 (BASE 75) 125.1 79.8 78.0 17.0 4.5 0.5 1.9 20.9 3.0 11.6 47.9 104.0 494.2
 (BASE 70) 223.4 173.5 161.4 56.5 16.7 5.2 8.0 41.2 15.6 34.2 104.3 181.9 1021.9
 (BASE 65) 358.6 304.8 289.5 134.4 42.5 16.8 19.3 73.1 45.2 87.0 191.2 296.4 1859.0

MAXIMUM TEMP. 98 95 92 90 85 79 82 88 81 87 92 98 98
 MINIMUM TEMP. 55 61 58 46 34 37 40 38 48 45 52 49 34

NO. DAYS MAX. 90 AND ABOVE 16 5 7 1 0 0 0 0 0 0 1 14 44
 NO. DAYS MAX. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

NO. DAYS MIN. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0
 NO. DAYS MIN. 0 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

AVG. WIND SPEED (MPH) 1.7 1.6 1.8 1.7 1.3 1.7 1.6 1.8 2.0 2.0 2.2 2.0 1.8

AVG. WIND SPEED (DAY) 1.8 1.6 1.8 1.8 1.3 1.8 1.6 1.9 2.0 2.0 2.2 2.0 1.8
 AVG. WIND SPEED (NIGHT) 2.1 1.7 3.6 10.6 0.1 1.5 1.5 -2.3 2.9 3.0 1.8 2.4 2.9

AVG. TEMP. (DAY) 77.2 77.0 75.5 69.0 59.2 59.1 57.1 62.5 63.6 65.8 70.9 74.4 67.9
 AVG. TEMP. (NIGHT) 86.6 97.1 120.1 452.7 7.8 51.3 47.7 -18.0 96.2 76.0 76.3 79.4 104.1

AVG. SKY COVER 4.2 4.4 3.6 4.0 3.2 6.0 4.8 2.9 5.8 4.4 2.5 2.9 4.1

AVG. SKY COVER (DAY) 4.3 4.5 3.7 4.2 3.3 6.1 4.8 3.0 5.9 4.4 2.6 2.9 4.1

AVG. REL. HUM. AT 4AM 94.9 94.3 94.1 93.9 96.3 95.9 94.9 92.7 94.5 93.8 93.3 88.2 93.9
 10AM 78.6 81.7 81.3 82.4 88.4 93.8 92.8 85.5 86.8 79.1 73.6 67.7 82.6
 4PM 63.6 67.9 64.0 65.0 61.9 74.8 72.1 67.9 75.5 63.8 54.3 51.2 65.1
 10PM 84.2 86.2 85.5 89.4 90.2 92.6 90.1 90.0 89.3 85.3 80.3 76.9 86.7

PoA -TRY 19 MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -30.03

LONGITUDE = -51.22

TIME ZONE = 3

PortoAlegreTRY1954_05.sta

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC YEAR

| | | | | | | | | | | | | | |
|-----------------------------------|--------|--------|--------|--------|-------|-------|-------|-------|--------|--------|--------|--------|--------|
| AVG. DAILY DIRECT NORMAL SOLAR | 746.2 | 723.0 | 649.6 | 465.4 | 127.5 | 73.1 | 90.4 | 375.9 | 370.2 | 693.5 | 792.5 | 1044.5 | 511.9 |
| AVG. DAILY TOTAL HORIZNTL SOLAR | 1123.2 | 1046.0 | 810.3 | 616.8 | 194.7 | 156.2 | 144.1 | 504.4 | 651.5 | 876.9 | 1157.7 | 1338.0 | 716.4 |
| MAX. DAILY DIRECT NORMAL SOLAR | 1517.0 | 1595.0 | 1409.0 | 1000.0 | 315.0 | 303.0 | 302.0 | 699.0 | 1215.0 | 1423.0 | 1194.0 | 1894.0 | 1894.0 |
| MAX. DAILY TOTAL HORIZNTL SOLAR | 1572.0 | 1533.0 | 1343.0 | 946.0 | 299.0 | 279.0 | 265.0 | 770.0 | 1110.0 | 1320.0 | 1483.0 | 1842.0 | 1842.0 |
| MIN. DAILY DIRECT NORMAL SOLAR | 49.0 | 84.0 | 43.0 | 32.0 | 14.0 | 10.0 | 6.0 | 4.0 | 66.0 | 23.0 | 13.0 | 44.0 | 4.0 |
| MIN. DAILY TOTAL HORIZNTL SOLAR | 665.0 | 677.0 | 406.0 | 170.0 | 120.0 | 124.0 | 84.0 | 89.0 | 436.0 | 427.0 | 436.0 | 685.0 | 84.0 |
| MAX. HRLY DIRECT NORMAL SOLAR | 247.0 | 268.0 | 237.0 | 227.0 | 134.0 | 147.0 | 144.0 | 168.0 | 247.0 | 271.0 | 191.0 | 299.0 | 299.0 |
| MAX. HRLY TOTAL HORIZNTL SOLAR | 313.0 | 323.0 | 294.0 | 271.0 | 151.0 | 152.0 | 145.0 | 223.0 | 296.0 | 325.0 | 283.0 | 351.0 | 351.0 |
| AVG. MAX. HRLY DIRECT NORML SOLAR | 166.4 | 154.2 | 154.5 | 129.2 | 60.9 | 36.3 | 46.7 | 103.5 | 98.6 | 158.8 | 157.0 | 185.3 | 120.8 |
| AVG. MAX. HRLY TOTAL HRZNTL SOLAR | 240.3 | 229.8 | 221.3 | 183.9 | 100.8 | 85.3 | 79.3 | 156.8 | 180.4 | 220.9 | 239.3 | 268.0 | 183.6 |

AVG. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|-------|-------|-------|-------|-------|--------|--------|--------|--------|
| N | 514.2 | 556.7 | 575.0 | 574.9 | 224.8 | 186.3 | 172.1 | 508.5 | 518.7 | 525.9 | 546.3 | 575.3 | 455.7 |
| E | 462.9 | 441.6 | 340.0 | 276.7 | 85.9 | 75.5 | 64.2 | 232.0 | 303.8 | 359.3 | 475.1 | 535.4 | 303.5 |
| S | 721.1 | 599.5 | 376.9 | 278.8 | 85.9 | 75.5 | 64.2 | 232.1 | 319.9 | 440.5 | 732.4 | 926.7 | 403.4 |
| W | 1529.6 | 1517.8 | 1260.4 | 1000.3 | 264.0 | 202.6 | 189.5 | 831.1 | 987.2 | 1305.0 | 1617.7 | 1889.0 | 1046.7 |

MAX. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| N | 626.9 | 767.5 | 802.8 | 880.5 | 343.2 | 381.6 | 340.5 | 720.5 | 859.2 | 759.8 | 701.9 | 716.7 | 880.5 |
| E | 568.1 | 573.7 | 526.4 | 389.5 | 106.8 | 134.0 | 94.1 | 331.0 | 433.1 | 630.5 | 643.7 | 658.4 | 658.4 |
| S | 1021.6 | 897.2 | 677.0 | 395.2 | 106.8 | 134.0 | 94.1 | 332.5 | 473.9 | 813.4 | 1031.6 | 1236.7 | 1236.7 |
| W | 2263.9 | 2370.9 | 2281.5 | 1699.0 | 429.3 | 436.1 | 390.0 | 1328.7 | 1931.6 | 2079.7 | 2157.2 | 2764.5 | 2764.5 |

MAX. HRLY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| N | 165.3 | 171.7 | 186.9 | 242.7 | 168.9 | 203.8 | 184.0 | 208.8 | 227.9 | 178.2 | 151.7 | 186.8 | 242.7 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|

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| | | | | | | | | | | | | | |
|----------|---------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|-------|
| E | 165.3 | 171.7 | 160.9 | 145.2 | 65.3 | 76.0 | 62.2 | 120.4 | 156.5 | 167.0 | 151.7 | 186.8 | 186.8 |
| S | 363.5 | 334.2 | 244.8 | 151.0 | 65.3 | 76.0 | 62.2 | 120.8 | 182.5 | 291.9 | 317.5 | 429.3 | 429.3 |
| W | 621.8 | 675.2 | 640.5 | 588.5 | 253.4 | 273.6 | 246.3 | 465.5 | 642.4 | 674.2 | 535.3 | 714.3 | 714.3 |
| PoA -TRY | 19 MONTHLY WEATHER DATA SUMMARY | | | | | | | | | | | DOE-2.1E-W7 | |

DESIGN TEMPERATURES ----- SUMMER ----- WINTER

| PER CENT | T(DRY) | T(WET) | T(DRY) |
|----------|--------|--------|--------|
| 1.0 | 95 | 80 | 42 |
| 2.5 | 92 | 78 | 45 |
| 5.0 | 90 | 77 | |

MONTHLY AVERAGE TEMPERATURES AS A FUNCTION OF HOUR OF THE DAY

| HOUR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 71.7 | 72.2 | 70.5 | 64.3 | 52.8 | 56.4 | 54.1 | 57.7 | 60.0 | 61.2 | 64.9 | 68.2 | 62.8 |
| 1 | 71.0 | 71.7 | 69.9 | 63.9 | 52.2 | 56.2 | 53.6 | 57.0 | 59.7 | 60.6 | 64.1 | 66.8 | 62.2 |
| 2 | 70.3 | 71.0 | 69.3 | 63.4 | 51.3 | 55.8 | 53.4 | 56.4 | 59.2 | 59.8 | 63.0 | 66.3 | 61.5 |
| 3 | 69.8 | 70.2 | 68.3 | 62.8 | 50.7 | 55.6 | 53.0 | 55.7 | 58.5 | 59.3 | 62.0 | 65.1 | 60.8 |
| 4 | 69.4 | 70.0 | 67.9 | 62.2 | 50.4 | 55.3 | 52.8 | 55.1 | 57.8 | 58.8 | 61.6 | 64.5 | 60.4 |
| 5 | 69.0 | 69.8 | 67.4 | 61.6 | 50.2 | 54.8 | 52.3 | 54.5 | 57.7 | 58.6 | 61.3 | 64.2 | 60.1 |
| 6 | 69.0 | 69.3 | 67.0 | 60.9 | 50.2 | 54.9 | 52.0 | 53.7 | 57.5 | 58.2 | 61.1 | 63.8 | 59.7 |
| 7 | 70.9 | 70.1 | 67.2 | 60.8 | 50.7 | 55.0 | 52.2 | 53.5 | 58.0 | 60.0 | 64.8 | 67.5 | 60.8 |
| 8 | 73.8 | 73.1 | 69.7 | 63.0 | 51.6 | 55.3 | 52.4 | 55.2 | 59.3 | 62.4 | 68.4 | 71.5 | 62.9 |
| 9 | 76.5 | 75.8 | 73.5 | 66.5 | 54.9 | 56.5 | 53.9 | 58.7 | 61.4 | 65.3 | 71.5 | 74.2 | 65.7 |
| 10 | 78.6 | 78.1 | 76.6 | 70.2 | 58.7 | 58.4 | 56.3 | 62.4 | 63.7 | 67.9 | 74.7 | 77.3 | 68.5 |
| 11 | 80.7 | 79.8 | 79.2 | 72.3 | 62.1 | 60.5 | 58.3 | 65.5 | 65.4 | 69.9 | 76.9 | 79.4 | 70.8 |
| 12 | 82.6 | 81.8 | 81.1 | 74.1 | 64.5 | 62.8 | 60.3 | 67.9 | 67.2 | 71.5 | 78.6 | 81.2 | 72.7 |
| 13 | 83.9 | 83.1 | 81.9 | 75.3 | 66.7 | 63.8 | 61.6 | 69.7 | 68.5 | 72.7 | 80.0 | 82.7 | 74.1 |
| 14 | 84.6 | 83.0 | 82.8 | 76.0 | 68.4 | 64.6 | 62.5 | 70.5 | 68.8 | 73.1 | 80.5 | 83.7 | 74.8 |
| 15 | 84.2 | 82.8 | 82.2 | 75.7 | 69.5 | 65.1 | 63.8 | 71.0 | 68.4 | 72.4 | 79.8 | 84.4 | 74.9 |
| 16 | 84.1 | 82.4 | 81.7 | 75.3 | 69.4 | 64.6 | 63.5 | 70.5 | 68.0 | 71.3 | 79.2 | 84.2 | 74.5 |

PortoAlegreTRY1954_05.sta

| | | | | | | | | | | | | | |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 17 | 83.4 | 81.4 | 80.5 | 74.4 | 67.4 | 63.2 | 62.0 | 69.2 | 66.9 | 70.0 | 77.6 | 83.0 | 73.2 |
| 18 | 82.2 | 80.5 | 78.7 | 71.7 | 63.9 | 61.3 | 60.1 | 66.1 | 65.2 | 68.5 | 75.1 | 81.1 | 71.2 |
| 19 | 79.8 | 78.0 | 76.0 | 68.5 | 60.6 | 59.8 | 58.2 | 62.6 | 63.7 | 66.3 | 72.4 | 77.5 | 68.6 |
| 20 | 76.6 | 75.9 | 74.1 | 67.3 | 58.5 | 59.0 | 57.0 | 60.9 | 62.7 | 64.5 | 69.7 | 74.5 | 66.7 |
| 21 | 74.5 | 74.0 | 72.5 | 65.9 | 56.7 | 58.0 | 56.3 | 59.4 | 61.3 | 63.3 | 67.8 | 71.4 | 65.0 |
| 22 | 73.3 | 73.4 | 71.9 | 65.1 | 55.4 | 57.1 | 55.6 | 58.8 | 60.9 | 62.5 | 66.7 | 70.1 | 64.2 |
| 23 | 72.2 | 72.8 | 71.1 | 64.2 | 54.4 | 56.7 | 55.1 | 58.2 | 60.3 | 61.7 | 65.9 | 68.7 | 63.4 |

| | | | | | | | | | | | | |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| GROUND TEMPERATURES | 530.5 | 530.6 | 528.8 | 523.3 | 514.1 | 516.1 | 513.7 | 517.1 | 519.0 | 520.4 | 523.6 | 525.9 |
| CLEARNESS NUMBERS | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

RECIFE

RecifeTRY1962_05.sta

(BASE 55) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
 (BASE 50) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

COOLING DEG. HRS./24 (BASE 80) 30.8 33.4 35.4 21.7 15.6 3.6 0.3 1.1 3.5 15.1 19.1 25.2 204.8
 (BASE 75) 156.2 153.2 158.0 121.0 111.7 63.0 46.5 55.1 74.5 120.0 130.1 148.7 1337.8
 (BASE 70) 310.5 292.9 310.5 265.9 257.3 190.9 164.4 183.1 214.3 273.3 279.9 302.9 3046.0
 (BASE 65) 465.5 432.9 465.5 415.9 412.3 340.7 318.7 336.3 363.9 428.3 429.9 457.9 4867.8

MAXIMUM TEMP. 84 86 85 85 84 83 81 82 83 83 89 86 89
 MINIMUM TEMP. 72 74 72 71 71 68 68 67 68 71 74 73 67

NO. DAYS MAX. 90 AND ABOVE 0 0 0 0 0 0 0 0 0 0 0 0 0
 NO. DAYS MAX. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

NO. DAYS MIN. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0
 NO. DAYS MIN. 0 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

AVG. WIND SPEED (MPH) 2.1 2.0 2.2 2.2 2.2 2.7 2.6 2.8 2.6 2.6 2.5 2.8 2.4

AVG. WIND SPEED (DAY) 2.1 2.0 2.2 2.2 2.2 2.7 2.6 2.8 2.6 2.7 2.5 2.9 2.5
 AVG. WIND SPEED (NIGHT) 1.5 1.8 1.7 1.7 1.8 2.6 2.4 2.4 2.1 1.0 2.4 1.6 2.0

AVG. TEMP. (DAY) 80.1 80.5 80.1 79.0 78.4 76.5 75.4 76.0 77.2 78.9 79.4 79.8 78.4
 AVG. TEMP. (NIGHT) 78.5 79.3 78.9 77.6 77.0 74.7 73.6 74.3 75.7 77.2 77.7 78.3 76.6

AVG. SKY COVER 3.4 4.4 5.5 5.2 5.0 5.5 4.9 4.5 4.1 3.4 3.8 4.7 4.5

AVG. SKY COVER (DAY) 3.4 4.4 5.5 5.3 5.1 5.5 5.0 4.5 4.1 3.4 3.9 4.7 4.6

AVG. REL. HUM. AT 4AM 81.6 81.1 86.9 89.4 90.2 90.4 91.0 86.4 82.3 80.4 80.8 81.8 85.2
 10AM 70.7 74.1 77.2 77.5 77.9 80.7 82.1 76.1 74.7 70.7 72.4 73.6 75.6
 4PM 70.5 70.4 75.9 75.0 76.0 78.4 78.6 75.0 75.2 69.7 71.0 72.8 74.1
 10PM 77.7 77.5 81.3 82.7 82.7 87.7 85.3 81.2 79.8 78.7 79.6 80.0 81.2

Recife -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -8.03

LONGITUDE = -34.52

TIME ZONE = 3

RecifeTRY1962_05.sta

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC YEAR

AVG. DAILY DIRECT NORMAL SOLAR 849.8 908.0 709.5 607.7 505.3 408.7 345.0 514.0 785.5 903.6 775.7 801.6 674.6
 AVG. DAILY TOTAL HORIZNTL SOLAR 1320.2 1332.8 1065.3 991.6 918.2 806.2 703.8 866.6 1106.2 1243.7 1198.4 1193.7 1060.4

MAX. DAILY DIRECT NORMAL SOLAR 1339.0 1662.0 1463.0 1255.0 1065.0 975.0 808.0 1067.0 1281.0 1236.0 1355.0 1641.0 1662.0
 MAX. DAILY TOTAL HORIZNTL SOLAR 1600.0 1737.0 1444.0 1340.0 1209.0 1131.0 1054.0 1219.0 1406.0 1422.0 1505.0 1670.0 1737.0
 MIN. DAILY DIRECT NORMAL SOLAR 73.0 109.0 122.0 84.0 138.0 70.0 6.0 14.0 28.0 273.0 130.0 70.0 6.0
 MIN. DAILY TOTAL HORIZNTL SOLAR 737.0 825.0 732.0 651.0 676.0 565.0 281.0 426.0 554.0 780.0 796.0 696.0 281.0

MAX. HRLY DIRECT NORMAL SOLAR 218.0 268.0 278.0 273.0 234.0 228.0 183.0 212.0 245.0 220.0 246.0 300.0 300.0
 MAX. HRLY TOTAL HORIZNTL SOLAR 293.0 320.0 332.0 322.0 284.0 273.0 248.0 277.0 304.0 292.0 306.0 350.0 350.0
 AVG. MAX. HRLY DIRECT NORML SOLAR 182.7 198.1 163.5 147.8 121.9 115.0 106.7 143.2 176.8 193.8 191.3 200.5 161.5
 AVG. MAX. HRLY TOTAL HRZNTL SOLAR 269.2 279.4 249.2 233.9 212.2 194.2 184.1 215.0 256.0 271.6 274.0 274.1 242.5

AVG. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

N 558.2 573.5 546.3 717.3 812.2 772.0 650.5 686.3 640.5 534.8 486.7 474.0 621.1
 E 561.1 558.8 427.7 420.6 405.7 361.7 319.5 373.1 444.7 490.2 486.6 476.2 443.0
 S 1059.2 884.2 493.3 425.5 404.9 360.9 318.8 372.2 483.8 682.9 857.2 947.8 606.1
 W 1801.8 1882.4 1381.5 1328.9 1212.4 1019.6 908.4 1157.2 1512.6 1702.5 1561.6 1515.3 1412.2

MAX. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

N 629.3 678.0 796.4 1004.6 1128.9 1152.0 998.6 992.4 787.9 614.0 556.8 563.9 1152.0
 E 633.6 648.2 496.3 501.0 478.9 444.9 425.4 464.4 507.9 542.3 556.9 565.9 648.2
 S 1276.7 1210.3 641.0 513.1 477.6 443.9 424.2 465.8 584.6 872.9 1098.8 1277.0 1277.0
 W 2217.8 2573.8 2041.0 1962.8 1718.7 1620.5 1461.5 1718.6 2023.2 1974.4 2075.2 2198.5 2573.8

MAX. HRLY TOTAL VERTICAL SOLAR

AZIMUTH

N 154.0 175.0 222.8 262.1 280.3 316.9 276.3 264.8 213.4 173.1 159.8 180.2 316.9

RecifeTRY1962_05.sta

| | | | | | | | | | | | | | |
|--------|-------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|-------|
| E | 154.0 | 169.8 | 167.4 | 166.7 | 149.7 | 142.5 | 129.9 | 144.6 | 159.0 | 153.7 | 159.8 | 180.2 | 180.2 |
| S | 319.0 | 320.1 | 238.5 | 177.5 | 149.7 | 142.5 | 129.9 | 145.9 | 193.3 | 259.1 | 318.7 | 390.9 | 390.9 |
| W | 584.0 | 691.4 | 692.3 | 686.3 | 591.7 | 545.5 | 477.9 | 566.8 | 645.3 | 601.0 | 631.9 | 707.3 | 707.3 |
| Recife | -TRY | MONTHLY WEATHER DATA SUMMARY | | | | | | | | | | DOE-2.1E-W7 | |

DESIGN TEMPERATURES ----- SUMMER ----- WINTER

| PER CENT | T(DRY) | T(WET) | T(DRY) |
|----------|--------|--------|--------|
| 1.0 | 85 | 78 | 69 |
| 2.5 | 84 | 77 | 70 |
| 5.0 | 84 | 77 | |

MONTHLY AVERAGE TEMPERATURES AS A FUNCTION OF HOUR OF THE DAY

| HOUR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 78.5 | 79.5 | 78.9 | 77.7 | 77.3 | 74.8 | 73.4 | 74.2 | 75.6 | 77.1 | 77.7 | 78.4 | 76.9 |
| 1 | 78.1 | 78.9 | 78.4 | 76.9 | 76.5 | 74.6 | 73.3 | 73.9 | 75.3 | 77.0 | 77.4 | 78.2 | 76.5 |
| 2 | 77.8 | 78.6 | 77.6 | 76.3 | 76.0 | 74.2 | 72.9 | 73.6 | 75.1 | 76.8 | 77.2 | 78.0 | 76.2 |
| 3 | 77.5 | 78.1 | 77.2 | 75.8 | 75.2 | 74.0 | 72.4 | 73.1 | 74.7 | 76.5 | 77.2 | 77.7 | 75.8 |
| 4 | 77.0 | 78.0 | 76.9 | 75.0 | 74.9 | 73.9 | 72.1 | 72.8 | 74.4 | 76.2 | 76.7 | 77.5 | 75.4 |
| 5 | 76.6 | 77.3 | 76.5 | 74.7 | 74.4 | 73.6 | 71.4 | 72.7 | 74.5 | 75.9 | 76.7 | 77.2 | 75.1 |
| 6 | 76.7 | 77.1 | 76.6 | 74.7 | 74.5 | 73.6 | 71.3 | 72.6 | 74.8 | 76.6 | 77.6 | 77.5 | 75.3 |
| 7 | 78.8 | 79.1 | 78.2 | 76.7 | 76.1 | 75.2 | 72.5 | 74.0 | 76.5 | 78.4 | 79.1 | 79.5 | 77.0 |
| 8 | 80.6 | 80.5 | 80.2 | 78.8 | 78.3 | 76.9 | 74.8 | 76.0 | 78.0 | 80.3 | 80.3 | 80.4 | 78.7 |
| 9 | 82.1 | 81.7 | 81.6 | 80.7 | 80.0 | 78.1 | 76.8 | 77.8 | 78.8 | 81.0 | 81.2 | 81.4 | 80.1 |
| 10 | 82.5 | 82.4 | 82.5 | 81.6 | 80.8 | 78.8 | 77.6 | 78.6 | 79.5 | 81.5 | 81.2 | 81.9 | 80.8 |
| 11 | 82.7 | 83.1 | 82.8 | 81.9 | 81.4 | 79.1 | 78.5 | 78.9 | 80.0 | 81.8 | 81.8 | 82.3 | 81.2 |
| 12 | 83.0 | 83.5 | 82.9 | 81.6 | 81.5 | 79.0 | 78.9 | 78.9 | 79.9 | 81.6 | 82.3 | 82.6 | 81.3 |
| 13 | 83.2 | 83.5 | 82.9 | 82.1 | 81.4 | 79.2 | 79.0 | 79.3 | 79.7 | 81.6 | 82.3 | 82.7 | 81.4 |
| 14 | 82.8 | 83.1 | 82.6 | 81.9 | 81.2 | 79.0 | 79.0 | 79.3 | 79.5 | 81.5 | 82.3 | 82.5 | 81.2 |
| 15 | 82.7 | 83.1 | 82.5 | 81.7 | 80.9 | 79.0 | 78.0 | 78.5 | 79.1 | 81.2 | 81.6 | 81.8 | 80.8 |
| 16 | 82.1 | 82.3 | 82.0 | 81.2 | 80.2 | 78.5 | 77.7 | 78.1 | 78.5 | 80.4 | 80.7 | 81.1 | 80.2 |

RecifeTRY1962_05.sta

| | | | | | | | | | | | | | |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 17 | 81.3 | 81.6 | 81.1 | 80.3 | 79.6 | 77.2 | 76.5 | 76.7 | 77.8 | 79.3 | 79.9 | 80.5 | 79.3 |
| 18 | 80.2 | 80.7 | 80.3 | 79.7 | 79.0 | 76.7 | 75.9 | 76.0 | 77.0 | 78.4 | 79.0 | 79.7 | 78.5 |
| 19 | 79.5 | 80.2 | 80.1 | 79.3 | 78.7 | 76.1 | 75.6 | 75.5 | 76.7 | 78.1 | 78.7 | 79.3 | 78.1 |
| 20 | 79.4 | 79.9 | 79.7 | 79.0 | 78.5 | 75.9 | 75.4 | 75.2 | 76.8 | 77.9 | 78.4 | 79.1 | 77.9 |
| 21 | 79.3 | 79.9 | 79.8 | 78.7 | 78.2 | 75.3 | 74.9 | 75.3 | 76.4 | 77.6 | 78.3 | 78.7 | 77.7 |
| 22 | 79.1 | 79.7 | 79.7 | 78.6 | 77.8 | 75.1 | 74.5 | 74.8 | 76.4 | 77.6 | 78.2 | 78.5 | 77.5 |
| 23 | 78.7 | 79.5 | 79.4 | 78.1 | 77.1 | 74.9 | 74.2 | 74.8 | 76.1 | 77.3 | 77.9 | 78.4 | 77.2 |

GROUND TEMPERATURES 533.5 534.0 534.6 534.0 533.4 532.1 531.0 530.6 531.3 532.1 533.0 533.6
CLEARNESS NUMBERS 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00

RIO DE JANEIRO

RiodeJaneiroTRY1963_05.sta
DOE-2.1E-W74 WEATHER UTILITY PROGRA

INPUT VERIFICATION

RUN TYPE STAT

Rio - TRY MONTHLY WEATHER DATA SUMMARY

DOE-2.1E-W7

LATITUDE = -22.54

LONGITUDE = -43.12

TIME ZONE = 3

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|--------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| AVG. TEMP. (F) (DRYBULB) | | 81.0 | 78.4 | 80.4 | 75.3 | 71.3 | 69.0 | 68.9 | 69.9 | 73.3 | 73.5 | 76.3 | 74.5 |
| AVG. TEMP. (F) (WETBULB) | | 75.6 | 73.5 | 74.5 | 70.9 | 67.6 | 65.2 | 65.8 | 66.3 | 69.1 | 70.8 | 72.3 | 70.2 |
| AVG. DAILY MAX. TEMP. | | 88.6 | 84.9 | 86.8 | 81.1 | 78.4 | 76.2 | 76.5 | 77.6 | 80.2 | 79.2 | 82.8 | 81.2 |
| AVG. DAILY MIN. TEMP. | | 75.1 | 73.6 | 75.1 | 70.2 | 64.5 | 62.6 | 62.2 | 63.2 | 67.9 | 69.2 | 71.1 | 68.8 |
| HEATING DEG. DAYS (BASE 65) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 | 8.5 | 0.0 | 0.0 | 0.0 | 10.0 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| (BASE 55) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| (BASE 50) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| COOLING DEG. DAYS (BASE 80) | | 80.0 | 22.0 | 49.5 | 0.5 | 0.0 | 0.0 | 1.5 | 0.0 | 0.0 | 4.5 | 24.0 | 206.5 |
| (BASE 75) | 213.0 | 123.5 | 185.5 | 40.0 | 12.0 | 0.0 | 10.0 | 6.0 | 23.0 | 33.0 | 88.5 | 92.0 | 826.5 |
| (BASE 70) | 368.0 | 259.0 | 340.0 | 170.5 | 63.0 | 23.0 | 26.5 | 57.0 | 125.0 | 133.5 | 210.5 | 207.0 | 1983.0 |
| (BASE 65) | 523.0 | 399.0 | 495.0 | 320.5 | 200.0 | 132.5 | 135.0 | 176.0 | 271.5 | 284.5 | 358.5 | 358.5 | 3654.0 |
| HEATING DEG. HRS./24 (BASE 65) | | 0.0 | 0.0 | 0.0 | 0.0 | 6.8 | 15.2 | 18.3 | 17.5 | 0.6 | 0.0 | 0.2 | 58.9 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.8 | 1.0 | 0.0 | 0.0 | 0.0 | 2.8 | |

RiodeJaneiroTRY1963_05.sta

(BASE 55) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
 (BASE 50) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

COOLING DEG. HRS./24 (BASE 80) 89.9 39.4 64.5 6.9 5.0 1.2 3.2 5.2 11.1 9.9 27.4 36.2 299.9
 (BASE 75) 193.2 109.8 171.9 52.2 25.0 9.2 13.2 22.8 39.5 37.2 83.8 95.2 853.0
 (BASE 70) 342.5 236.1 323.5 164.2 90.3 45.1 51.7 72.5 114.3 118.7 193.7 204.2 1956.8
 (BASE 65) 497.5 376.0 478.5 309.6 203.0 134.6 140.0 168.6 249.1 262.4 337.9 351.2 3508.5

MAXIMUM TEMP. 100 95 95 89 90 84 92 95 89 93 99 101 101
 MINIMUM TEMP. 73 69 72 66 60 57 58 55 62 66 63 62 55

NO. DAYS MAX. 90 AND ABOVE 14 5 7 0 1 0 2 1 0 3 5 5 43
 NO. DAYS MAX. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

NO. DAYS MIN. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0
 NO. DAYS MIN. 0 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

AVG. WIND SPEED (MPH) 1.6 1.8 1.7 1.7 1.2 1.3 1.4 1.5 1.7 1.8 1.8 2.3 1.6

AVG. WIND SPEED (DAY) 1.7 1.8 1.8 1.7 1.2 1.3 1.4 1.5 1.7 1.9 1.9 2.4 1.7
 AVG. WIND SPEED (NIGHT) 5.5 47.5 -0.8 1.2 0.6 1.3 1.0 0.7 -0.4 6.9 2.5 5.2 -4.1

AVG. TEMP. (DAY) 84.1 79.9 80.5 75.4 71.4 69.1 69.1 70.0 74.1 76.3 79.0 79.1 75.8
 AVG. TEMP. (NIGHT) 194.5 2461.9 78.2 73.4 69.2 67.0 67.2 67.6 -10.8 170.4 129.9 132.6 -44.8

AVG. SKY COVER 3.7 4.6 2.7 3.6 1.8 3.2 2.3 3.0 2.2 5.5 4.9 4.6 3.5

AVG. SKY COVER (DAY) 3.9 4.7 2.7 3.6 1.8 3.3 2.3 3.0 2.2 5.8 5.2 4.8 3.6

AVG. REL. HUM. AT 4AM 89.5 88.9 86.7 89.5 92.5 91.9 93.1 91.6 90.4 93.7 91.1 87.7 90.6
 10AM 76.6 79.5 76.8 80.8 83.2 83.4 86.4 83.4 81.8 86.3 80.1 75.8 81.2
 4PM 67.5 67.8 64.4 70.0 72.2 70.5 77.1 73.4 71.0 82.2 75.9 70.5 71.9
 10PM 83.0 83.5 77.7 82.5 84.7 83.8 85.4 84.1 82.6 91.1 86.2 81.1 83.8

Rio - TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -22.54

LONGITUDE = -43.12

TIME ZONE = 3

RiodeJaneiroTRY1963_05.sta

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC YEAR

| | | | | | | | | | | | | | |
|-----------------------------------|--------|--------|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| AVG. DAILY DIRECT NORMAL SOLAR | 898.7 | 926.5 | 550.3 | 477.3 | 334.2 | 408.2 | 280.0 | 564.1 | 354.0 | 653.8 | 679.0 | 833.1 | 578.2 |
| AVG. DAILY TOTAL HORIZNTL SOLAR | 1236.3 | 1203.1 | 937.0 | 708.3 | 569.4 | 553.4 | 482.2 | 691.9 | 693.4 | 1030.5 | 1132.9 | 1200.5 | 868.2 |
| MAX. DAILY DIRECT NORMAL SOLAR | 1535.0 | 1676.0 | 857.0 | 1081.0 | 479.0 | 665.0 | 374.0 | 1004.0 | 650.0 | 1779.0 | 1482.0 | 1698.0 | 1779.0 |
| MAX. DAILY TOTAL HORIZNTL SOLAR | 1575.0 | 1584.0 | 1145.0 | 1173.0 | 685.0 | 709.0 | 591.0 | 955.0 | 1089.0 | 1720.0 | 1602.0 | 1724.0 | 1724.0 |
| MIN. DAILY DIRECT NORMAL SOLAR | 76.0 | 143.0 | 40.0 | 15.0 | 11.0 | 23.0 | 0.0 | 31.0 | 4.0 | 39.0 | 42.0 | 25.0 | 0.0 |
| MIN. DAILY TOTAL HORIZNTL SOLAR | 702.0 | 759.0 | 422.0 | 342.0 | 280.0 | 291.0 | 87.0 | 343.0 | 174.0 | 590.0 | 665.0 | 595.0 | 87.0 |
| MAX. HRLY DIRECT NORMAL SOLAR | 264.0 | 291.0 | 155.0 | 199.0 | 116.0 | 175.0 | 100.0 | 227.0 | 109.0 | 295.0 | 243.0 | 288.0 | 295.0 |
| MAX. HRLY TOTAL HORIZNTL SOLAR | 325.0 | 345.0 | 259.0 | 263.0 | 199.0 | 214.0 | 180.0 | 272.0 | 224.0 | 341.0 | 311.0 | 339.0 | 345.0 |
| AVG. MAX. HRLY DIRECT NORML SOLAR | 180.4 | 196.8 | 118.7 | 142.0 | 89.9 | 122.1 | 79.5 | 149.7 | 81.8 | 141.2 | 146.5 | 189.3 | 136.1 |
| AVG. MAX. HRLY TOTAL HRZNTL SOLAR | 267.3 | 276.5 | 222.9 | 208.6 | 166.8 | 173.4 | 154.1 | 208.2 | 183.6 | 220.6 | 235.2 | 259.6 | 214.4 |

AVG. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| N | 498.2 | 566.8 | 602.8 | 611.8 | 590.3 | 651.1 | 528.2 | 662.4 | 500.3 | 569.1 | 513.8 | 491.5 | 565.5 |
| E | 479.2 | 475.2 | 414.2 | 307.8 | 262.5 | 251.9 | 226.9 | 284.6 | 308.7 | 453.3 | 483.1 | 482.8 | 368.7 |
| S | 782.8 | 650.8 | 462.7 | 310.8 | 262.5 | 251.9 | 226.9 | 284.6 | 324.9 | 576.9 | 739.5 | 832.1 | 474.8 |
| W | 1630.4 | 1693.6 | 1353.9 | 1042.3 | 817.2 | 838.1 | 695.9 | 1033.6 | 947.5 | 1497.0 | 1533.9 | 1588.8 | 1220.3 |

MAX. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|
| N | 566.8 | 735.8 | 758.8 | 914.6 | 675.6 | 862.8 | 618.8 | 844.1 | 695.7 | 876.0 | 644.6 | 605.1 | 914.6 |
| E | 555.4 | 536.5 | 470.2 | 488.6 | 297.4 | 303.2 | 265.7 | 346.1 | 475.1 | 628.2 | 601.8 | 599.0 | 628.2 |
| S | 1021.0 | 799.2 | 570.6 | 511.0 | 297.4 | 303.2 | 265.7 | 346.1 | 537.8 | 946.5 | 1031.9 | 1130.2 | 1130.2 |
| W | 2119.6 | 2317.7 | 1654.0 | 1904.3 | 1006.8 | 1140.9 | 848.5 | 1478.2 | 1574.3 | 2641.8 | 2275.8 | 2403.4 | 2641.8 |

MAX. HRLY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| N | 167.0 | 185.8 | 165.5 | 228.1 | 197.1 | 262.2 | 190.6 | 257.5 | 160.8 | 192.8 | 162.9 | 177.0 | 262.2 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|

RiodeJaneiroTRY1963_05.sta

| | | | | | | | | | | | | | |
|-----------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|-------|
| E | 167.0 | 178.1 | 137.9 | 144.2 | 105.6 | 114.0 | 95.5 | 138.6 | 122.9 | 183.1 | 162.9 | 177.0 | 183.1 |
| S | 357.0 | 320.7 | 195.5 | 159.4 | 105.6 | 114.0 | 95.5 | 138.6 | 155.1 | 330.2 | 338.1 | 390.0 | 390.0 |
| W | 652.2 | 723.2 | 500.6 | 563.9 | 366.9 | 424.6 | 319.5 | 562.8 | 421.4 | 739.8 | 622.8 | 688.7 | 739.8 |
| Rio - TRY | MONTHLY WEATHER DATA SUMMARY | | | | | | | | | | | DOE-2.1E-W7 | |

DESIGN TEMPERATURES ----- SUMMER ----- WINTER

| PER CENT | T(DRY) | T(WET) | T(DRY) |
|----------|--------|--------|--------|
| 1.0 | 95 | 82 | 59 |
| 2.5 | 92 | 80 | 60 |
| 5.0 | 90 | 79 | |

MONTHLY AVERAGE TEMPERATURES AS A FUNCTION OF HOUR OF THE DAY

| HOUR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 77.9 | 76.0 | 78.5 | 73.6 | 69.4 | 67.0 | 67.4 | 67.9 | 71.1 | 71.5 | 73.8 | 74.0 | 72.3 |
| 1 | 77.5 | 75.6 | 78.0 | 73.1 | 69.0 | 66.5 | 66.5 | 67.1 | 70.3 | 71.2 | 73.4 | 73.8 | 71.8 |
| 2 | 77.2 | 75.4 | 77.4 | 72.7 | 68.3 | 65.8 | 65.7 | 66.5 | 69.8 | 70.8 | 73.0 | 73.4 | 71.3 |
| 3 | 76.4 | 75.0 | 76.5 | 72.0 | 67.0 | 65.2 | 64.7 | 65.7 | 69.3 | 70.5 | 72.7 | 72.8 | 70.6 |
| 4 | 76.0 | 74.5 | 76.1 | 71.5 | 66.5 | 64.5 | 64.1 | 65.1 | 68.9 | 70.1 | 72.7 | 72.2 | 70.1 |
| 5 | 75.6 | 74.2 | 75.8 | 71.1 | 65.9 | 64.0 | 63.6 | 64.5 | 68.6 | 70.0 | 72.4 | 71.8 | 69.8 |
| 6 | 76.0 | 73.9 | 75.4 | 70.6 | 65.2 | 63.4 | 63.0 | 64.0 | 68.2 | 69.9 | 72.8 | 72.3 | 69.5 |
| 7 | 77.3 | 74.7 | 76.3 | 71.1 | 65.1 | 63.5 | 62.5 | 64.2 | 69.2 | 70.8 | 74.1 | 73.7 | 70.2 |
| 8 | 79.6 | 76.9 | 78.8 | 72.7 | 67.7 | 64.8 | 64.3 | 66.1 | 70.8 | 72.2 | 76.1 | 75.9 | 72.1 |
| 9 | 82.3 | 78.9 | 80.7 | 75.5 | 70.6 | 67.1 | 67.1 | 68.8 | 72.8 | 73.9 | 77.9 | 78.2 | 74.5 |
| 10 | 84.2 | 80.3 | 82.0 | 76.8 | 73.0 | 69.8 | 69.1 | 71.1 | 75.0 | 75.5 | 79.1 | 79.2 | 76.2 |
| 11 | 85.9 | 81.7 | 83.6 | 78.5 | 75.0 | 71.9 | 71.9 | 72.8 | 76.6 | 76.3 | 80.3 | 79.8 | 77.8 |
| 12 | 86.4 | 82.6 | 84.2 | 79.4 | 76.3 | 73.6 | 73.8 | 74.3 | 77.8 | 76.9 | 80.2 | 80.6 | 78.8 |
| 13 | 87.3 | 83.5 | 85.0 | 80.1 | 76.5 | 74.4 | 74.6 | 75.6 | 78.1 | 77.3 | 80.4 | 80.5 | 79.4 |
| 14 | 86.7 | 83.7 | 85.2 | 79.7 | 77.3 | 75.2 | 75.0 | 75.9 | 78.7 | 77.5 | 80.2 | 80.5 | 79.6 |
| 15 | 86.5 | 83.6 | 85.5 | 79.7 | 77.0 | 74.9 | 74.9 | 75.6 | 78.6 | 77.1 | 79.8 | 80.0 | 79.4 |
| 16 | 85.7 | 82.5 | 84.6 | 79.1 | 76.2 | 74.1 | 74.3 | 74.9 | 77.7 | 76.6 | 78.5 | 79.3 | 78.6 |

RiodeJaneiroTRY1963_05.sta

| | | | | | | | | | | | | | |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 17 | 84.2 | 81.5 | 83.8 | 78.0 | 75.2 | 72.6 | 73.1 | 74.1 | 76.7 | 75.6 | 78.4 | 78.6 | 77.6 |
| 18 | 83.0 | 80.2 | 82.6 | 77.0 | 73.9 | 71.5 | 71.7 | 72.7 | 75.0 | 74.9 | 77.6 | 77.8 | 76.5 |
| 19 | 81.7 | 78.9 | 81.8 | 76.4 | 73.1 | 70.8 | 70.9 | 71.7 | 74.3 | 74.2 | 76.6 | 76.8 | 75.6 |
| 20 | 80.5 | 77.9 | 80.7 | 75.7 | 72.3 | 70.1 | 70.2 | 70.8 | 73.6 | 73.3 | 75.8 | 75.9 | 74.7 |
| 21 | 79.5 | 77.2 | 79.9 | 74.9 | 71.4 | 69.1 | 69.4 | 70.0 | 73.1 | 72.6 | 75.3 | 75.4 | 74.0 |
| 22 | 79.2 | 76.9 | 79.5 | 74.4 | 70.5 | 68.3 | 68.6 | 69.2 | 72.5 | 72.5 | 74.8 | 74.8 | 73.4 |
| 23 | 78.6 | 76.6 | 78.7 | 74.1 | 69.8 | 67.6 | 67.7 | 68.2 | 72.0 | 72.1 | 74.2 | 74.4 | 72.8 |

GROUND TEMPERATURES 535.0 532.9 533.9 530.2 527.0 524.6 525.2 525.7 528.5 530.2 531.7 530.6
CLEARNESS NUMBERS 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00

SALVADOR

SalvadorTRY1962_05.sta
DOE-2.1E-W74 WEATHER UTILITY PROGRA

INPUT VERIFICATION

RUN TYPE STAT

Salvador - TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -12.90 LONGITUDE = -38.33 TIME ZONE = 3

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|--------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| AVG. TEMP. (F) (DRYBULB) | | 79.8 | 80.0 | 80.2 | 79.2 | 77.4 | 76.0 | 73.8 | 74.1 | 75.6 | 77.5 | 78.6 | 77.5 |
| AVG. TEMP. (F) (WETBULB) | | 74.2 | 73.9 | 74.6 | 74.1 | 72.2 | 71.2 | 68.6 | 68.2 | 69.4 | 71.3 | 71.7 | 71.8 |
| AVG. DAILY MAX. TEMP. | | 86.8 | 86.7 | 86.7 | 84.7 | 83.2 | 81.7 | 79.9 | 80.2 | 82.3 | 83.5 | 84.8 | 83.7 |
| AVG. DAILY MIN. TEMP. | | 72.4 | 71.6 | 72.8 | 72.9 | 70.5 | 70.6 | 67.7 | 67.7 | 67.3 | 72.2 | 71.3 | 70.7 |
| HEATING DEG. DAYS (BASE 65) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 55) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 50) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| COOLING DEG. DAYS (BASE 80) | | 15.5 | 7.5 | 15.0 | 6.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 | 3.0 |
| (BASE 75) | 143.0 | 117.0 | 148.0 | 114.0 | 61.0 | 44.5 | 12.0 | 7.0 | 30.0 | 88.0 | 91.0 | 91.5 | 947.0 |
| (BASE 70) | 298.0 | 257.0 | 303.0 | 263.5 | 211.5 | 184.5 | 118.0 | 123.0 | 145.0 | 242.0 | 241.0 | 246.0 | 2632.5 |
| (BASE 65) | 453.0 | 397.0 | 458.0 | 413.5 | 366.5 | 334.5 | 272.0 | 278.0 | 295.0 | 397.0 | 391.0 | 401.0 | 4456.5 |
| HEATING DEG. HRS./24 (BASE 65) | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 4.1 | 3.7 | 2.8 | 0.0 | 0.0 | 10.8 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | |

SalvadorTRY1962_05.sta

(BASE 55) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
 (BASE 50) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

COOLING DEG. HRS./24 (BASE 80) 58.1 54.7 59.5 37.8 22.2 8.1 1.6 1.5 12.3 21.4 37.8 34.3 349.2
 (BASE 75) 160.0 151.7 171.3 137.0 100.5 60.2 36.5 40.5 66.3 90.5 123.1 124.9 1262.4
 (BASE 70) 305.8 281.7 318.1 277.7 233.8 183.2 136.2 142.2 182.2 232.9 259.5 268.6 2821.9
 (BASE 65) 460.0 420.6 472.3 426.9 383.9 329.1 275.7 285.6 320.5 386.4 407.5 422.8 4591.2

MAXIMUM TEMP. 90 90 92 87 86 84 83 82 85 85 86 87 92
 MINIMUM TEMP. 65 66 66 67 64 63 60 58 60 65 66 66 58

NO. DAYS MAX. 90 AND ABOVE 1 2 1 0 0 0 0 0 0 0 0 0 4
 NO. DAYS MAX. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

NO. DAYS MIN. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0
 NO. DAYS MIN. 0 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

AVG. WIND SPEED (MPH) 2.5 2.0 2.2 1.6 1.7 2.0 1.9 2.1 2.3 2.8 2.7 2.4 2.2

AVG. WIND SPEED (DAY) 2.6 2.0 2.2 1.6 1.7 2.0 2.0 2.1 2.3 2.9 2.8 2.5 2.2
 AVG. WIND SPEED (NIGHT) 0.5 2.2 1.4 1.5 1.0 2.0 1.4 1.5 1.9 -12.3 15.9 -275.3 0.8

AVG. TEMP. (DAY) 79.9 80.1 80.3 79.3 77.5 76.1 74.0 74.3 75.7 78.3 81.7 80.2 78.1
 AVG. TEMP. (NIGHT) 77.3 78.1 78.2 77.4 75.2 73.6 70.8 71.6 72.9 -57.8 496.3 ***** 62.2

AVG. SKY COVER 4.4 3.0 4.8 4.3 4.7 4.8 4.7 4.5 3.2 4.4 3.6 5.3 4.3

AVG. SKY COVER (DAY) 4.4 3.0 4.8 4.4 4.7 4.8 4.8 4.5 3.2 4.5 3.8 5.4 4.4

AVG. REL. HUM. AT 4AM 89.5 86.7 87.3 86.3 87.2 86.4 84.5 80.9 85.3 83.0 82.9 85.7 85.5

10AM 67.9 68.6 69.9 73.6 72.9 74.0 71.3 70.0 66.1 68.0 64.9 70.1 69.8

4PM 68.7 67.5 68.9 72.3 71.1 72.8 70.0 67.4 64.8 68.0 64.1 67.8 68.6

10PM 82.6 79.5 80.6 81.4 82.0 84.8 80.5 79.0 78.0 78.2 76.5 82.3 80.5

Salvador - TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -12.90

LONGITUDE = -38.33

TIME ZONE = 3

SalvadorTRY1962_05.sta

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC YEAR

AVG. DAILY DIRECT NORMAL SOLAR 671.0 772.5 718.3 616.8 382.2 390.5 474.2 545.3 726.0 917.5 960.0 682.5 653.6
 AVG. DAILY TOTAL HORIZNTL SOLAR 1096.3 1119.5 1063.4 973.3 807.2 721.6 787.9 876.0 1067.7 1225.4 1313.8 1151.7 1016.1

MAX. DAILY DIRECT NORMAL SOLAR 1474.0 1218.0 1547.0 1375.0 1059.0 862.0 1077.0 1246.0 1378.0 1706.0 1612.0 1729.0 1729.0
 MAX. DAILY TOTAL HORIZNTL SOLAR 1542.0 1337.0 1488.0 1377.0 1166.0 1024.0 1149.0 1276.0 1428.0 1690.0 1657.0 1795.0 1795.0
 MIN. DAILY DIRECT NORMAL SOLAR 108.0 143.0 150.0 97.0 90.0 19.0 35.0 33.0 92.0 34.0 102.0 125.0 19.0
 MIN. DAILY TOTAL HORIZNTL SOLAR 747.0 712.0 738.0 635.0 583.0 406.0 469.0 482.0 598.0 593.0 787.0 790.0 406.0

MAX. HRLY DIRECT NORMAL SOLAR 271.0 227.0 288.0 273.0 208.0 185.0 231.0 246.0 244.0 295.0 288.0 326.0 326.0
 MAX. HRLY TOTAL HORIZNTL SOLAR 326.0 303.0 341.0 320.0 261.0 236.0 274.0 294.0 302.0 341.0 335.0 380.0 380.0
 AVG. MAX. HRLY DIRECT NORML SOLAR 170.7 178.9 186.6 166.4 115.3 107.7 145.0 157.7 187.8 224.1 224.9 170.1 169.5
 AVG. MAX. HRLY TOTAL HRZNTL SOLAR 253.8 262.2 256.0 234.5 198.2 176.9 201.3 228.2 259.4 284.9 285.7 260.9 241.7

AVG. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

N 447.8 473.9 600.8 754.7 750.8 737.5 788.0 746.1 688.8 574.0 537.6 488.4 633.1
 E 446.5 445.5 447.1 425.7 382.2 332.9 355.7 390.9 461.8 503.5 531.9 489.4 434.3
 S 778.1 640.5 508.2 431.1 382.0 332.8 355.6 391.4 499.2 681.8 925.0 894.1 568.0
 W 1362.0 1479.0 1480.6 1392.7 1117.4 986.2 1098.2 1267.4 1586.6 1772.4 1821.2 1487.9 1403.2

MAX. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

N 530.2 559.9 777.7 1085.9 1118.8 1116.4 1166.4 1116.0 872.2 758.0 628.5 624.0 1166.4
 E 530.2 499.7 527.6 511.8 471.5 431.7 456.1 484.5 544.4 600.9 615.9 625.5 625.5
 S 1121.0 846.2 630.4 527.5 471.2 431.7 455.9 488.6 619.1 951.6 1172.9 1346.7 1346.7
 W 2037.5 1850.1 2222.6 2115.1 1789.6 1549.5 1768.1 1959.3 2159.1 2515.3 2380.7 2502.9 2515.3

MAX. HRLY TOTAL VERTICAL SOLAR

AZIMUTH

N 166.7 166.0 208.5 293.6 274.2 282.5 325.9 284.3 217.1 197.2 176.8 197.7 325.9

SalvadorTRY1962_05.sta

| | | | | | | | | | | | | | |
|----------------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|-------|
| E | 166.7 | 155.5 | 177.5 | 169.9 | 141.9 | 129.1 | 147.5 | 157.1 | 161.5 | 180.8 | 176.8 | 197.7 | 197.7 |
| S | 360.8 | 285.5 | 238.7 | 183.8 | 141.9 | 129.1 | 147.5 | 163.4 | 207.2 | 316.8 | 369.3 | 426.6 | 426.6 |
| W | 645.1 | 607.7 | 734.6 | 698.5 | 547.1 | 476.3 | 575.7 | 635.1 | 652.4 | 741.0 | 711.0 | 773.8 | 773.8 |
| Salvador - TRY | MONTHLY WEATHER DATA SUMMARY | | | | | | | | | | | DOE-2.1E-W7 | |

DESIGN TEMPERATURES ----- SUMMER ----- WINTER

| PER CENT | T(DRY) | T(WET) | T(DRY) |
|----------|--------|--------|--------|
| 1.0 | 88 | 78 | 62 |
| 2.5 | 87 | 78 | 63 |
| 5.0 | 87 | 77 | |

MONTHLY AVERAGE TEMPERATURES AS A FUNCTION OF HOUR OF THE DAY

| HOUR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 77.2 | 78.1 | 78.4 | 77.4 | 75.4 | 73.7 | 70.9 | 71.5 | 72.9 | 74.8 | 75.7 | 76.6 | 75.2 |
| 1 | 76.7 | 77.5 | 77.6 | 76.5 | 74.7 | 73.3 | 70.2 | 71.2 | 72.4 | 74.6 | 75.0 | 76.4 | 74.6 |
| 2 | 76.0 | 76.5 | 76.7 | 76.0 | 74.2 | 73.3 | 70.0 | 70.9 | 71.7 | 74.2 | 74.5 | 75.8 | 74.1 |
| 3 | 75.0 | 75.0 | 76.0 | 75.6 | 73.4 | 72.7 | 70.0 | 70.5 | 70.4 | 73.5 | 73.5 | 75.2 | 73.4 |
| 4 | 74.0 | 74.4 | 75.1 | 74.8 | 72.5 | 72.4 | 69.0 | 69.9 | 69.6 | 73.2 | 72.6 | 73.9 | 72.6 |
| 5 | 73.1 | 72.8 | 74.2 | 74.2 | 71.9 | 72.1 | 68.7 | 69.3 | 68.6 | 73.1 | 71.4 | 72.5 | 71.8 |
| 6 | 73.1 | 72.2 | 73.7 | 73.6 | 71.6 | 72.5 | 69.4 | 69.4 | 68.6 | 73.7 | 73.1 | 72.9 | 72.0 |
| 7 | 77.3 | 75.7 | 76.7 | 76.5 | 74.5 | 74.6 | 71.1 | 71.0 | 72.9 | 77.5 | 78.7 | 77.6 | 75.3 |
| 8 | 81.5 | 81.2 | 81.8 | 80.6 | 78.7 | 77.1 | 74.7 | 75.0 | 77.2 | 79.6 | 81.5 | 80.5 | 79.1 |
| 9 | 83.6 | 83.3 | 84.1 | 82.2 | 80.4 | 78.7 | 77.1 | 77.2 | 79.7 | 80.9 | 82.4 | 81.5 | 80.9 |
| 10 | 84.7 | 84.1 | 85.4 | 83.2 | 81.6 | 79.8 | 77.9 | 78.4 | 80.8 | 81.5 | 83.5 | 82.8 | 82.0 |
| 11 | 85.9 | 85.5 | 85.2 | 83.5 | 82.1 | 80.0 | 78.2 | 79.3 | 81.5 | 82.1 | 84.0 | 83.4 | 82.5 |
| 12 | 85.9 | 85.6 | 85.7 | 83.6 | 82.5 | 80.6 | 78.9 | 79.4 | 81.7 | 82.2 | 84.3 | 83.6 | 82.8 |
| 13 | 85.8 | 86.1 | 85.6 | 83.8 | 82.4 | 80.7 | 78.8 | 79.8 | 81.6 | 82.8 | 84.3 | 83.4 | 82.9 |
| 14 | 85.7 | 85.4 | 85.0 | 83.1 | 81.8 | 80.3 | 78.3 | 79.0 | 81.4 | 82.2 | 83.9 | 83.3 | 82.4 |
| 15 | 84.2 | 84.8 | 84.5 | 82.9 | 81.1 | 79.7 | 77.8 | 78.0 | 80.4 | 81.1 | 83.1 | 82.4 | 81.6 |
| 16 | 83.3 | 84.1 | 83.1 | 82.4 | 80.4 | 78.4 | 77.0 | 77.2 | 79.3 | 80.0 | 81.9 | 81.5 | 80.7 |

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| | | | | | | | | | | | | | |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 17 | 82.3 | 82.9 | 81.6 | 81.0 | 78.9 | 76.9 | 75.5 | 75.0 | 77.0 | 78.1 | 80.6 | 80.4 | 79.2 |
| 18 | 80.2 | 80.9 | 80.1 | 79.4 | 77.5 | 75.1 | 74.3 | 73.6 | 75.4 | 76.1 | 78.1 | 78.5 | 77.4 |
| 19 | 78.8 | 79.5 | 79.3 | 78.7 | 77.1 | 74.8 | 73.7 | 73.2 | 74.8 | 75.7 | 77.4 | 77.7 | 76.7 |
| 20 | 78.4 | 79.1 | 79.2 | 78.3 | 76.8 | 74.4 | 73.0 | 72.6 | 74.3 | 75.7 | 76.9 | 77.1 | 76.3 |
| 21 | 78.1 | 78.8 | 79.1 | 78.1 | 76.3 | 74.3 | 72.5 | 72.5 | 74.2 | 75.7 | 76.8 | 76.9 | 76.1 |
| 22 | 77.7 | 78.6 | 78.9 | 78.0 | 75.8 | 73.9 | 72.1 | 72.3 | 74.1 | 75.4 | 76.6 | 76.7 | 75.8 |
| 23 | 77.6 | 78.5 | 78.6 | 78.0 | 75.6 | 73.8 | 71.3 | 71.9 | 73.5 | 75.2 | 76.3 | 76.5 | 75.6 |

GROUND TEMPERATURES 533.7 533.3 534.0 533.5 531.6 530.5 527.9 527.6 528.8 530.7 531.1 532.2
CLEARNESS NUMBERS 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00

SÃO LUÍS

Statistics for sao luisCSV
 Location -- Sao Luis -TRY
 {S 2° 34'} {W 44° 13'} {GMT -3.0 Hours}
 Elevation -- 53m above sea level
 Standard Pressure at Elevation -- 100690Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

Design Stat HDB 99.6% HDB 99%
 Units {C} {C}
 HEATING 21.3 21.8

Design Stat CDB .4% CDB 1% CDB 2% CDP .4% CDP 1% CDP 2%
 Units {C} {C} {C} {C} {C} {C}
 COOLING 33.6 33.2 33.1 25.9 25.5 25.2

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|
| Maximum | 33.3 | 33.9 | 33.1 | 33.0 | 33.7 | 33.0 | 32.6 | 33.0 | 33.5 | 33.7 | 34.2 | 35.0 |
| Day:Hour | 13:14 | 28:15 | 12:14 | 18:14 | 12:16 | 14:15 | 28:15 | 18:15 | 27:14 | 1:15 | 7:14 | 7:15 |
| Minimum | 23.5 | 22.3 | 20.3 | 22.0 | 22.7 | 21.0 | 21.0 | 22.0 | 22.2 | 22.4 | 21.7 | 22.4 |
| Day:Hour | 10:06 | 12:06 | 9:07 | 14:20 | 31:06 | 6:05 | 5:08 | 20:07 | 20:05 | 6:05 | 16:21 | 11:03 |
| Daily Avg | 27.5 | 26.6 | 26.2 | 26.3 | 26.4 | 26.5 | 26.5 | 26.7 | 26.9 | 27.2 | 27.2 | 27.0 |

- Maximum Dry Bulb temperature of 35.0°C on Dec 7
- Minimum Dry Bulb temperature of 20.3°C on Mar 9

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 25.3 | 24.9 | 24.4 | 24.6 | 24.5 | 24.3 | 24.4 | 24.4 | 24.3 | 24.7 | 25.0 | 25.0 |
| 1:01- 2:00 | 24.9 | 24.7 | 24.2 | 24.3 | 24.4 | 24.1 | 24.3 | 24.1 | 24.1 | 24.5 | 24.8 | 24.8 |
| 2:01- 3:00 | 24.5 | 24.4 | 24.0 | 24.1 | 24.2 | 23.9 | 24.0 | 23.9 | 24.0 | 24.2 | 24.7 | 24.6 |
| 3:01- 4:00 | 24.3 | 24.2 | 23.9 | 23.9 | 24.1 | 23.7 | 23.8 | 23.6 | 23.8 | 24.1 | 24.5 | 24.4 |
| 4:01- 5:00 | 24.2 | 24.0 | 23.7 | 23.7 | 23.9 | 23.5 | 23.7 | 23.4 | 23.7 | 23.9 | 24.4 | 24.3 |
| 5:01- 6:00 | 24.1 | 23.8 | 23.5 | 23.6 | 23.7 | 23.4 | 23.5 | 23.4 | 23.6 | 23.7 | 24.2 | 24.2 |
| 6:01- 7:00 | 24.5 | 24.2 | 23.7 | 23.9 | 23.8 | 23.5 | 23.8 | 23.5 | 24.0 | 23.8 | 24.2 | 24.4 |
| 7:01- 8:00 | 25.5 | 24.9 | 24.6 | 24.7 | 24.9 | 24.6 | 24.6 | 24.6 | 25.5 | 25.5 | 24.5 | 25.6 |
| 8:01- 9:00 | 27.2 | 26.3 | 26.3 | 26.4 | 26.6 | 26.5 | 26.7 | 27.0 | 27.4 | 27.8 | 25.8 | 27.4 |
| 9:01-10:00 | 28.5 | 27.4 | 27.6 | 27.6 | 28.1 | 27.9 | 28.0 | 28.1 | 28.6 | 29.1 | 27.8 | 28.6 |
| 10:01-11:00 | 29.6 | 28.2 | 28.8 | 29.0 | 29.0 | 29.0 | 28.9 | 29.2 | 29.7 | 30.0 | 28.8 | 29.5 |
| 11:01-12:00 | 30.4 | 29.3 | 29.5 | 29.7 | 29.8 | 29.8 | 29.8 | 30.1 | 30.5 | 30.8 | 30.1 | 30.3 |
| 12:01-13:00 | 31.3 | 30.0 | 30.0 | 29.9 | 30.1 | 30.6 | 30.4 | 30.8 | 31.3 | 31.4 | 30.8 | 30.6 |
| 13:01-14:00 | 31.8 | 30.3 | 30.1 | 30.1 | 30.2 | 30.7 | 30.3 | 31.3 | 31.6 | 31.7 | 31.4 | 30.8 |
| 14:01-15:00 | 31.8 | 29.8 | 29.8 | 29.4 | 29.6 | 30.5 | 30.6 | 31.4 | 31.7 | 31.8 | 31.6 | 30.7 |
| 15:01-16:00 | 31.5 | 29.2 | 29.0 | 28.3 | 29.0 | 29.8 | 29.6 | 30.7 | 31.2 | 31.2 | 31.5 | 30.3 |
| 16:01-17:00 | 30.8 | 29.1 | 28.1 | 27.8 | 28.1 | 29.0 | 29.3 | 29.8 | 30.2 | 30.1 | 30.9 | 29.5 |
| 17:01-18:00 | 29.5 | 28.3 | 26.9 | 27.2 | 27.1 | 27.6 | 28.2 | 28.3 | 28.8 | 28.8 | 29.8 | 28.4 |
| 18:01-19:00 | 28.0 | 27.1 | 26.0 | 26.4 | 26.3 | 26.5 | 26.6 | 26.9 | 27.0 | 27.1 | 28.5 | 27.1 |
| 19:01-20:00 | 27.1 | 26.4 | 25.6 | 26.0 | 25.8 | 25.8 | 25.8 | 26.2 | 26.1 | 26.2 | 26.9 | 26.4 |
| 20:01-21:00 | 26.5 | 26.0 | 25.2 | 25.6 | 25.4 | 25.4 | 25.4 | 25.4 | 25.4 | 25.7 | 26.1 | 26.0 |
| 21:01-22:00 | 26.1 | 25.7 | 24.9 | 25.3 | 25.0 | 25.1 | 25.1 | 25.1 | 25.1 | 25.3 | 25.7 | 25.7 |
| 22:01-23:00 | 25.8 | 25.5 | 24.7 | 25.0 | 24.8 | 24.9 | 24.8 | 24.9 | 24.7 | 25.1 | 25.4 | 25.5 |
| 23:01-24:00 | 25.5 | 25.2 | 24.5 | 24.8 | 24.6 | 24.7 | 24.6 | 24.6 | 24.5 | 24.9 | 25.2 | 25.2 |
| Max Hour | 15 | 14 | 14 | 14 | 14 | 14 | 15 | 15 | 15 | 15 | 15 | 14 |
| Min Hour | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 6 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|
| Maximum | 25.8 | 26.3 | 26.8 | 26.5 | 25.9 | 26.0 | 25.0 | 24.7 | 24.2 | 24.2 | 24.0 | 24.7 |
| Day:Hour | 10:09 | 4:14 | 12:15 | 2:15 | 6:18 | 17:15 | 3:19 | 2:15 | 28:08 | 22:13 | 29:21 | 10:12 |
| Minimum | 20.7 | 19.5 | 19.4 | 20.7 | 21.0 | 20.7 | 19.9 | 20.4 | 19.3 | 19.9 | 20.1 | 20.0 |
| Day:Hour | 13:12 | 25:20 | 9:07 | 15:10 | 6:05 | 6:05 | 26:16 | 10:16 | 29:11 | 17:12 | 21:13 | 7:18 |

Daily Avg 22.6 22.8 23.0 23.4 23.5 23.1 23.0 22.8 22.3 22.1 22.3 22.8

- Maximum Dew Point temperature of 26.8°C on Mar 12
- Minimum Dew Point temperature of 19.3°C on Sep 29

- Monthly Statistics for Wind Chill/Heat Index temperatures °C **

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------|-------|-------|-------|-------|-------|------|------|------|-------|------|------|------|
| Minimum WC | | | | | | | | | | | | |
| Day:Hour | | | | | | | | | | | | |
| Average WC | | | | | | | | | | | | |
| Avg Del WC | | | | | | | | | | | | |
| # Hours WC | | | | | | | | | | | | |
| Maximum HI | 40 | 40 | 41 | 40 | 41 | 38 | 37 | 39 | 38 | 38 | 38 | 39 |
| Day:Hour | 17:15 | 28:15 | 12:15 | 21:15 | 12:16 | 4:16 | 1:15 | 1:16 | 14:15 | 8:15 | 6:15 | 5:13 |
| Average HI | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 |
| Avg Del HI | 4 | 4 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| # Hours HI | 366 | 252 | 258 | 244 | 273 | 276 | 293 | 312 | 315 | 329 | 315 | 318 |

- **WindChill/HeatIndex Temps -- statistics...only those different from Air Temps

- Monthly Statistics for Extreme temperatures °C

| #Days | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Max >= 32 | 23 | 12 | 13 | 6 | 6 | 10 | 11 | 19 | 18 | 23 | 23 | 14 |
| Max <= 0 | | | | | | | | | | | | |
| Min <= 0 | | | | | | | | | | | | |
| Min <=-18 | | | | | | | | | | | | |

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| HDD base 10C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HDD base 18C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CDD base 10C | | 541 | 465 | 503 | 489 | 507 | 494 | 511 | 517 | 508 | 532 | 516 |
| CDD base 18C | | 293 | 241 | 255 | 249 | 259 | 254 | 263 | 269 | 268 | 284 | 276 |

| | | | | | | | | | | | | |
|--------------|------|------|------|------|------|------|------|------|------|------|------|------|
| CDH base 20C | 5545 | 4452 | 4623 | 4539 | 4733 | 4645 | 4832 | 4980 | 5002 | 5320 | 5180 | 5241 |
| CDH base 23C | 3313 | 2440 | 2441 | 2388 | 2503 | 2497 | 2607 | 2759 | 2846 | 3090 | 3035 | 3012 |
| CDH base 27C | 1053 | 641 | 643 | 569 | 625 | 727 | 727 | 848 | 938 | 1030 | 976 | 854 |

- 6112 annual cooling degree-days (10°C baseline)
- 0 annual heating degree-days (10°C baseline)

- 3192 annual cooling degree-days (18°C baseline)
- 0 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|
| 4am | 92 | 91 | 94 | 95 | 96 | 96 | 95 | 95 | 94 | 90 | 90 | 92 |
| 10am | 73 | 79 | 80 | 80 | 80 | 79 | 77 | 75 | 70 | 66 | 74 | 74 |
| 3pm | 60 | 71 | 72 | 74 | 74 | 67 | 64 | 61 | 57 | 58 | 58 | 65 |
| 10pm | 83 | 85 | 91 | 91 | 93 | 93 | 92 | 90 | 88 | 85 | 84 | 86 |
| Maximum | 97 | 99 | 99 | 100 | 100 | 100 | 100 | 99 | 97 | 97 | 99 | 98 |
| Day:Hour | 3:07 | 13:08 | 4:22 | 14:18 | 4:08 | 6:05 | 5:08 | 6:05 | 1:07 | 1:02 | 17:03 | 9:05 |
| Minimum | 52 | 52 | 54 | 55 | 56 | 53 | 48 | 49 | 49 | 48 | 46 | 45 |
| Day:Hour | 2:15 | 3:14 | 19:14 | 17:15 | 12:15 | 14:15 | 29:16 | 10:16 | 29:12 | 3:15 | 7:14 | 7:15 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2.8 | 2.9 | 2.9 | 3.0 | 3.0 | 2.8 | 2.7 | 2.7 | 2.6 | 2.6 | 2.6 | 2.8 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Direct Avg | 3148 | 3871 | 3117 | 3164 | 3327 | 3647 | 3884 | 4661 | 4484 | 4669 | 4311 | 3785 |
| Direct Max | 6491 | 7964 | 6108 | 6262 | 6069 | 5946 | 7692 | 6479 | 7422 | 7438 | 8006 | 7836 |
| Day | 1 | 28 | 31 | 17 | 8 | 13 | 30 | 18 | 30 | 28 | 6 | 8 |
| Diffuse Avg | 2927 | 2961 | 3136 | 2977 | 2641 | 2294 | 2234 | 2368 | 2623 | 2641 | 2677 | 2746 |

- Maximum Direct Solar of 8006 Wh/m² on Nov 6

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 52 | 57 | 54 | 57 | 66 | 51 | 74 | 65 | 68 | 59 | 55 | 55 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|------|-------|-------|-------|------|-------|-------|-------|-------|------|------|-------|
| Maximum | 10.0 | 15.0 | 11.0 | 9.0 | 9.0 | 9.0 | 10.0 | 10.0 | 13.0 | 13.0 | 10.0 | 13.0 |
| Day:Hour | 1:10 | 22:24 | 25:15 | 19:10 | 9:23 | 25:10 | 11:11 | 10:11 | 29:12 | 1:10 | 1:11 | 10:24 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 1:02 | 1:01 | 1:04 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 2:21 | 1:20 | 1:01 |
| Daily Avg | 3.5 | 2.6 | 2.8 | 2.2 | 2.4 | 1.9 | 3.1 | 3.6 | 4.8 | 4.4 | 3.7 | 3.3 |

- Maximum Wind Speed of 15.0 m/s on Feb 22

- Minimum Wind Speed of 0.0 m/s on Jan 1

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 18.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |
| 2.0 m | 21.7 | 22.8 | 23.3 | 23.3 | 22.4 | 21.1 | 19.8 | 18.6 | 18.1 | 18.2 | 19.0 | 20.3 |
| 4.0 m | 20.9 | 21.8 | 22.3 | 22.5 | 22.1 | 21.4 | 20.5 | 19.6 | 19.0 | 18.9 | 19.3 | 20.0 |

- Climate type "Af" (Köppen classification)

- Tropical wet (no dry season, rainforest, hot all year, lat. < 10°)

- Heating may not be required

- Typical/Extreme Period Determination

- No dry season.....

Week closest to average annual temperature selected for Typical Period

Typical Week Period selected: Jul 30:Aug 5, Average Temp= 26.75°C, Deviation=| 0.008|°C

Week closest to maximum annual temperature selected for Typical Period

Extreme Hot Week Period selected: Nov 5:Nov 11, Maximum Temp= 35.00°C, Deviation=| 7.200|°C

Week closest to minimum annual temperature selected for Typical Period

Extreme Cold Week Period selected: Mar 5:Mar 11, Minimum Temp= 20.30°C, Deviation=| 4.483|°C

SÃO PAULO

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DOE-2.1E-W74 WEATHER UTILITY PROGRA

INPUT VERIFICATION

RUN TYPE STAT

SaoPaulo -TRY MONTHLY WEATHER DATA SUMMARY

DOE-2.1E-W7

LATITUDE = -23.30

LONGITUDE = -46.37

TIME ZONE = 3

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|--------------------------------|-------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| AVG. TEMP. (F) (DRYBULB) | 72.5 | 71.8 | 70.1 | 65.3 | 62.2 | 62.2 | 60.9 | 63.0 | 64.7 | 64.2 | 66.0 | 68.0 | 65.9 |
| AVG. TEMP. (F) (WETBULB) | 67.3 | 68.0 | 66.7 | 61.8 | 59.6 | 58.8 | 56.5 | 56.4 | 59.8 | 60.7 | 61.7 | 63.0 | 61.7 |
| AVG. DAILY MAX. TEMP. | 83.7 | 81.1 | 80.4 | 74.0 | 70.2 | 71.5 | 71.9 | 74.6 | 76.6 | 74.1 | 77.0 | 77.2 | 76.0 |
| AVG. DAILY MIN. TEMP. | 65.4 | 65.9 | 64.4 | 59.6 | 56.9 | 56.0 | 53.9 | 54.2 | 57.8 | 58.3 | 59.3 | 61.0 | 59.4 |
| HEATING DEG. DAYS (BASE 65) | 1.5 | 0.0 | 2.0 | 38.0 | 81.0 | 58.5 | 78.5 | 67.0 | 38.0 | 60.5 | 8.5 | 13.5 | 447.0 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 0.5 | 20.0 | 4.5 | 11.5 | 22.0 | 6.0 | 9.5 | 0.0 | 0.0 | 74.0 |
| (BASE 55) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 |
| (BASE 50) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| COOLING DEG. DAYS (BASE 80) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 75) | 32.0 | 26.0 | 8.5 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 1.0 | 8.5 | 78.0 | |
| (BASE 70) | 152.0 | 106.5 | 97.0 | 17.5 | 2.0 | 0.0 | 0.0 | 3.0 | 32.5 | 20.5 | 21.0 | 43.0 | 495.0 |
| (BASE 65) | 297.5 | 238.0 | 230.0 | 92.5 | 36.0 | 20.0 | 12.5 | 49.5 | 104.0 | 97.5 | 103.0 | 140.5 | 1421.0 |
| HEATING DEG. HRS./24 (BASE 65) | 5.6 | 1.3 | 10.8 | 68.1 | 129.8 | 129.3 | 176.9 | 148.4 | 101.6 | 104.1 | 58.5 | 45.3 | 979.6 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 17.2 | 41.5 | 36.8 | 73.3 | 60.5 | 24.4 | 25.5 | 5.5 | 5.5 | 290.4 |

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(BASE 55) 0.0 0.0 0.0 0.7 3.8 4.5 13.2 14.4 3.3 1.0 0.0 0.1 40.8
 (BASE 50) 0.0 0.0 0.0 0.0 0.0 0.3 0.4 0.8 0.1 0.0 0.0 0.0 1.6

COOLING DEG. HRS./24 (BASE 80) 23.0 14.1 10.2 1.0 0.0 0.0 0.0 0.0 0.5 9.5 5.5 6.4 7.6 77.8
 (BASE 75) 60.5 37.5 34.7 10.5 2.5 0.5 2.1 13.9 24.5 18.8 16.7 26.3 248.6
 (BASE 70) 123.3 87.7 77.1 32.4 14.3 13.7 18.0 43.4 50.6 43.2 42.4 66.2 612.4
 (BASE 65) 237.4 192.8 170.2 78.3 41.8 44.8 49.6 87.5 91.7 80.5 89.0 139.2 1303.0

MAXIMUM TEMP. 91 91 88 84 81 77 81 82 90 88 91 89 91
 MINIMUM TEMP. 60 62 59 53 49 48 48 46 49 50 55 54 46

NO. DAYS MAX. 90 AND ABOVE 2 2 0 0 0 0 0 0 1 0 2 0 7
 NO. DAYS MAX. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

NO. DAYS MIN. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0
 NO. DAYS MIN. 0 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

AVG. WIND SPEED (MPH) 2.1 2.2 2.1 2.4 2.5 1.9 2.2 2.3 2.6 2.8 2.7 2.7 2.4

AVG. WIND SPEED (DAY) 2.2 2.3 2.2 2.4 2.5 1.9 2.3 2.4 2.6 2.9 2.7 2.7 2.4
 AVG. WIND SPEED (NIGHT) 3.1 3.8 279.8 -0.4 0.8 1.3 1.8 0.2 7.8 4.4 2.9 3.3 10.0

AVG. TEMP. (DAY) 73.6 73.1 71.5 66.7 63.3 62.3 61.1 64.1 65.9 65.3 66.9 69.0 67.0
 AVG. TEMP. (NIGHT) 97.1 137.0 7179.5 -18.8 29.6 59.4 57.7 28.4 216.3 86.3 78.8 82.2 225.1

AVG. SKY COVER 5.8 5.9 5.8 5.3 6.7 5.4 4.7 3.8 4.8 6.5 5.2 5.2 5.4

AVG. SKY COVER (DAY) 5.9 6.1 6.0 5.4 6.9 5.4 4.7 3.9 5.0 6.7 5.4 5.3 5.6

AVG. REL. HUM. AT 4AM 93.3 94.6 95.9 95.0 96.0 95.7 92.8 88.4 90.1 94.8 93.5 89.3 93.3
 10AM 77.8 81.9 84.5 84.4 88.8 89.3 84.8 75.9 78.9 81.8 75.0 74.5 81.5
 4PM 62.2 70.4 67.8 63.5 72.7 63.8 55.8 46.3 63.0 72.2 69.9 66.0 64.4
 10PM 86.1 89.6 91.6 91.1 94.0 89.9 86.1 75.3 88.4 90.3 90.3 86.0 88.2

SaoPaulo -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -23.30

LONGITUDE = -46.37

TIME ZONE = 3

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JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC YEAR

AVG. DAILY DIRECT NORMAL SOLAR 745.2 604.5 566.3 457.3 294.0 350.0 314.6 540.8 487.8 596.7 790.8 909.6 554.8
 AVG. DAILY TOTAL HORIZNTL SOLAR 1174.2 1044.7 916.2 690.3 557.8 538.3 485.6 678.8 709.0 943.0 1224.3 1321.5 856.2

MAX. DAILY DIRECT NORMAL SOLAR 1638.0 1651.0 1323.0 1112.0 738.0 728.0 753.0 889.0 1096.0 1523.0 1537.0 2063.0 2063.0
 MAX. DAILY TOTAL HORIZNTL SOLAR 1597.0 1524.0 1414.0 1037.0 770.0 762.0 766.0 902.0 1066.0 1434.0 1621.0 2040.0 2040.0
 MIN. DAILY DIRECT NORMAL SOLAR 114.0 162.0 88.0 88.0 113.0 54.0 15.0 36.0 28.0 91.0 50.0 173.0 15.0
 MIN. DAILY TOTAL HORIZNTL SOLAR 777.0 791.0 504.0 450.0 427.0 342.0 256.0 342.0 388.0 575.0 697.0 888.0 256.0

MAX. HRLY DIRECT NORMAL SOLAR 287.0 278.0 268.0 247.0 204.0 199.0 204.0 223.0 227.0 301.0 256.0 337.0 337.0
 MAX. HRLY TOTAL HORIZNTL SOLAR 341.0 330.0 320.0 295.0 245.0 239.0 244.0 266.0 285.0 361.0 316.0 395.0 395.0
 AVG. MAX. HRLY DIRECT NORML SOLAR 173.7 156.8 151.9 152.2 95.4 124.5 110.7 156.8 131.8 157.6 185.3 181.2 148.1
 AVG. MAX. HRLY TOTAL HRZNTL SOLAR 262.4 241.1 237.5 212.4 171.4 181.3 168.9 211.9 208.8 248.4 264.6 268.3 223.0

AVG. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

N 511.3 539.6 600.7 597.2 577.4 630.8 548.6 660.8 541.5 520.2 571.9 543.9 570.4
 E 489.5 458.5 410.8 306.8 272.8 265.4 234.3 293.4 310.7 409.5 539.0 533.3 376.6
 S 784.6 606.5 462.0 308.7 272.8 265.4 234.3 293.4 324.5 511.6 857.8 913.7 485.8
 W 1603.9 1474.5 1390.7 1041.0 838.7 859.6 762.6 1074.4 1073.6 1370.8 1809.5 1757.6 1253.6

MAX. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

N 613.1 784.5 790.9 829.8 908.0 954.1 905.3 856.2 788.9 775.7 672.2 734.3 954.1
 E 592.3 560.7 551.2 387.9 362.8 347.4 325.7 358.8 394.7 647.8 628.2 720.3 720.3
 S 1076.4 757.9 671.4 389.9 362.8 347.4 325.7 358.8 427.5 972.6 1117.9 1389.5 1389.5
 W 2316.1 2447.6 2295.7 1654.8 1352.7 1303.7 1275.3 1485.1 1674.6 2323.1 2432.7 2958.6 2958.6

MAX. HRLY TOTAL VERTICAL SOLAR

AZIMUTH

N 177.7 187.2 209.0 269.8 278.3 292.2 281.8 261.4 218.8 200.8 169.8 210.0 292.2

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| | | | | | | | | | | | | | |
|----------|-------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|-------|
| E | 177.7 | 176.3 | 171.6 | 153.3 | 131.9 | 129.5 | 129.3 | 138.7 | 146.8 | 183.6 | 169.8 | 210.0 | 210.0 |
| S | 371.0 | 294.9 | 251.4 | 155.4 | 131.9 | 129.5 | 129.3 | 138.7 | 169.8 | 311.0 | 350.1 | 463.3 | 463.3 |
| W | 701.5 | 718.7 | 701.6 | 622.9 | 509.5 | 487.2 | 499.9 | 558.0 | 594.7 | 754.8 | 660.9 | 809.9 | 809.9 |
| SaoPaulo | -TRY | MONTHLY WEATHER DATA SUMMARY | | | | | | | | | | DOE-2.1E-W7 | |

DESIGN TEMPERATURES ----- SUMMER ----- WINTER

| PER CENT | T(DRY) | T(WET) | T(DRY) |
|----------|--------|--------|--------|
| 1.0 | 88 | 75 | 50 |
| 2.5 | 86 | 73 | 51 |
| 5.0 | 84 | 72 | |

MONTHLY AVERAGE TEMPERATURES AS A FUNCTION OF HOUR OF THE DAY

| HOUR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 68.5 | 68.6 | 67.0 | 62.2 | 59.7 | 59.1 | 57.6 | 59.4 | 61.0 | 60.9 | 61.8 | 64.5 | 62.5 |
| 1 | 67.9 | 68.3 | 66.6 | 61.9 | 59.5 | 58.8 | 56.8 | 58.6 | 60.8 | 60.4 | 61.6 | 64.1 | 62.1 |
| 2 | 67.3 | 68.0 | 66.0 | 61.4 | 59.3 | 58.4 | 56.4 | 57.6 | 60.3 | 60.2 | 61.1 | 63.6 | 61.6 |
| 3 | 66.8 | 67.5 | 65.7 | 61.1 | 58.8 | 58.0 | 55.9 | 56.8 | 60.1 | 59.8 | 60.7 | 63.2 | 61.2 |
| 4 | 66.7 | 67.4 | 65.3 | 60.6 | 58.7 | 57.6 | 55.5 | 56.0 | 59.9 | 59.6 | 60.4 | 62.7 | 60.8 |
| 5 | 66.4 | 66.9 | 65.2 | 60.5 | 58.4 | 57.1 | 55.1 | 55.5 | 59.3 | 59.5 | 59.9 | 62.1 | 60.5 |
| 6 | 66.2 | 66.5 | 64.9 | 60.3 | 58.4 | 56.9 | 55.0 | 55.2 | 59.0 | 59.6 | 60.0 | 62.2 | 60.3 |
| 7 | 67.4 | 66.9 | 65.2 | 60.6 | 58.5 | 56.7 | 55.0 | 55.3 | 59.3 | 60.5 | 62.2 | 63.7 | 60.9 |
| 8 | 69.9 | 69.0 | 66.6 | 62.0 | 59.2 | 57.3 | 55.6 | 56.9 | 61.0 | 62.3 | 64.2 | 66.5 | 62.5 |
| 9 | 72.7 | 72.0 | 69.4 | 64.5 | 61.2 | 59.6 | 57.9 | 60.3 | 63.5 | 64.6 | 67.2 | 69.0 | 65.1 |
| 10 | 76.4 | 75.1 | 72.4 | 67.2 | 63.2 | 62.5 | 60.8 | 64.5 | 66.8 | 67.3 | 70.2 | 71.7 | 68.1 |
| 11 | 78.8 | 77.0 | 75.3 | 69.1 | 65.3 | 65.5 | 63.7 | 68.1 | 69.7 | 69.6 | 73.2 | 73.6 | 70.7 |
| 12 | 80.5 | 78.5 | 77.5 | 71.2 | 67.4 | 67.8 | 66.4 | 70.6 | 72.5 | 71.1 | 75.3 | 74.5 | 72.7 |
| 13 | 82.0 | 79.1 | 79.1 | 72.4 | 68.7 | 69.5 | 68.7 | 72.8 | 74.5 | 71.9 | 76.1 | 75.5 | 74.2 |
| 14 | 81.8 | 78.6 | 78.5 | 73.2 | 69.0 | 70.2 | 70.7 | 73.5 | 74.7 | 71.8 | 75.2 | 75.2 | 74.3 |
| 15 | 80.3 | 78.5 | 78.1 | 73.3 | 68.6 | 70.7 | 70.6 | 73.5 | 73.1 | 70.4 | 72.4 | 74.3 | 73.6 |
| 16 | 77.8 | 76.9 | 75.7 | 71.9 | 66.9 | 69.7 | 69.8 | 72.5 | 70.1 | 68.8 | 70.2 | 73.5 | 72.0 |

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| | | | | | | | | | | | | | |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 17 | 75.7 | 75.3 | 73.1 | 68.9 | 64.9 | 67.5 | 67.9 | 69.9 | 68.1 | 67.0 | 68.7 | 71.6 | 69.9 |
| 18 | 73.5 | 73.2 | 70.6 | 66.5 | 63.0 | 64.6 | 64.4 | 66.6 | 65.9 | 65.0 | 66.5 | 70.0 | 67.5 |
| 19 | 72.3 | 71.5 | 69.2 | 65.1 | 61.8 | 62.5 | 61.8 | 64.2 | 64.1 | 63.5 | 64.8 | 68.0 | 65.7 |
| 20 | 71.0 | 70.7 | 68.6 | 64.2 | 60.9 | 61.7 | 60.4 | 62.5 | 63.0 | 62.8 | 64.1 | 66.7 | 64.7 |
| 21 | 70.4 | 70.1 | 68.3 | 63.7 | 60.5 | 61.0 | 59.3 | 61.6 | 62.4 | 62.2 | 63.4 | 66.0 | 64.0 |
| 22 | 69.9 | 69.6 | 67.7 | 63.3 | 60.2 | 60.2 | 58.5 | 60.6 | 61.8 | 61.5 | 62.8 | 65.5 | 63.4 |
| 23 | 69.2 | 69.2 | 67.2 | 62.8 | 59.8 | 59.7 | 57.8 | 60.2 | 61.4 | 61.5 | 62.4 | 64.9 | 63.0 |

GROUND TEMPERATURES 526.7 527.4 526.1 521.2 519.0 518.2 515.9 515.8 519.1 520.2 521.1 522.4
CLEARNESS NUMBERS 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00

VITÓRIA

INPUT VERIFICATION

RUN TYPE STAT

Vitoria -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -20.19 LONGITUDE = -40.20 TIME ZONE = 3

| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|--------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| AVG. TEMP. (F) (DRYBULB) | 78.2 | 78.7 | 77.9 | 75.9 | 72.4 | 68.0 | 68.2 | 70.5 | 71.6 | 72.6 | 75.5 | 76.3 | 73.8 |
| AVG. TEMP. (F) (WETBULB) | 74.4 | 74.3 | 74.1 | 71.6 | 68.7 | 65.0 | 65.2 | 66.6 | 68.0 | 69.0 | 70.8 | 72.7 | 70.0 |
| AVG. DAILY MAX. TEMP. | 85.7 | 86.7 | 86.6 | 84.9 | 80.7 | 76.0 | 76.5 | 80.4 | 79.1 | 80.0 | 83.2 | 83.6 | 81.9 |
| AVG. DAILY MIN. TEMP. | 72.5 | 73.4 | 71.3 | 68.6 | 65.8 | 61.8 | 61.0 | 62.7 | 65.9 | 66.8 | 69.9 | 71.0 | 67.5 |
| HEATING DEG. DAYS (BASE 65) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.5 | 0.0 | 0.5 | 1.0 | 0.0 | 7.0 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 55) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| (BASE 50) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| COOLING DEG. DAYS (BASE 80) | 20.5 | 35.5 | 15.0 | 3.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 9.5 | 10.0 | 95.0 |
| (BASE 75) | 128.0 | 144.0 | 123.5 | 58.5 | 19.5 | 0.0 | 0.0 | 8.0 | 18.5 | 34.5 | 82.5 | 90.0 | 707.0 |
| (BASE 70) | 281.5 | 281.0 | 277.0 | 201.5 | 109.0 | 8.5 | 17.5 | 62.5 | 98.5 | 119.0 | 200.5 | 227.0 | 1883.5 |
| (BASE 65) | 436.5 | 421.0 | 432.0 | 351.5 | 255.5 | 116.5 | 122.0 | 203.0 | 226.5 | 261.0 | 345.5 | 381.5 | 3552.5 |
| HEATING DEG. HRS./24 (BASE 65) | 0.0 | 0.0 | 0.0 | 0.2 | 5.2 | 25.4 | 30.0 | 17.1 | 8.2 | 4.4 | 0.2 | 0.0 | 90.8 |
| (BASE 60) | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 | 5.0 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 | 7.0 | |

VitoriaTRY1962_05.sta

(BASE 55) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.8 0.0 0.0 0.0 0.0 0.0 0.8
 (BASE 50) 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

COOLING DEG. HRS./24 (BASE 80) 40.8 45.3 44.3 27.2 14.0 0.5 1.7 9.0 8.5 13.3 27.2 27.8 259.7
 (BASE 75) 117.8 116.3 116.3 82.4 45.6 6.5 13.7 33.1 33.6 43.3 74.9 84.7 768.0
 (BASE 70) 253.6 244.8 246.0 183.2 118.2 38.3 49.8 85.5 92.8 118.7 175.2 201.9 1808.0
 (BASE 65) 408.2 384.8 400.3 325.8 235.8 115.8 130.6 186.3 205.1 240.3 314.2 351.8 3299.0

MAXIMUM TEMP. 96 93 92 93 90 84 84 91 90 90 91 93 96
 MINIMUM TEMP. 68 70 67 63 62 58 52 58 60 60 63 66 52

NO. DAYS MAX. 90 AND ABOVE 5 9 7 6 2 0 0 1 1 2 5 3 41
 NO. DAYS MAX. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

NO. DAYS MIN. 32 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0
 NO. DAYS MIN. 0 AND BELOW 0 0 0 0 0 0 0 0 0 0 0 0 0

AVG. WIND SPEED (MPH) 2.7 3.1 2.0 2.3 2.3 2.0 2.2 2.6 2.7 2.8 3.5 3.0 2.6

AVG. WIND SPEED (DAY) 2.7 3.2 2.1 2.3 2.4 2.1 2.3 2.7 2.7 2.9 3.6 3.1 2.7
 AVG. WIND SPEED (NIGHT) 20.4 2.0 0.4 1.4 1.5 1.4 1.2 1.2 1.7 14.1 6.0 7.8 -0.5

AVG. TEMP. (DAY) 80.2 78.8 78.0 76.0 72.7 68.3 68.5 70.7 71.6 75.0 78.2 79.2 74.9
 AVG. TEMP. (NIGHT) 459.4 75.4 74.4 72.1 68.7 64.8 64.9 66.4 68.5 284.6 162.7 177.1 34.9

AVG. SKY COVER 5.5 5.8 3.9 3.2 3.7 4.7 4.4 3.7 5.4 6.1 4.4 6.2 4.7

AVG. SKY COVER (DAY) 5.7 5.8 3.9 3.2 3.7 4.7 4.4 3.7 5.4 6.3 4.6 6.4 4.8

AVG. REL. HUM. AT 4AM 94.3 92.1 94.6 92.7 92.2 92.6 91.9 91.9 92.6 93.4 89.8 92.7 92.6

10AM 78.4 76.3 76.7 73.1 77.8 83.0 81.0 77.8 79.4 79.6 72.7 79.6 78.0

4PM 74.4 71.5 73.9 71.2 71.3 75.6 78.0 71.5 75.1 74.0 72.7 77.2 73.9

10PM 89.4 88.9 90.0 88.9 88.8 90.8 89.7 88.2 89.3 88.4 87.2 89.1 89.1

Vitoria -TRY MONTHLY WEATHER DATA SUMMARY DOE-2.1E-W7

LATITUDE = -20.19

LONGITUDE = -40.20

TIME ZONE = 3

VitoriaTRY1962_05.sta

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC YEAR

| | | | | | | | | | | | | | |
|-----------------------------------|--------|--------|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| AVG. DAILY DIRECT NORMAL SOLAR | 925.0 | 642.2 | 760.3 | 553.7 | 305.3 | 330.3 | 321.1 | 626.0 | 399.0 | 508.5 | 737.0 | 631.7 | 561.6 |
| AVG. DAILY TOTAL HORIZNTL SOLAR | 1351.6 | 1074.7 | 1051.3 | 836.4 | 561.6 | 537.0 | 520.7 | 847.1 | 790.9 | 1010.4 | 1157.4 | 1165.2 | 908.2 |
| MAX. DAILY DIRECT NORMAL SOLAR | 2099.0 | 1683.0 | 1237.0 | 1001.0 | 613.0 | 767.0 | 820.0 | 1265.0 | 1312.0 | 1800.0 | 1440.0 | 1932.0 | 2099.0 |
| MAX. DAILY TOTAL HORIZNTL SOLAR | 2105.0 | 1626.0 | 1275.0 | 1139.0 | 761.0 | 796.0 | 831.0 | 1261.0 | 1380.0 | 1721.0 | 1574.0 | 1915.0 | 2105.0 |
| MIN. DAILY DIRECT NORMAL SOLAR | 229.0 | 201.0 | 62.0 | 36.0 | 34.0 | 49.0 | 21.0 | 42.0 | 23.0 | 85.0 | 37.0 | 187.0 | 21.0 |
| MIN. DAILY TOTAL HORIZNTL SOLAR | 879.0 | 813.0 | 635.0 | 405.0 | 357.0 | 356.0 | 298.0 | 395.0 | 467.0 | 704.0 | 647.0 | 893.0 | 298.0 |
| MAX. HRLY DIRECT NORMAL SOLAR | 322.0 | 305.0 | 240.0 | 191.0 | 153.0 | 201.0 | 211.0 | 241.0 | 229.0 | 305.0 | 241.0 | 336.0 | 336.0 |
| MAX. HRLY TOTAL HORIZNTL SOLAR | 369.0 | 362.0 | 300.0 | 259.0 | 223.0 | 241.0 | 252.0 | 284.0 | 292.0 | 353.0 | 308.0 | 392.0 | 392.0 |
| AVG. MAX. HRLY DIRECT NORML SOLAR | 191.1 | 165.5 | 175.2 | 137.2 | 87.4 | 108.6 | 109.0 | 152.1 | 114.5 | 136.2 | 158.3 | 143.4 | 139.8 |
| AVG. MAX. HRLY TOTAL HRZNTL SOLAR | 281.5 | 256.5 | 252.8 | 219.0 | 164.9 | 167.4 | 169.7 | 215.0 | 193.0 | 225.7 | 244.6 | 250.8 | 219.9 |

AVG. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|
| N | 569.8 | 517.5 | 677.5 | 695.8 | 564.8 | 597.7 | 560.2 | 774.4 | 564.5 | 569.8 | 503.7 | 508.0 | 592.6 |
| E | 556.0 | 450.1 | 439.8 | 365.1 | 255.0 | 243.3 | 233.4 | 365.1 | 371.2 | 461.9 | 481.8 | 499.7 | 393.4 |
| S | 937.8 | 601.9 | 487.4 | 370.0 | 255.0 | 243.3 | 233.4 | 365.7 | 396.2 | 571.4 | 743.9 | 824.8 | 502.5 |
| W | 1820.9 | 1417.7 | 1512.9 | 1223.1 | 756.4 | 738.3 | 713.4 | 1276.0 | 1129.2 | 1396.0 | 1544.1 | 1461.1 | 1248.7 |

MAX. DAILY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| N | 766.5 | 617.2 | 919.3 | 971.4 | 774.7 | 943.4 | 928.2 | 1113.4 | 941.8 | 933.3 | 609.3 | 652.7 | 1113.4 |
| E | 758.9 | 543.0 | 491.9 | 464.6 | 305.5 | 326.4 | 315.5 | 492.8 | 542.8 | 631.6 | 587.4 | 643.5 | 758.9 |
| S | 1486.1 | 863.7 | 573.5 | 481.7 | 305.4 | 326.4 | 315.5 | 498.6 | 622.2 | 809.7 | 1008.7 | 1245.3 | 1486.1 |
| W | 3084.6 | 2255.4 | 1976.5 | 1788.3 | 1069.2 | 1206.5 | 1234.4 | 2050.3 | 2147.3 | 2700.5 | 2194.6 | 2614.6 | 3084.6 |

MAX. HRLY TOTAL VERTICAL SOLAR

AZIMUTH

| | | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| N | 195.0 | 185.3 | 207.3 | 224.2 | 232.2 | 290.2 | 292.0 | 270.7 | 214.8 | 209.7 | 161.6 | 203.3 | 292.0 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|

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| | | | | | | | | | | | | | |
|---------|-----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| E | 195.0 | 183.5 | 157.1 | 140.7 | 115.4 | 125.4 | 128.6 | 154.6 | 154.4 | 189.6 | 161.6 | 203.3 | 203.3 |
| S | 432.5 | 342.2 | 209.5 | 149.6 | 115.4 | 125.4 | 128.6 | 160.3 | 198.1 | 296.4 | 334.2 | 437.2 | 437.2 |
| W | 764.9 | 748.1 | 637.1 | 544.1 | 424.1 | 474.5 | 495.5 | 625.6 | 615.1 | 782.4 | 628.5 | 797.2 | 797.2 |
| Vitoria | -TRY MONTHLY WEATHER DATA SUMMARY | | | | | | | | | | | | |
| | DOE-2.1E-W7 | | | | | | | | | | | | |

DESIGN TEMPERATURES ----- SUMMER ----- WINTER

| PER CENT | T(DRY) | T(WET) | T(DRY) |
|----------|--------|--------|--------|
| 1.0 | 90 | 81 | 58 |
| 2.5 | 89 | 80 | 59 |
| 5.0 | 88 | 79 | |

MONTHLY AVERAGE TEMPERATURES AS A FUNCTION OF HOUR OF THE DAY

| HOUR | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0 | 74.9 | 75.6 | 74.2 | 72.2 | 68.7 | 64.7 | 64.9 | 66.5 | 68.4 | 70.0 | 72.0 | 73.3 | 70.4 |
| 1 | 74.4 | 75.3 | 73.8 | 71.8 | 68.5 | 64.3 | 64.4 | 65.9 | 68.0 | 69.1 | 71.6 | 73.0 | 70.0 |
| 2 | 74.0 | 74.9 | 73.4 | 71.1 | 68.1 | 63.7 | 63.9 | 65.7 | 67.7 | 68.6 | 71.2 | 72.6 | 69.5 |
| 3 | 73.6 | 74.5 | 72.9 | 70.4 | 67.5 | 63.2 | 63.3 | 65.0 | 67.4 | 68.2 | 71.0 | 72.2 | 69.1 |
| 4 | 73.4 | 74.4 | 72.3 | 69.8 | 67.1 | 63.0 | 62.9 | 64.3 | 67.2 | 67.8 | 70.6 | 71.9 | 68.7 |
| 5 | 73.1 | 74.0 | 71.8 | 69.4 | 66.7 | 62.5 | 62.3 | 63.7 | 66.9 | 67.5 | 70.3 | 71.7 | 68.3 |
| 6 | 73.5 | 74.0 | 71.3 | 68.9 | 66.4 | 62.4 | 62.0 | 63.2 | 66.7 | 68.1 | 71.3 | 72.4 | 68.3 |
| 7 | 76.2 | 76.1 | 73.7 | 71.0 | 67.3 | 63.4 | 63.4 | 64.8 | 69.0 | 70.8 | 74.5 | 75.0 | 70.4 |
| 8 | 78.8 | 78.7 | 77.8 | 75.1 | 71.0 | 66.4 | 66.2 | 68.9 | 72.0 | 73.8 | 77.0 | 77.1 | 73.6 |
| 9 | 81.0 | 80.8 | 81.4 | 79.1 | 75.0 | 69.3 | 69.6 | 72.5 | 74.2 | 75.7 | 79.0 | 78.7 | 76.3 |
| 10 | 82.6 | 82.7 | 83.2 | 81.8 | 77.3 | 71.7 | 73.1 | 76.3 | 76.1 | 77.0 | 80.6 | 79.8 | 78.5 |
| 11 | 83.0 | 84.6 | 85.0 | 82.9 | 78.4 | 73.6 | 74.4 | 78.3 | 77.6 | 78.0 | 81.6 | 81.1 | 79.8 |
| 12 | 83.9 | 85.7 | 85.4 | 83.7 | 79.2 | 74.2 | 75.5 | 78.9 | 77.8 | 78.1 | 82.3 | 81.5 | 80.5 |
| 13 | 84.5 | 86.0 | 85.7 | 84.1 | 80.1 | 74.7 | 75.5 | 79.2 | 77.9 | 78.2 | 82.0 | 82.5 | 80.8 |
| 14 | 84.2 | 84.9 | 85.0 | 82.9 | 79.9 | 75.0 | 75.2 | 79.0 | 77.0 | 77.7 | 81.2 | 81.6 | 80.3 |
| 15 | 83.3 | 84.0 | 83.7 | 81.7 | 79.0 | 74.1 | 74.4 | 77.7 | 76.3 | 77.0 | 79.6 | 81.0 | 79.3 |
| 16 | 81.7 | 82.6 | 82.0 | 80.4 | 77.7 | 73.0 | 73.1 | 75.6 | 75.0 | 76.0 | 77.8 | 79.5 | 77.8 |

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| | | | | | | | | | | | | | |
|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 17 | 80.3 | 80.9 | 80.3 | 78.6 | 75.6 | 71.4 | 71.5 | 73.6 | 73.4 | 74.3 | 76.4 | 78.0 | 76.2 |
| 18 | 78.7 | 79.0 | 78.5 | 76.7 | 73.3 | 69.3 | 69.5 | 71.3 | 71.5 | 73.0 | 75.1 | 76.8 | 74.4 |
| 19 | 77.3 | 77.3 | 77.1 | 75.2 | 71.9 | 67.9 | 67.8 | 69.5 | 70.2 | 71.7 | 73.9 | 75.6 | 72.9 |
| 20 | 76.6 | 76.5 | 76.2 | 74.4 | 70.6 | 67.2 | 67.1 | 68.6 | 69.8 | 71.1 | 73.5 | 74.8 | 72.2 |
| 21 | 76.1 | 76.0 | 75.6 | 73.6 | 70.3 | 66.3 | 66.5 | 67.9 | 69.5 | 70.5 | 73.0 | 74.4 | 71.6 |
| 22 | 75.7 | 75.9 | 74.9 | 73.0 | 69.6 | 65.9 | 66.0 | 67.5 | 69.1 | 70.3 | 72.9 | 74.1 | 71.2 |
| 23 | 75.2 | 75.6 | 74.7 | 72.7 | 69.3 | 65.2 | 65.3 | 67.2 | 68.8 | 69.8 | 72.4 | 73.7 | 70.8 |

GROUND TEMPERATURES 533.8 533.7 533.5 531.0 528.1 524.4 524.6 525.9 527.4 528.3 530.2 532.1
CLEARNESS NUMBERS 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00



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Fax: (48) 331-5191

LabEEE

ANEXO 2
Arquivos Estatísticos do EnergyPlus

BELÉM

Statistics for belemCSV

Location -- Belem -TRY

{S 1° 22'} {W 48° 28'} {GMT -3.0 Hours}

Elevation -- 16m above sea level

Standard Pressure at Elevation -- 101133Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

Design Stat HDB 99.6% HDB 99%
Units {C} {C}
HEATING 20.7 21.1

Design Stat CDB .4% CDB 1% CDB 2% CDP .4% CDP 1% CDP 2%
Units {C} {C} {C} {C} {C} {C}
COOLING 33.3 33.1 32.8 26.7 26.3 25.9

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|
| Maximum | 32.5 | 32.4 | 33.2 | 33.8 | 33.3 | 34.9 | 33.4 | 33.4 | 33.7 | 33.3 | 34.2 | 33.4 |
| Day:Hour | 7:16 | 8:15 | 9:16 | 8:16 | 7:16 | 1:17 | 1:15 | 1:16 | 8:16 | 8:14 | 18:14 | 29:16 |
| Minimum | 21.3 | 20.5 | 21.6 | 21.6 | 20.0 | 21.3 | 21.4 | 20.9 | 20.8 | 20.7 | 20.3 | 21.5 |
| Day:Hour | 11:07 | 11:07 | 10:07 | 11:05 | 11:07 | 27:07 | 7:07 | 11:07 | 11:07 | 23:07 | 18:07 | 25:05 |
| Daily Avg | 25.5 | 25.6 | 25.9 | 25.8 | 26.0 | 26.3 | 26.5 | 26.3 | 26.0 | 26.1 | 26.3 | 26.1 |

- Maximum Dry Bulb temperature of 34.9°C on Jun 1
- Minimum Dry Bulb temperature of 20.0°C on May 11

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 23.9 | 23.8 | 24.2 | 24.0 | 24.2 | 24.1 | 24.1 | 23.7 | 23.6 | 23.7 | 24.2 | 24.0 |
| 1:01- 2:00 | 23.7 | 23.7 | 24.0 | 23.8 | 24.0 | 23.9 | 23.9 | 23.5 | 23.4 | 23.5 | 23.9 | 23.8 |
| 2:01- 3:00 | 23.6 | 23.4 | 23.8 | 23.6 | 23.8 | 23.7 | 23.6 | 23.3 | 23.1 | 23.1 | 23.5 | 23.5 |
| 3:01- 4:00 | 23.4 | 23.2 | 23.6 | 23.5 | 23.6 | 23.4 | 23.3 | 23.1 | 22.9 | 22.8 | 23.2 | 23.3 |
| 4:01- 5:00 | 23.3 | 23.0 | 23.4 | 23.3 | 23.5 | 23.2 | 23.1 | 22.9 | 22.7 | 22.5 | 22.9 | 23.0 |
| 5:01- 6:00 | 23.2 | 22.8 | 23.2 | 23.1 | 23.3 | 23.0 | 22.9 | 22.7 | 22.5 | 22.2 | 22.6 | 22.8 |
| 6:01- 7:00 | 23.1 | 22.7 | 23.0 | 23.0 | 23.2 | 22.8 | 22.7 | 22.4 | 22.3 | 22.0 | 22.4 | 22.6 |
| 7:01- 8:00 | 23.4 | 23.2 | 23.5 | 23.5 | 23.6 | 23.4 | 23.3 | 23.0 | 23.0 | 22.8 | 23.1 | 23.1 |
| 8:01- 9:00 | 24.9 | 24.8 | 25.1 | 24.8 | 25.2 | 25.4 | 25.2 | 25.2 | 25.3 | 25.3 | 25.5 | 25.4 |
| 9:01-10:00 | 26.3 | 26.5 | 26.6 | 26.5 | 27.2 | 27.4 | 27.4 | 27.3 | 27.3 | 27.4 | 27.5 | 27.5 |
| 10:01-11:00 | 27.6 | 27.5 | 27.9 | 28.0 | 28.5 | 28.9 | 28.8 | 28.8 | 28.7 | 28.7 | 28.9 | 28.9 |
| 11:01-12:00 | 28.8 | 28.6 | 29.2 | 28.8 | 29.3 | 29.6 | 30.0 | 30.2 | 29.7 | 30.0 | 30.0 | 29.9 |
| 12:01-13:00 | 29.3 | 29.0 | 29.6 | 29.4 | 29.8 | 30.1 | 30.7 | 30.7 | 30.3 | 30.5 | 30.9 | 30.5 |
| 13:01-14:00 | 28.9 | 29.5 | 29.7 | 29.5 | 30.2 | 30.7 | 31.1 | 31.2 | 30.9 | 30.8 | 31.2 | 31.0 |
| 14:01-15:00 | 28.5 | 29.2 | 29.3 | 29.7 | 29.3 | 30.4 | 31.1 | 31.3 | 30.9 | 30.8 | 31.0 | 30.8 |
| 15:01-16:00 | 28.1 | 28.4 | 28.3 | 28.9 | 29.2 | 29.9 | 30.9 | 31.0 | 30.2 | 30.1 | 29.5 | 29.9 |
| 16:01-17:00 | 27.2 | 27.6 | 28.0 | 28.0 | 28.3 | 29.3 | 30.3 | 30.4 | 28.9 | 29.4 | 29.2 | 28.3 |
| 17:01-18:00 | 26.6 | 26.6 | 27.3 | 27.1 | 27.0 | 28.4 | 29.4 | 28.8 | 27.8 | 28.2 | 28.3 | 27.5 |
| 18:01-19:00 | 25.9 | 26.0 | 26.6 | 26.3 | 26.4 | 27.4 | 28.1 | 27.8 | 26.8 | 27.3 | 27.3 | 26.5 |
| 19:01-20:00 | 25.3 | 25.4 | 25.9 | 25.7 | 25.7 | 26.1 | 26.8 | 26.2 | 25.7 | 26.1 | 26.2 | 25.4 |
| 20:01-21:00 | 24.9 | 25.1 | 25.3 | 25.2 | 25.2 | 25.3 | 25.8 | 25.1 | 25.1 | 25.5 | 25.5 | 25.0 |
| 21:01-22:00 | 24.5 | 24.7 | 24.9 | 24.8 | 24.7 | 24.9 | 25.2 | 24.6 | 24.7 | 25.1 | 25.2 | 24.7 |
| 22:01-23:00 | 24.3 | 24.4 | 24.7 | 24.5 | 24.5 | 24.6 | 24.7 | 24.2 | 24.4 | 24.6 | 24.8 | 24.4 |
| 23:01-24:00 | 24.1 | 24.1 | 24.5 | 24.3 | 24.3 | 24.3 | 24.3 | 24.0 | 24.0 | 24.1 | 24.4 | 24.1 |
| Max Hour | 13 | 14 | 14 | 15 | 14 | 14 | 15 | 15 | 15 | 14 | 14 | 14 |
| Min Hour | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

Min <=-18

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|--------------|-----|------|------|------|------|------|------|------|------|------|------|------|------|
| HDD base 10C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HDD base 18C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CDD base 10C | | 482 | 436 | 493 | 474 | 496 | 488 | 513 | 505 | 480 | 500 | 489 | 499 |
| CDD base 18C | | 234 | 212 | 245 | 234 | 248 | 248 | 265 | 257 | 240 | 252 | 249 | 251 |
| CDH base 20C | | 4120 | 3733 | 4388 | 4177 | 4466 | 4504 | 4863 | 4692 | 4325 | 4548 | 4528 | 4524 |
| CDH base 23C | | 1923 | 1759 | 2180 | 2039 | 2252 | 2376 | 2665 | 2529 | 2249 | 2427 | 2430 | 2348 |
| CDH base 27C | | 433 | 422 | 526 | 495 | 605 | 757 | 915 | 927 | 722 | 799 | 787 | 742 |

- 5853 annual cooling degree-days (10°C baseline)

- 0 annual heating degree-days (10°C baseline)

- 2933 annual cooling degree-days (18°C baseline)

- 0 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|
| 4am | 97 | 97 | 97 | 96 | 97 | 96 | 95 | 96 | 96 | 95 | 95 | 96 |
| 10am | 85 | 84 | 84 | 84 | 82 | 79 | 79 | 79 | 79 | 76 | 77 | 79 |
| 3pm | 79 | 75 | 76 | 72 | 73 | 66 | 67 | 63 | 64 | 63 | 65 | 66 |
| 10pm | 95 | 93 | 94 | 94 | 93 | 91 | 89 | 91 | 92 | 87 | 89 | 90 |
| Maximum | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Day:Hour | 1:04 | 1:06 | 13:02 | 23:01 | 16:07 | 3:04 | 4:07 | 3:05 | 14:07 | 3:04 | 4:06 | 1:06 |
| Minimum | 52 | 56 | 51 | 49 | 49 | 48 | 43 | 43 | 49 | 47 | 50 | 51 |
| Day:Hour | 11:13 | 11:12 | 6:15 | 11:14 | 11:15 | 12:13 | 12:14 | 12:15 | 11:15 | 7:15 | 25:13 | 29:16 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 3.0 | 3.0 | 3.0 | 2.9 | 2.9 | 2.8 | 2.9 | 2.8 | 2.8 | 2.7 | 2.8 | 2.8 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Direct Avg | 2903 | 3396 | 3299 | 2979 | 3022 | 3282 | 3748 | 4174 | 5025 | 4271 | 3175 | 2877 |
| Direct Max | 7316 | 8303 | 8492 | 7381 | 6174 | 7019 | 8327 | 7294 | 7693 | 6685 | 6091 | 6391 |
| Day | 9 | 9 | 9 | 13 | 9 | 1 | 9 | 9 | 19 | 22 | 9 | 3 |
| Diffuse Avg | 2996 | 2937 | 2929 | 2962 | 2820 | 2558 | 2510 | 2629 | 2555 | 2570 | 2813 | 2783 |

- Maximum Direct Solar of 8492 Wh/m² on Mar 9

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 62 | 60 | 70 | 67 | 61 | 67 | 71 | 73 | 57 | 60 | 72 | 70 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|
| Maximum | 8.0 | 10.0 | 8.0 | 8.0 | 10.0 | 7.0 | 8.0 | 7.0 | 10.0 | 8.0 | 8.0 | 8.0 |
| Day:Hour | 15:14 | 18:16 | 13:17 | 18:12 | 23:16 | 26:12 | 2:15 | 14:16 | 16:18 | 18:12 | 21:13 | 29:18 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:02 | 1:01 |
| Daily Avg | 1.4 | 1.4 | 1.4 | 1.4 | 1.2 | 1.5 | 1.8 | 1.9 | 1.8 | 1.8 | 1.8 | 1.7 |

- Maximum Wind Speed of 10.0 m/s on Feb 18

- Minimum Wind Speed of 0.0 m/s on Jan 1

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.0 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 16.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |

- Climate type "Af" (Köppen classification)
- Tropical wet (no dry season, rainforest, hot all year, lat. < 10°)
- Heating may not be required

- Typical/Extreme Period Determination
- No dry season.....
 - Week closest to average annual temperature selected for Typical Period
 - Typical Week Period selected: Jul 23:Jul 29, Average Temp= 26.04°C, Deviation=| 0.004|°C
 - Week closest to maximum annual temperature selected for Typical Period
 - Extreme Hot Week Period selected: Aug 6:Aug 12, Maximum Temp= 34.90°C, Deviation=| 7.674|°C
 - Week closest to minimum annual temperature selected for Typical Period
 - Extreme Cold Week Period selected: Feb 19:Feb 25, Minimum Temp= 20.00°C, Deviation=| 5.132|°C

BRASÍLIA

Statistics for brasiliaCSV
 Location -- Brasilia -TRY
 {S 15° 52'} {W 47° 55'} {GMT -3.0 Hours}
 Elevation -- 1060m above sea level
 Standard Pressure at Elevation -- 89222Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

| | | |
|-------------|-----------|---------|
| Design Stat | HDB 99.6% | HDB 99% |
| Units | {C} | {C} |
| HEATING | 8.1 | 9.0 |

| | | | | | | |
|-------------|---------|--------|--------|---------|--------|--------|
| Design Stat | CDB .4% | CDB 1% | CDB 2% | CDP .4% | CDP 1% | CDP 2% |
| Units | {C} | {C} | {C} | {C} | {C} | {C} |
| COOLING | 31.7 | 31.2 | 30.5 | 21.6 | 20.8 | 20.5 |

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Maximum | 28.2 | 29.6 | 31.0 | 29.7 | 29.2 | 27.4 | 27.8 | 31.1 | 33.0 | 30.8 | 31.3 | 29.0 |
| Day:Hour | 19:16 | 14:15 | 6:15 | 17:15 | 2:16 | 23:16 | 30:17 | 30:14 | 22:16 | 19:14 | 17:17 | 4:14 |
| Minimum | 17.0 | 17.0 | 15.3 | 13.0 | 9.9 | 7.5 | 6.1 | 8.3 | 13.2 | 14.8 | 13.7 | 17.2 |
| Day:Hour | 18:07 | 1:07 | 29:07 | 8:07 | 31:08 | 18:06 | 24:08 | 2:08 | 19:06 | 28:07 | 14:06 | 16:05 |
| Daily Avg | 21.6 | 22.0 | 21.6 | 21.3 | 19.2 | 17.7 | 17.8 | 20.4 | 22.6 | 21.4 | 21.9 | 20.9 |

- Maximum Dry Bulb temperature of 33.0°C on Sep 22
- Minimum Dry Bulb temperature of 6.1°C on Jul 24

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 19.8 | 19.7 | 19.2 | 18.8 | 16.4 | 14.9 | 14.5 | 17.4 | 20.2 | 19.2 | 19.4 | 19.4 |
| 1:01- 2:00 | 19.6 | 19.5 | 19.0 | 18.2 | 15.8 | 14.2 | 13.5 | 16.4 | 19.4 | 18.9 | 19.1 | 19.1 |
| 2:01- 3:00 | 19.4 | 19.2 | 18.8 | 17.6 | 15.1 | 13.4 | 13.0 | 15.6 | 19.1 | 18.5 | 18.8 | 18.9 |
| 3:01- 4:00 | 19.1 | 18.9 | 18.6 | 17.2 | 14.8 | 12.8 | 12.3 | 15.0 | 18.6 | 18.4 | 18.4 | 18.7 |
| 4:01- 5:00 | 18.9 | 18.7 | 18.3 | 16.8 | 14.4 | 12.4 | 11.7 | 14.4 | 18.2 | 18.1 | 18.3 | 18.6 |
| 5:01- 6:00 | 18.8 | 18.5 | 18.0 | 16.3 | 13.9 | 12.0 | 11.2 | 14.0 | 17.7 | 17.9 | 18.0 | 18.7 |
| 6:01- 7:00 | 18.6 | 18.4 | 17.8 | 16.1 | 13.7 | 11.6 | 11.0 | 13.5 | 17.4 | 17.6 | 17.8 | 18.7 |
| 7:01- 8:00 | 19.1 | 18.7 | 18.1 | 16.3 | 13.8 | 11.6 | 10.7 | 13.3 | 17.4 | 18.2 | 18.7 | 19.0 |
| 8:01- 9:00 | 20.3 | 20.0 | 19.7 | 18.1 | 15.7 | 13.6 | 12.9 | 15.9 | 19.2 | 19.9 | 21.0 | 19.9 |
| 9:01-10:00 | 21.7 | 21.8 | 21.4 | 20.8 | 18.5 | 16.5 | 16.4 | 19.6 | 21.6 | 21.5 | 22.9 | 20.9 |
| 10:01-11:00 | 22.8 | 24.0 | 23.1 | 23.3 | 20.9 | 19.2 | 19.5 | 22.4 | 23.9 | 23.0 | 24.5 | 22.1 |
| 11:01-12:00 | 23.9 | 25.4 | 24.3 | 24.9 | 22.7 | 20.9 | 21.6 | 24.3 | 25.8 | 24.2 | 25.6 | 22.8 |
| 12:01-13:00 | 24.6 | 26.1 | 25.1 | 25.9 | 23.9 | 22.4 | 23.0 | 25.7 | 26.8 | 24.9 | 26.3 | 23.5 |
| 13:01-14:00 | 24.6 | 26.1 | 26.0 | 26.6 | 24.8 | 23.4 | 24.0 | 26.7 | 28.0 | 25.5 | 26.6 | 23.6 |
| 14:01-15:00 | 24.8 | 26.1 | 26.3 | 26.9 | 25.2 | 24.1 | 24.8 | 27.4 | 28.9 | 25.8 | 26.7 | 23.8 |
| 15:01-16:00 | 24.7 | 25.6 | 26.2 | 26.8 | 25.4 | 24.6 | 25.2 | 27.5 | 28.6 | 25.6 | 26.7 | 23.5 |
| 16:01-17:00 | 24.6 | 25.4 | 25.6 | 26.5 | 25.2 | 24.5 | 25.3 | 27.4 | 27.6 | 25.3 | 25.4 | 22.9 |
| 17:01-18:00 | 24.2 | 24.8 | 25.0 | 25.6 | 24.3 | 23.7 | 24.7 | 26.8 | 27.2 | 24.5 | 24.5 | 23.0 |
| 18:01-19:00 | 23.3 | 24.0 | 23.8 | 24.4 | 22.6 | 21.6 | 22.6 | 25.0 | 25.7 | 23.1 | 23.4 | 22.1 |
| 19:01-20:00 | 22.4 | 22.9 | 22.3 | 22.6 | 20.6 | 19.6 | 20.2 | 22.8 | 24.1 | 21.8 | 22.1 | 21.2 |
| 20:01-21:00 | 21.5 | 22.0 | 21.5 | 21.5 | 19.4 | 18.2 | 18.8 | 21.4 | 23.1 | 21.0 | 21.3 | 20.6 |
| 21:01-22:00 | 20.9 | 21.3 | 20.6 | 20.8 | 18.7 | 17.2 | 17.7 | 20.4 | 22.3 | 20.5 | 20.7 | 20.2 |
| 22:01-23:00 | 20.4 | 20.8 | 20.1 | 20.2 | 17.8 | 16.2 | 16.6 | 19.3 | 21.4 | 20.0 | 20.2 | 19.9 |
| 23:01-24:00 | 20.0 | 20.2 | 19.6 | 19.3 | 17.1 | 15.4 | 15.6 | 18.3 | 20.8 | 19.6 | 19.8 | 19.6 |
| Max Hour | 15 | 15 | 15 | 15 | 16 | 16 | 17 | 16 | 15 | 15 | 16 | 15 |
| Min Hour | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 7 | 7 | 5 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| Maximum | 23.2 | 22.7 | 20.8 | 23.0 | 20.9 | 20.3 | 19.3 | 19.9 | 19.9 | 20.0 | 20.1 | 21.2 |
| Day:Hour | 21:17 | 12:17 | 8:15 | 29:12 | 2:18 | 6:14 | 27:18 | 15:14 | 26:20 | 14:14 | 5:13 | 2:11 |
| Minimum | 14.7 | 14.1 | 13.9 | 11.3 | 7.9 | 6.0 | 2.2 | 4.9 | 2.5 | 11.3 | 8.2 | 15.3 |
| Day:Hour | 25:05 | 9:06 | 24:12 | 18:07 | 31:08 | 19:08 | 23:19 | 24:21 | 21:16 | 18:05 | 14:18 | 4:01 |

Daily Avg 18.5 18.3 17.8 16.4 14.2 12.1 10.2 11.9 14.2 16.4 16.3 18.0

- Maximum Dew Point temperature of 23.2°C on Jan 21
- Minimum Dew Point temperature of 2.2°C on Jul 23

- Monthly Statistics for Wind Chill/Heat Index temperatures °C **

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------|-------|-------|------|-------|------|-------|-------|-------|------|-------|------|------|
| Minimum WC | | | | | | 9 | 8 | | | | | |
| Day:Hour | | | | | | 21:07 | 25:08 | | | | | |
| Average WC | | | | | | 9 | 8 | | | | | |
| Avg Del WC | | | | | | 0 | 0 | | | | | |
| # Hours WC | | | | | | 2 | 2 | | | | | |
| Maximum HI | 30 | 31 | 32 | 32 | 31 | 27 | 27 | 30 | 31 | 30 | 31 | 29 |
| Day:Hour | 19:16 | 23:15 | 6:15 | 29:12 | 2:16 | 23:16 | 29:16 | 14:15 | 2:16 | 20:14 | 5:13 | 4:15 |
| Average HI | 29 | 29 | 29 | 28 | 29 | 27 | 27 | 28 | 28 | 28 | 29 | 28 |
| Avg Del HI | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| # Hours HI | 31 | 65 | 80 | 80 | 26 | 1 | 2 | 33 | 70 | 61 | 48 | 18 |

- **WindChill/HeatIndex Temps -- statistics...only those different from Air Temps

- Monthly Statistics for Extreme temperatures °C

| #Days | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Max >= 32 | | | | | | | | | | 3 | | |
| Max <= 0 | | | | | | | | | | | | |
| Min <= 0 | | | | | | | | | | | | |
| Min <=-18 | | | | | | | | | | | | |

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| HDD base 10C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HDD base 18C | | 0 | 0 | 0 | 0 | 9 | 21 | 15 | 1 | 0 | 0 | 0 |
| CDD base 10C | | 359 | 336 | 359 | 339 | 285 | 230 | 241 | 323 | 379 | 353 | 358 |
| CDD base 18C | | 111 | 112 | 111 | 99 | 46 | 11 | 8 | 76 | 139 | 105 | 118 |

| | | | | | | | | | | | | |
|--------------|------|------|------|------|------|-----|------|------|------|------|------|------|
| CDH base 20C | 1433 | 1625 | 1645 | 1723 | 1211 | 821 | 1005 | 1867 | 2433 | 1580 | 1782 | 1013 |
| CDH base 23C | 474 | 662 | 717 | 766 | 463 | 238 | 316 | 892 | 1290 | 640 | 811 | 271 |
| CDH base 27C | 14 | 70 | 86 | 85 | 13 | 0 | 2 | 146 | 380 | 90 | 131 | 10 |

- 3900 annual cooling degree-days (10°C baseline)
- 0 annual heating degree-days (10°C baseline)
- 1026 annual cooling degree-days (18°C baseline)
- 45 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 4am | 93 | 93 | 92 | 92 | 91 | 88 | 81 | 79 | 77 | 89 | 89 | 95 |
| 10am | 85 | 84 | 82 | 79 | 78 | 74 | 69 | 63 | 66 | 76 | 70 | 85 |
| 3pm | 72 | 66 | 64 | 58 | 57 | 54 | 43 | 42 | 42 | 59 | 54 | 72 |
| 10pm | 88 | 85 | 87 | 81 | 78 | 76 | 64 | 62 | 64 | 80 | 81 | 90 |
| Maximum | 100 | 100 | 100 | 100 | 99 | 100 | 95 | 99 | 100 | 100 | 100 | 100 |
| Day:Hour | 24:14 | 12:06 | 15:01 | 27:07 | 1:06 | 11:08 | 18:08 | 24:06 | 25:07 | 21:19 | 2:04 | 6:07 |
| Minimum | 56 | 49 | 45 | 37 | 35 | 30 | 26 | 26 | 15 | 35 | 28 | 45 |
| Day:Hour | 19:12 | 14:15 | 29:16 | 9:17 | 29:18 | 22:15 | 28:16 | 26:15 | 21:16 | 19:16 | 14:18 | 4:14 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2.2 | 2.2 | 2.1 | 2.0 | 1.8 | 1.6 | 1.3 | 1.5 | 1.6 | 1.9 | 1.8 | 2.1 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|-------|-------|------|
| Direct Avg | 5095 | 5362 | 4127 | 3706 | 2737 | 2764 | 2226 | 4303 | 5151 | 4540 | 4432 | 3988 |
| Direct Max | 7119 | 8331 | 7389 | 7362 | 4541 | 3937 | 3662 | 6719 | 8235 | 10011 | 10177 | 7974 |
| Day | 19 | 20 | 30 | 7 | 18 | 5 | 28 | 28 | 17 | 19 | 15 | 30 |
| Diffuse Avg | 2965 | 2814 | 2718 | 2269 | 1918 | 1459 | 1856 | 1673 | 2167 | 2942 | 2973 | 3304 |

- Maximum Direct Solar of 10177 Wh/m² on Nov 15

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 130 | 100 | 83 | 39 | 61 | 49 | 46 | 57 | 60 | 80 | 62 | 137 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|------|-------|------|------|-------|------|------|-------|------|-------|-------|-------|
| Maximum | 10.0 | 15.0 | 12.0 | 8.0 | 9.0 | 8.0 | 8.0 | 10.0 | 9.0 | 13.0 | 13.0 | 10.0 |
| Day:Hour | 1:17 | 17:17 | 8:20 | 2:15 | 19:15 | 9:18 | 1:10 | 24:17 | 2:24 | 21:19 | 30:19 | 24:14 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 1:04 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 |
| Daily Avg | 1.9 | 1.6 | 2.0 | 1.2 | 1.8 | 1.8 | 1.4 | 1.7 | 1.8 | 1.9 | 1.3 | 2.0 |

- Maximum Wind Speed of 15.0 m/s on Feb 17

- Minimum Wind Speed of 0.0 m/s on Jan 1

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 18.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |
| 2.0 m | 21.7 | 22.8 | 23.3 | 23.3 | 22.4 | 21.1 | 19.8 | 18.6 | 18.1 | 18.2 | 19.0 | 20.3 |
| 4.0 m | 20.9 | 21.8 | 22.3 | 22.5 | 22.1 | 21.4 | 20.5 | 19.6 | 19.0 | 18.9 | 19.3 | 20.0 |

- Climate type "Csa" (Köppen classification)

- Mediterranean climate (dry hot summer, mild winter, lat. 30-45°S)

- Typical/Extreme Period Determination

- Summer is Sep:Nov

Extreme Summer Week (nearest maximum temperature for summer)

Extreme Hot Week Period selected: Sep 8:Sep 14, Maximum Temp= 33.00°C, Deviation=| 8.471|°C

Typical Summer Week (nearest average temperature for summer)

Typical Week Period selected: Oct 6:Oct 12, Average Temp= 21.97°C, Deviation=| 0.015|°C

- Winter is Mar:May

Extreme Winter Week (nearest minimum temperature for winter)

Extreme Cold Week Period selected: May 10:May 16, Minimum Temp= 9.90°C, Deviation=| 7.283|°C

Typical Winter Week (nearest average temperature for winter)

Typical Week Period selected: May 3:May 9, Average Temp= 20.69°C, Deviation=| 0.085|°C

- Autumn is Dec:Feb

Typical Autumn Week (nearest average temperature for autumn)

Typical Week Period selected: Jan 6:Jan 12, Average Temp= 21.47°C, Deviation=| 0.037|°C

- Spring is Jun:Aug

Typical Spring Week (nearest average temperature for spring)

Typical Week Period selected: Jun 1:Jun 7, Average Temp= 18.64°C, Deviation=| 0.013|°C

CURITIBA

Statistics for curitibaCSV
 Location -- Curitiba -TRY
 {S 25° 31'} {W 49° 10'} {GMT -3.0 Hours}
 Elevation -- 910m above sea level
 Standard Pressure at Elevation -- 90860Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

| | | |
|-------------|-----------|---------|
| Design Stat | HDB 99.6% | HDB 99% |
| Units | {C} | {C} |
| HEATING | 0.1 | 0.8 |

| | | | | | | |
|-------------|---------|--------|--------|---------|--------|--------|
| Design Stat | CDB .4% | CDB 1% | CDB 2% | CDP .4% | CDP 1% | CDP 2% |
| Units | {C} | {C} | {C} | {C} | {C} | {C} |
| COOLING | 30.2 | 29.8 | 28.9 | 22.1 | 21.3 | 20.8 |

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|-------|-------|------|------|-------|-------|-------|-------|-------|-------|
| Maximum | 31.0 | 31.0 | 30.5 | 25.5 | 26.3 | 25.2 | 26.0 | 26.5 | 28.6 | 29.6 | 30.5 | 29.8 |
| Day:Hour | 30:17 | 7:16 | 18:17 | 20:17 | 2:17 | 8:16 | 21:15 | 14:15 | 25:16 | 28:15 | 28:16 | 20:14 |
| Minimum | 13.6 | 13.0 | 9.5 | 10.8 | -0.4 | -0.2 | -2.1 | 4.9 | 1.5 | 4.2 | 11.0 | 10.1 |
| Day:Hour | 26:07 | 21:06 | 16:08 | 16:08 | 5:07 | 5:08 | 11:08 | 9:08 | 6:08 | 8:03 | 10:07 | 26:02 |
| Daily Avg | 20.6 | 20.7 | 19.6 | 16.3 | 14.6 | 13.1 | 12.5 | 13.6 | 15.4 | 14.2 | 18.0 | 17.8 |

- Maximum Dry Bulb temperature of 31.0°C on Jan 30
- Minimum Dry Bulb temperature of -2.1°C on Jul 11

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 18.2 | 18.5 | 17.3 | 14.6 | 12.5 | 11.5 | 10.2 | 11.4 | 12.9 | 12.2 | 15.9 | 15.5 |
| 1:01- 2:00 | 18.0 | 18.3 | 17.1 | 14.5 | 12.3 | 11.1 | 10.0 | 11.2 | 12.6 | 12.0 | 15.7 | 15.1 |
| 2:01- 3:00 | 17.7 | 18.1 | 16.9 | 14.4 | 12.1 | 10.9 | 9.8 | 10.9 | 12.4 | 11.9 | 15.6 | 15.0 |
| 3:01- 4:00 | 17.4 | 17.9 | 16.7 | 14.3 | 11.7 | 10.7 | 9.5 | 10.7 | 12.2 | 11.7 | 15.5 | 14.7 |
| 4:01- 5:00 | 17.1 | 17.8 | 16.5 | 14.1 | 11.4 | 10.5 | 9.2 | 10.3 | 12.0 | 11.6 | 15.2 | 14.5 |
| 5:01- 6:00 | 16.8 | 17.7 | 16.3 | 13.9 | 11.2 | 10.1 | 8.8 | 9.9 | 11.7 | 11.4 | 15.0 | 14.2 |
| 6:01- 7:00 | 16.5 | 17.6 | 16.1 | 13.8 | 10.7 | 9.8 | 8.4 | 9.7 | 11.4 | 11.5 | 15.1 | 14.3 |
| 7:01- 8:00 | 17.5 | 18.1 | 16.5 | 13.9 | 10.6 | 9.7 | 8.1 | 9.7 | 11.6 | 11.9 | 16.0 | 15.4 |
| 8:01- 9:00 | 18.9 | 19.2 | 17.6 | 14.7 | 11.4 | 10.3 | 8.7 | 10.3 | 12.7 | 12.9 | 17.1 | 16.9 |
| 9:01-10:00 | 20.4 | 20.6 | 18.9 | 15.7 | 12.9 | 11.8 | 10.1 | 11.7 | 14.4 | 14.2 | 18.4 | 18.3 |
| 10:01-11:00 | 22.2 | 22.0 | 20.6 | 17.0 | 14.9 | 13.6 | 12.2 | 13.8 | 16.5 | 15.3 | 19.5 | 19.7 |
| 11:01-12:00 | 23.8 | 23.4 | 21.9 | 18.2 | 16.9 | 15.4 | 14.7 | 15.9 | 17.8 | 16.3 | 20.4 | 20.8 |
| 12:01-13:00 | 24.7 | 24.4 | 22.9 | 19.1 | 18.2 | 16.4 | 16.3 | 17.2 | 19.0 | 17.0 | 20.7 | 21.5 |
| 13:01-14:00 | 25.8 | 24.8 | 23.8 | 20.0 | 19.3 | 17.2 | 17.4 | 18.5 | 20.1 | 17.9 | 21.6 | 22.0 |
| 14:01-15:00 | 26.4 | 25.0 | 24.4 | 20.5 | 19.8 | 17.6 | 18.0 | 19.0 | 20.8 | 18.1 | 21.8 | 22.2 |
| 15:01-16:00 | 25.9 | 25.0 | 24.7 | 20.4 | 20.0 | 17.6 | 18.2 | 19.2 | 20.7 | 17.9 | 21.8 | 22.4 |
| 16:01-17:00 | 25.0 | 24.6 | 24.5 | 19.9 | 19.7 | 17.2 | 17.9 | 18.8 | 20.3 | 17.6 | 21.6 | 21.6 |
| 17:01-18:00 | 23.5 | 23.9 | 23.2 | 19.1 | 18.8 | 16.3 | 17.1 | 17.9 | 19.3 | 16.8 | 20.7 | 20.6 |
| 18:01-19:00 | 22.7 | 22.7 | 21.8 | 17.8 | 17.0 | 14.9 | 15.7 | 16.5 | 17.9 | 15.8 | 19.6 | 19.3 |
| 19:01-20:00 | 20.7 | 21.0 | 19.5 | 16.2 | 15.2 | 13.5 | 13.4 | 14.5 | 15.8 | 14.3 | 18.1 | 17.8 |
| 20:01-21:00 | 19.6 | 20.1 | 18.6 | 15.6 | 14.1 | 12.8 | 12.5 | 13.5 | 15.0 | 13.7 | 17.3 | 16.8 |
| 21:01-22:00 | 19.2 | 19.4 | 18.2 | 15.2 | 13.5 | 12.4 | 11.9 | 12.6 | 14.3 | 13.0 | 16.6 | 16.1 |
| 22:01-23:00 | 18.8 | 19.2 | 17.9 | 14.9 | 13.2 | 11.8 | 11.2 | 12.2 | 13.8 | 12.6 | 16.5 | 15.9 |
| 23:01-24:00 | 18.5 | 18.9 | 17.6 | 14.6 | 12.8 | 11.4 | 10.8 | 11.6 | 13.4 | 12.5 | 16.1 | 15.7 |
| Max Hour | 15 | 15 | 16 | 15 | 16 | 15 | 16 | 16 | 15 | 15 | 15 | 16 |
| Min Hour | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 7 | 7 | 6 | 6 | 6 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|
| Maximum | 22.7 | 22.7 | 20.7 | 19.8 | 18.1 | 18.4 | 17.7 | 16.2 | 17.9 | 20.0 | 21.5 | 20.1 |
| Day:Hour | 30:18 | 8:18 | 21:14 | 1:12 | 23:16 | 14:18 | 21:19 | 24:23 | 7:17 | 28:21 | 8:16 | 20:17 |
| Minimum | 11.9 | 12.6 | 9.2 | 8.2 | -3.3 | -0.7 | -3.1 | 1.6 | 1.0 | 2.3 | 7.2 | 8.2 |
| Day:Hour | 21:14 | 20:10 | 16:08 | 16:15 | 4:12 | 4:09 | 9:23 | 21:13 | 5:16 | 8:03 | 10:07 | 27:10 |

Daily Avg 16.9 17.9 16.4 14.1 11.9 10.8 9.7 10.2 12.1 11.7 15.3 14.5

- Maximum Dew Point temperature of 22.7°C on Jan 30
- Minimum Dew Point temperature of -3.3°C on May 4

- Monthly Statistics for Wind Chill/Heat Index temperatures °C **

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------|------|------|-------|-----|------|------|-------|-------|-------|-------|-------|-------|
| Minimum WC | | | 9 | | -3 | -6 | -10 | -2 | 1 | -2 | | |
| Day:Hour | | | 16:08 | | 4:11 | 4:08 | 10:08 | 21:09 | 8:22 | 7:07 | | |
| Average WC | | | 9 | | 4 | 3 | 1 | 4 | 6 | 3 | | |
| Avg Del WC | | | 0 | | 3 | 4 | 5 | 4 | 3 | 5 | | |
| # Hours WC | | | 1 | | 31 | 97 | 121 | 133 | 50 | 76 | | |
| Maximum HI | 32 | 33 | 30 | | | | | | 28 | 29 | 31 | 30 |
| Day:Hour | 5:15 | 7:16 | 25:16 | | | | | | 25:17 | 28:16 | 28:16 | 20:14 |
| Average HI | 29 | 30 | 28 | | | | | | 28 | 28 | 29 | 28 |
| Avg Del HI | 1 | 1 | 0 | | | | | | 0 | 0 | 1 | 0 |
| # Hours HI | 64 | 61 | 30 | | | | | | 11 | 8 | 28 | 7 |

- **WindChill/HeatIndex Temps -- statistics...only those different from Air Temps

- Monthly Statistics for Extreme temperatures °C

| #Days | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Max >= 32 | | | | | | | | | | | | |
| Max <= 0 | | | | | | | | | | | | |
| Min <= 0 | | | | | 1 | 2 | 2 | | | | | |
| Min <=-18 | | | | | | | | | | | | |

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| HDD base 10C | | 0 | 0 | 0 | 0 | 2 | 11 | 24 | 8 | 0 | 2 | 0 |
| HDD base 18C | | 1 | 8 | 2 | 51 | 107 | 147 | 171 | 137 | 83 | 125 | 34 |
| CDD base 10C | | 330 | 301 | 296 | 190 | 144 | 104 | 101 | 120 | 161 | 132 | 240 |
| CDD base 18C | | 82 | 85 | 50 | 1 | 1 | 0 | 0 | 1 | 4 | 7 | 34 |

| | | | | | | | | | | | | |
|--------------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CDH base 20C | 1390 | 1316 | 941 | 183 | 188 | 161 | 185 | 357 | 372 | 227 | 694 | 490 |
| CDH base 23C | 600 | 558 | 371 | 21 | 30 | 34 | 27 | 115 | 147 | 90 | 260 | 124 |
| CDH base 27C | 71 | 89 | 45 | 0 | 0 | 0 | 0 | 0 | 11 | 16 | 41 | 9 |

- 2360 annual cooling degree-days (10°C baseline)
- 46 annual heating degree-days (10°C baseline)
- 286 annual cooling degree-days (18°C baseline)
- 892 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|------|-------|-------|------|------|-------|------|------|-------|-------|-------|
| 4am | 97 | 98 | 98 | 99 | 99 | 98 | 97 | 97 | 97 | 97 | 97 | 96 |
| 10am | 81 | 86 | 89 | 92 | 92 | 93 | 93 | 90 | 87 | 86 | 85 | 78 |
| 3pm | 59 | 69 | 64 | 70 | 67 | 71 | 65 | 61 | 64 | 71 | 71 | 65 |
| 10pm | 91 | 95 | 94 | 97 | 94 | 94 | 93 | 91 | 93 | 95 | 94 | 93 |
| Maximum | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Day:Hour | 2:21 | 3:01 | 2:06 | 1:01 | 1:02 | 1:01 | 1:01 | 2:02 | 1:01 | 1:06 | 1:22 | 9:22 |
| Minimum | 38 | 48 | 33 | 42 | 33 | 46 | 32 | 35 | 27 | 35 | 42 | 36 |
| Day:Hour | 30:17 | 1:18 | 17:19 | 27:16 | 6:15 | 2:16 | 11:15 | 4:16 | 2:16 | 27:16 | 28:16 | 18:14 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2.0 | 2.1 | 1.9 | 1.6 | 1.5 | 1.4 | 1.3 | 1.3 | 1.5 | 1.4 | 1.8 | 1.7 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Direct Avg | 3968 | 3859 | 3164 | 2788 | 1891 | 2186 | 2416 | 3172 | 2729 | 2762 | 3260 | 4880 |
| Direct Max | 8678 | 7115 | 7040 | 6892 | 4440 | 4805 | 5186 | 6583 | 7042 | 8333 | 7957 | 11019 |
| Day | 16 | 25 | 5 | 19 | 5 | 2 | 30 | 17 | 22 | 11 | 27 | 16 |
| Diffuse Avg | 3253 | 3010 | 2599 | 2259 | 1789 | 1419 | 1309 | 1803 | 2189 | 2734 | 3306 | 3174 |

- Maximum Direct Solar of 11019 Wh/m² on Dec 16

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 136 | 125 | 108 | 105 | 111 | 112 | 109 | 120 | 119 | 97 | 129 | 98 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|------|------|------|-------|------|-------|-------|------|------|------|------|------|
| Maximum | 10.0 | 10.0 | 8.0 | 11.0 | 11.0 | 10.0 | 12.0 | 10.0 | 13.0 | 12.0 | 11.0 | 10.0 |
| Day:Hour | 1:18 | 7:19 | 1:18 | 28:15 | 4:15 | 14:13 | 15:14 | 6:12 | 3:15 | 5:11 | 8:16 | 2:18 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 1:02 | 1:06 | 1:05 | 1:07 | 1:03 | 1:01 | 1:24 | 3:23 | 1:01 | 3:15 | 1:08 | 1:10 |
| Daily Avg | 3.5 | 3.2 | 3.0 | 3.1 | 2.7 | 3.5 | 2.6 | 3.2 | 3.4 | 3.8 | 4.0 | 4.4 |

- Maximum Wind Speed of 13.0 m/s on Sep 3

- Minimum Wind Speed of 0.0 m/s on Jan 1

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 18.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |
| 2.0 m | 21.7 | 22.8 | 23.3 | 23.3 | 22.4 | 21.1 | 19.8 | 18.6 | 18.1 | 18.2 | 19.0 | 20.3 |
| 4.0 m | 20.9 | 21.8 | 22.3 | 22.5 | 22.1 | 21.4 | 20.5 | 19.6 | 19.0 | 18.9 | 19.3 | 20.0 |

- Climate type "Cfb" (Köppen classification)

- Marine west coastal (warm summer, mild winter, rain all year, lat. 35-60°S)

- Unbearably humid periods in summer, but passive cooling is possible

- Typical/Extreme Period Determination

- Summer is Jan:Mar

Extreme Summer Week (nearest maximum temperature for summer)

Extreme Hot Week Period selected: Feb 5:Feb 11, Maximum Temp= 31.00°C, Deviation=| 8.704|°C

Typical Summer Week (nearest average temperature for summer)

Typical Week Period selected: Mar 19:Mar 25, Average Temp= 20.30°C, Deviation=| 0.012|°C

- Winter is Jul:Sep
 - Extreme Winter Week (nearest minimum temperature for winter)
 - Extreme Cold Week Period selected: Jul 8:Jul 14, Minimum Temp= -2.10°C, Deviation=| 8.878|°C
 - Typical Winter Week (nearest average temperature for winter)
 - Typical Week Period selected: Jul 22:Jul 28, Average Temp= 13.81°C, Deviation=| 0.177|°C

- Autumn is Apr:Jun
 - Typical Autumn Week (nearest average temperature for autumn)
 - Typical Week Period selected: Apr 29:May 5, Average Temp= 14.68°C, Deviation=| 0.282|°C

- Spring is Oct:Dec
 - Typical Spring Week (nearest average temperature for spring)
 - Typical Week Period selected: Dec 24:Dec 30, Average Temp= 16.63°C, Deviation=| 0.307|°C

FLORIANÓPOLIS

Statistics for florianopolisCSV
 Location -- Florianopolis -TRY
 {S 27° 40'} {W 48° 32'} {GMT -3.0 Hours}
 Elevation -- 7m above sea level
 Standard Pressure at Elevation -- 101241Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

| | | |
|-------------|-----------|---------|
| Design Stat | HDB 99.6% | HDB 99% |
| Units | {C} | {C} |
| HEATING | 5.1 | 6.3 |

| | | | | | | |
|-------------|---------|--------|--------|---------|--------|--------|
| Design Stat | CDB .4% | CDB 1% | CDB 2% | CDP .4% | CDP 1% | CDP 2% |
| Units | {C} | {C} | {C} | {C} | {C} | {C} |
| COOLING | 34.3 | 32.8 | 31.6 | 27.7 | 26.4 | 25.8 |

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Maximum | 36.0 | 34.5 | 35.3 | 29.5 | 29.5 | 29.5 | 28.2 | 26.0 | 28.0 | 28.3 | 30.8 | 32.9 |
| Day:Hour | 8:15 | 19:15 | 7:16 | 22:14 | 2:13 | 30:16 | 10:17 | 27:16 | 18:14 | 14:13 | 25:16 | 31:14 |
| Minimum | 18.5 | 16.7 | 17.8 | 12.5 | 10.2 | 4.0 | 5.0 | 2.0 | 12.3 | 12.0 | 13.0 | 14.0 |
| Day:Hour | 19:06 | 21:07 | 30:06 | 23:08 | 21:08 | 21:08 | 23:22 | 6:08 | 17:01 | 1:05 | 11:05 | 22:07 |
| Daily Avg | 24.8 | 24.3 | 24.3 | 21.5 | 19.0 | 17.0 | 17.5 | 17.1 | 19.1 | 19.7 | 21.3 | 22.6 |

- Maximum Dry Bulb temperature of 36.0°C on Jan 8
- Minimum Dry Bulb temperature of 2.0°C on Aug 6

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 22.8 | 22.9 | 22.8 | 19.5 | 17.1 | 15.0 | 16.0 | 15.8 | 17.8 | 18.1 | 19.6 | 20.9 |
| 1:01- 2:00 | 22.7 | 22.7 | 22.7 | 19.3 | 16.7 | 14.7 | 15.8 | 15.6 | 17.8 | 18.0 | 19.5 | 20.7 |
| 2:01- 3:00 | 22.6 | 22.4 | 22.5 | 19.1 | 16.5 | 14.6 | 15.6 | 15.4 | 17.5 | 17.9 | 19.3 | 20.5 |
| 3:01- 4:00 | 22.6 | 22.3 | 22.4 | 19.0 | 16.4 | 14.5 | 15.4 | 15.4 | 17.3 | 17.9 | 19.3 | 20.2 |
| 4:01- 5:00 | 22.5 | 22.0 | 22.3 | 18.8 | 16.2 | 14.4 | 15.1 | 15.0 | 17.2 | 17.8 | 19.1 | 20.1 |
| 5:01- 6:00 | 22.4 | 21.8 | 22.1 | 18.4 | 15.8 | 14.1 | 14.8 | 14.8 | 17.2 | 17.6 | 19.0 | 20.1 |
| 6:01- 7:00 | 22.4 | 21.5 | 22.0 | 18.1 | 15.6 | 13.9 | 14.5 | 14.8 | 17.4 | 17.7 | 19.2 | 20.0 |
| 7:01- 8:00 | 23.5 | 22.2 | 22.6 | 17.9 | 15.6 | 13.8 | 14.5 | 15.0 | 17.7 | 18.5 | 20.2 | 21.3 |
| 8:01- 9:00 | 24.5 | 23.8 | 23.8 | 19.8 | 16.9 | 14.6 | 15.1 | 15.7 | 18.3 | 19.4 | 21.2 | 22.6 |
| 9:01-10:00 | 25.6 | 24.9 | 24.8 | 21.9 | 18.8 | 16.4 | 16.9 | 17.0 | 19.1 | 20.5 | 22.3 | 23.6 |
| 10:01-11:00 | 26.8 | 26.2 | 26.0 | 23.5 | 20.7 | 18.2 | 18.4 | 18.4 | 20.3 | 21.6 | 23.0 | 24.7 |
| 11:01-12:00 | 27.7 | 26.8 | 26.8 | 25.0 | 22.3 | 19.8 | 19.8 | 19.3 | 21.0 | 22.2 | 23.8 | 25.5 |
| 12:01-13:00 | 28.4 | 27.3 | 27.3 | 25.7 | 23.3 | 21.0 | 20.7 | 20.2 | 21.5 | 22.4 | 24.1 | 25.8 |
| 13:01-14:00 | 28.6 | 27.1 | 27.6 | 26.4 | 23.8 | 21.8 | 21.4 | 20.6 | 21.9 | 22.3 | 24.2 | 25.8 |
| 14:01-15:00 | 28.4 | 27.2 | 27.5 | 26.3 | 23.8 | 21.9 | 21.7 | 20.6 | 21.9 | 22.1 | 24.0 | 25.5 |
| 15:01-16:00 | 27.9 | 27.0 | 27.3 | 25.8 | 23.4 | 21.8 | 21.5 | 20.3 | 21.6 | 21.8 | 23.8 | 25.3 |
| 16:01-17:00 | 26.8 | 26.2 | 26.4 | 25.2 | 22.6 | 20.7 | 20.9 | 19.5 | 21.4 | 21.4 | 23.4 | 24.8 |
| 17:01-18:00 | 26.1 | 25.6 | 25.7 | 23.9 | 21.2 | 19.3 | 19.8 | 18.6 | 20.5 | 20.8 | 22.9 | 24.3 |
| 18:01-19:00 | 24.8 | 24.5 | 24.7 | 22.0 | 19.4 | 17.6 | 18.2 | 17.4 | 19.5 | 19.9 | 22.1 | 23.8 |
| 19:01-20:00 | 24.2 | 24.2 | 23.9 | 21.0 | 18.7 | 16.7 | 17.5 | 16.7 | 18.8 | 19.3 | 21.1 | 22.5 |
| 20:01-21:00 | 23.8 | 23.7 | 23.6 | 20.4 | 18.0 | 16.4 | 17.0 | 16.4 | 18.5 | 19.0 | 20.5 | 21.7 |
| 21:01-22:00 | 23.6 | 23.5 | 23.3 | 19.9 | 17.8 | 15.9 | 16.8 | 16.1 | 18.2 | 18.8 | 20.2 | 21.4 |
| 22:01-23:00 | 23.3 | 23.3 | 23.1 | 19.6 | 17.5 | 15.5 | 16.6 | 16.1 | 18.1 | 18.7 | 19.9 | 21.2 |
| 23:01-24:00 | 23.0 | 23.1 | 23.0 | 19.4 | 17.3 | 15.2 | 16.4 | 15.9 | 17.8 | 18.6 | 19.9 | 21.0 |
| Max Hour | 14 | 13 | 14 | 14 | 15 | 15 | 15 | 14 | 15 | 13 | 14 | 14 |
| Min Hour | 6 | 7 | 7 | 8 | 8 | 8 | 8 | 6 | 6 | 6 | 6 | 7 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|
| Maximum | 30.6 | 26.4 | 26.3 | 24.1 | 21.4 | 22.3 | 19.3 | 19.5 | 20.6 | 23.0 | 25.0 | 25.6 |
| Day:Hour | 27:14 | 5:13 | 17:15 | 9:14 | 2:17 | 11:14 | 11:15 | 29:15 | 26:17 | 31:17 | 26:13 | 9:17 |
| Minimum | 16.7 | 14.1 | 13.9 | 10.4 | 5.4 | 1.5 | 2.9 | -2.0 | 9.4 | 6.2 | 9.0 | 12.1 |
| Day:Hour | 17:10 | 8:06 | 28:15 | 17:08 | 4:12 | 21:08 | 23:08 | 6:12 | 30:23 | 1:10 | 21:20 | 22:07 |

Daily Avg 22.0 21.7 21.3 18.2 15.3 13.7 14.5 13.9 16.7 16.8 18.2 19.0

- Maximum Dew Point temperature of 30.6°C on Jan 27
- Minimum Dew Point temperature of -2.0°C on Aug 6

- Monthly Statistics for Wind Chill/Heat Index temperatures °C **

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------|-------|-------|------|------|------|-------|-------|------|-------|-------|-------|-------|
| Minimum WC | | | | | | 5 | 1 | 2 | | | | |
| Day:Hour | | | | | | 20:24 | 23:07 | 6:09 | | | | |
| Average WC | | | | | | 7 | 7 | 5 | | | | |
| Avg Del WC | | | | | | 1 | 1 | 2 | | | | |
| # Hours WC | | | | | | 16 | 15 | 15 | | | | |
| Maximum HI | 56 | 44 | 44 | 33 | 30 | 30 | 29 | | 28 | 31 | 37 | 40 |
| Day:Hour | 27:14 | 19:15 | 7:15 | 2:17 | 2:13 | 11:14 | 11:15 | | 18:15 | 31:17 | 25:16 | 31:14 |
| Average HI | 36 | 34 | 33 | 30 | 29 | 29 | 28 | | 28 | 30 | 31 | 32 |
| Avg Del HI | 6 | 5 | 4 | 2 | 1 | 1 | 1 | | 0 | 2 | 3 | 3 |
| # Hours HI | 174 | 117 | 146 | 60 | 6 | 5 | 10 | | 2 | 12 | 32 | 77 |

- **WindChill/HeatIndex Temps -- statistics...only those different from Air Temps

- Monthly Statistics for Extreme temperatures °C

| #Days | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Max >= 32 | 8 | 1 | 4 | | | | | | | | | 1 |
| Max <= 0 | | | | | | | | | | | | |
| Min <= 0 | | | | | | | | | | | | |
| Min <=-18 | | | | | | | | | | | | |

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| HDD base 10C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| HDD base 18C | | 0 | 0 | 0 | 0 | 11 | 49 | 39 | 46 | 10 | 9 | 0 |
| CDD base 10C | | 459 | 399 | 444 | 345 | 278 | 210 | 233 | 222 | 273 | 300 | 339 |
| CDD base 18C | | 211 | 175 | 196 | 105 | 41 | 19 | 23 | 18 | 42 | 61 | 99 |

| | | | | | | | | | | | | |
|--------------|------|------|------|------|-----|-----|-----|-----|-----|-----|------|------|
| CDH base 20C | 3586 | 2886 | 3287 | 1637 | 750 | 374 | 471 | 261 | 502 | 724 | 1390 | 2237 |
| CDH base 23C | 1700 | 1185 | 1486 | 590 | 182 | 74 | 134 | 27 | 94 | 168 | 417 | 813 |
| CDH base 27C | 439 | 207 | 292 | 47 | 6 | 6 | 7 | 0 | 2 | 7 | 35 | 111 |

- 3894 annual cooling degree-days (10°C baseline)
- 2 annual heating degree-days (10°C baseline)
- 1135 annual cooling degree-days (18°C baseline)
- 163 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|------|------|------|-------|------|-------|-------|-------|-------|------|-------|-------|
| 4am | 93 | 94 | 93 | 95 | 92 | 94 | 94 | 92 | 96 | 92 | 92 | 91 |
| 10am | 82 | 83 | 83 | 81 | 82 | 84 | 87 | 82 | 89 | 81 | 81 | 79 |
| 3pm | 78 | 80 | 75 | 67 | 63 | 65 | 69 | 69 | 79 | 78 | 76 | 72 |
| 10pm | 91 | 90 | 90 | 90 | 89 | 89 | 90 | 89 | 91 | 90 | 89 | 86 |
| Maximum | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Day:Hour | 9:02 | 1:01 | 9:22 | 4:04 | 1:07 | 3:06 | 1:06 | 9:07 | 2:24 | 3:18 | 1:01 | 9:05 |
| Minimum | 46 | 58 | 42 | 47 | 36 | 40 | 42 | 25 | 37 | 47 | 46 | 48 |
| Day:Hour | 9:15 | 4:12 | 7:14 | 22:14 | 4:15 | 21:15 | 10:17 | 12:15 | 18:14 | 7:11 | 11:11 | 29:12 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2.9 | 2.8 | 2.7 | 2.3 | 1.8 | 1.7 | 1.7 | 1.7 | 2.0 | 2.0 | 2.2 | 2.3 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Direct Avg | 3989 | 3749 | 2183 | 3661 | 2374 | 2060 | 1747 | 1818 | 1405 | 1837 | 2149 | 2722 |
| Direct Max | 9218 | 8966 | 5211 | 6166 | 4563 | 3376 | 4041 | 5072 | 6100 | 8394 | 7962 | 9642 |
| Day | 26 | 21 | 4 | 10 | 2 | 26 | 25 | 23 | 19 | 29 | 22 | 12 |
| Diffuse Avg | 3095 | 2962 | 2610 | 1778 | 1566 | 1277 | 1255 | 1762 | 2155 | 2339 | 3009 | 3077 |

- Maximum Direct Solar of 9642 Wh/m² on Dec 12

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 129 | 121 | 113 | 124 | 147 | 147 | 149 | 138 | 128 | 137 | 127 | 113 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|------|-------|-------|------|-------|-------|-------|-------|------|------|------|-------|
| Maximum | 10.0 | 8.0 | 9.0 | 9.0 | 9.0 | 9.0 | 10.0 | 11.0 | 10.0 | 12.0 | 9.0 | 12.0 |
| Day:Hour | 5:09 | 11:15 | 26:14 | 1:14 | 15:16 | 16:01 | 22:16 | 12:16 | 1:15 | 5:16 | 5:16 | 12:21 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 2:02 | 1:01 | 1:13 | 3:04 | 1:01 | 2:04 | 1:01 | 1:08 | 2:02 | 1:23 | 1:03 | 2:23 |
| Daily Avg | 3.4 | 2.5 | 2.9 | 2.2 | 2.5 | 2.4 | 2.5 | 2.9 | 2.7 | 3.2 | 3.2 | 3.3 |

- Maximum Wind Speed of 12.0 m/s on Oct 5

- Minimum Wind Speed of 0.0 m/s on Jan 2

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 18.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |
| 2.0 m | 21.7 | 22.8 | 23.3 | 23.3 | 22.4 | 21.1 | 19.8 | 18.6 | 18.1 | 18.2 | 19.0 | 20.3 |
| 4.0 m | 20.9 | 21.8 | 22.3 | 22.5 | 22.1 | 21.4 | 20.5 | 19.6 | 19.0 | 18.9 | 19.3 | 20.0 |

- Climate type "Cfa" (Köppen classification)

- Humid subtropical (mild with no dry season, hot summer, lat. 20-35°S)

- Unbearably humid periods in summer, but passive cooling is possible

- Typical/Extreme Period Determination

- Summer is Jan:Mar

Extreme Summer Week (nearest maximum temperature for summer)

Extreme Hot Week Period selected: Jan 1:Jan 7, Maximum Temp= 36.00°C, Deviation=| 9.353|°C

Typical Summer Week (nearest average temperature for summer)

Typical Week Period selected: Jan 29:Feb 4, Average Temp= 24.47°C, Deviation=| 0.112|°C

- Winter is Jul:Sep
 - Extreme Winter Week (nearest minimum temperature for winter)
 - Extreme Cold Week Period selected: Aug 5:Aug 11, Minimum Temp= 2.00°C, Deviation=|12.226|°C
 - Typical Winter Week (nearest average temperature for winter)
 - Typical Week Period selected: Aug 19:Aug 25, Average Temp= 17.89°C, Deviation=| 0.238|°C

- Autumn is Apr:Jun
 - Typical Autumn Week (nearest average temperature for autumn)
 - Typical Week Period selected: May 20:May 26, Average Temp= 19.15°C, Deviation=| 0.164|°C

- Spring is Oct:Dec
 - Typical Spring Week (nearest average temperature for spring)
 - Typical Week Period selected: Oct 8:Oct 14, Average Temp= 21.21°C, Deviation=| 0.090|°C

FORTALEZA

Statistics for fortalezaCSV

Location -- Fortaleza -TRY

{S 3° 46'} {W 38° 31'} {GMT -3.0 Hours}

Elevation -- 25m above sea level

Standard Pressure at Elevation -- 101025Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

Design Stat HDB 99.6% HDB 99%
Units {C} {C}
HEATING 20.4 21.1

Design Stat CDB .4% CDB 1% CDB 2% CDP .4% CDP 1% CDP 2%
Units {C} {C} {C} {C} {C} {C}
COOLING 31.7 31.5 31.3 26.5 26.0 25.9

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|-------|------|------|------|-------|-------|------|-------|------|-------|
| Maximum | 31.6 | 31.5 | 30.9 | 31.4 | 31.6 | 31.5 | 31.4 | 32.0 | 32.2 | 31.4 | 31.6 | 31.7 |
| Day:Hour | 24:14 | 20:12 | 16:15 | 2:13 | 5:13 | 3:13 | 1:13 | 1:13 | 3:13 | 18:12 | 2:14 | 17:14 |
| Minimum | 20.8 | 20.2 | 21.4 | 21.3 | 20.5 | 19.8 | 19.7 | 20.0 | 20.5 | 21.2 | 21.0 | 22.2 |
| Day:Hour | 7:07 | 7:07 | 4:06 | 6:07 | 8:07 | 8:07 | 18:07 | 17:07 | 7:07 | 7:06 | 7:07 | 5:06 |
| Daily Avg | 27.0 | 26.8 | 26.1 | 26.5 | 26.4 | 26.0 | 26.2 | 26.3 | 26.5 | 26.7 | 26.8 | 27.1 |

- Maximum Dry Bulb temperature of 32.2°C on Sep 3
- Minimum Dry Bulb temperature of 19.7°C on Jul 18

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 25.6 | 25.6 | 24.7 | 24.8 | 24.8 | 24.5 | 25.0 | 25.0 | 25.2 | 25.3 | 25.3 | 25.8 |
| 1:01- 2:00 | 25.4 | 25.4 | 24.5 | 24.7 | 24.5 | 24.3 | 24.8 | 24.8 | 24.9 | 25.2 | 25.2 | 25.6 |
| 2:01- 3:00 | 25.1 | 25.2 | 24.2 | 24.5 | 24.3 | 24.0 | 24.4 | 24.6 | 24.7 | 25.0 | 25.0 | 25.5 |
| 3:01- 4:00 | 24.7 | 24.9 | 24.0 | 24.1 | 24.1 | 23.7 | 24.0 | 24.3 | 24.4 | 24.8 | 24.8 | 25.2 |
| 4:01- 5:00 | 24.5 | 24.6 | 23.8 | 23.9 | 23.9 | 23.4 | 23.5 | 23.9 | 24.1 | 24.5 | 24.6 | 24.9 |
| 5:01- 6:00 | 24.1 | 24.4 | 23.7 | 23.7 | 23.4 | 23.1 | 22.9 | 23.4 | 23.9 | 24.2 | 24.2 | 24.5 |
| 6:01- 7:00 | 23.7 | 24.3 | 23.5 | 23.8 | 23.2 | 22.7 | 22.8 | 23.2 | 23.8 | 24.1 | 24.4 | 24.6 |
| 7:01- 8:00 | 25.0 | 25.1 | 24.2 | 24.9 | 24.6 | 23.9 | 23.9 | 24.0 | 24.8 | 25.3 | 25.6 | 25.6 |
| 8:01- 9:00 | 27.2 | 26.5 | 25.7 | 26.6 | 26.2 | 25.6 | 26.2 | 25.8 | 26.4 | 26.5 | 27.0 | 27.0 |
| 9:01-10:00 | 28.6 | 27.5 | 26.8 | 27.7 | 27.8 | 26.8 | 27.5 | 27.3 | 27.4 | 27.8 | 28.0 | 28.2 |
| 10:01-11:00 | 29.2 | 28.2 | 27.8 | 28.7 | 28.9 | 27.9 | 28.7 | 28.4 | 28.6 | 28.9 | 28.8 | 29.1 |
| 11:01-12:00 | 29.9 | 29.0 | 28.9 | 29.4 | 29.4 | 28.9 | 29.4 | 29.2 | 29.2 | 29.5 | 29.3 | 29.6 |
| 12:01-13:00 | 30.0 | 29.4 | 29.2 | 29.7 | 29.8 | 29.4 | 29.4 | 29.7 | 29.5 | 29.7 | 29.6 | 30.0 |
| 13:01-14:00 | 29.8 | 29.7 | 29.0 | 29.8 | 29.9 | 29.6 | 29.5 | 29.8 | 29.6 | 29.7 | 30.0 | 30.2 |
| 14:01-15:00 | 29.9 | 29.8 | 29.1 | 29.6 | 29.8 | 29.6 | 29.5 | 29.5 | 29.4 | 29.5 | 29.7 | 30.0 |
| 15:01-16:00 | 29.6 | 29.5 | 28.7 | 29.2 | 29.4 | 29.0 | 29.0 | 29.0 | 29.0 | 29.1 | 29.4 | 29.6 |
| 16:01-17:00 | 29.0 | 28.8 | 27.9 | 28.6 | 28.6 | 28.4 | 28.3 | 28.3 | 28.3 | 28.4 | 28.6 | 28.8 |
| 17:01-18:00 | 28.0 | 28.1 | 27.3 | 27.6 | 27.7 | 27.5 | 27.4 | 27.3 | 27.4 | 27.5 | 27.7 | 27.8 |
| 18:01-19:00 | 27.2 | 27.1 | 26.5 | 26.7 | 26.7 | 26.3 | 26.3 | 26.3 | 26.4 | 26.5 | 26.7 | 27.0 |
| 19:01-20:00 | 26.7 | 26.7 | 26.1 | 26.2 | 26.1 | 25.8 | 25.9 | 25.7 | 25.9 | 26.1 | 26.2 | 26.6 |
| 20:01-21:00 | 26.4 | 26.4 | 25.7 | 25.8 | 25.8 | 25.6 | 25.6 | 25.6 | 25.7 | 25.8 | 26.1 | 26.4 |
| 21:01-22:00 | 26.3 | 26.2 | 25.4 | 25.6 | 25.3 | 25.4 | 25.3 | 25.3 | 25.5 | 25.7 | 25.9 | 26.2 |
| 22:01-23:00 | 26.2 | 26.0 | 25.2 | 25.4 | 25.2 | 25.0 | 25.1 | 25.1 | 25.4 | 25.5 | 25.8 | 26.1 |
| 23:01-24:00 | 26.1 | 25.7 | 24.9 | 25.0 | 25.0 | 24.8 | 25.0 | 25.1 | 25.3 | 25.4 | 25.6 | 26.0 |
| Max Hour | 13 | 15 | 13 | 14 | 14 | 14 | 14 | 14 | 14 | 13 | 14 | 14 |
| Min Hour | 7 | 7 | 7 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 6 | 6 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

Min <=-18

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
|--------------|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|
| HDD base 10C | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HDD base 18C | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CDD base 10C | | | 527 | 472 | 499 | 495 | 509 | 481 | 503 | 504 | 494 | 517 | 504 | 530 |
| CDD base 18C | | | 279 | 248 | 251 | 255 | 261 | 241 | 255 | 256 | 254 | 269 | 264 | 282 |
| CDH base 20C | | | 5215 | 4599 | 4546 | 4680 | 4783 | 4356 | 4636 | 4668 | 4645 | 4962 | 4904 | 5273 |
| CDH base 23C | | | 3003 | 2597 | 2331 | 2539 | 2571 | 2268 | 2470 | 2482 | 2499 | 2745 | 2760 | 3045 |
| CDH base 27C | | | 715 | 580 | 459 | 585 | 583 | 467 | 513 | 512 | 511 | 562 | 572 | 675 |

- 6036 annual cooling degree-days (10°C baseline)

- 0 annual heating degree-days (10°C baseline)

- 3116 annual cooling degree-days (18°C baseline)

- 0 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|------|-------|-------|------|-------|------|-------|------|------|-------|------|
| 4am | 92 | 92 | 95 | 95 | 95 | 94 | 93 | 91 | 92 | 89 | 90 | 91 |
| 10am | 79 | 83 | 85 | 83 | 81 | 81 | 79 | 78 | 79 | 77 | 79 | 80 |
| 3pm | 74 | 76 | 77 | 77 | 75 | 73 | 74 | 71 | 74 | 71 | 74 | 73 |
| 10pm | 87 | 87 | 91 | 91 | 91 | 89 | 89 | 88 | 88 | 86 | 88 | 87 |
| Maximum | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 99 | 99 | 100 | 100 | 100 |
| Day:Hour | 30:04 | 4:11 | 13:07 | 13:03 | 4:06 | 5:07 | 5:07 | 4:04 | 4:08 | 5:07 | 2:05 | 6:08 |
| Minimum | 64 | 66 | 64 | 65 | 60 | 62 | 62 | 55 | 60 | 60 | 61 | 63 |
| Day:Hour | 19:12 | 2:16 | 7:13 | 2:13 | 8:11 | 20:14 | 9:12 | 17:12 | 7:13 | 7:13 | 15:14 | 8:13 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 3.1 | 3.1 | 3.0 | 3.1 | 3.1 | 2.9 | 3.0 | 2.9 | 3.0 | 2.9 | 3.0 | 3.0 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Direct Avg | 4566 | 4282 | 3968 | 4053 | 4419 | 4408 | 4462 | 4742 | 5107 | 4090 | 4146 | 3744 |
| Direct Max | 7393 | 7139 | 8044 | 8262 | 8627 | 8104 | 6939 | 8552 | 7140 | 6493 | 6598 | 7110 |
| Day | 20 | 19 | 29 | 3 | 3 | 3 | 3 | 3 | 22 | 9 | 30 | 14 |
| Diffuse Avg | 2486 | 2627 | 2744 | 2522 | 2240 | 2069 | 2040 | 2255 | 2285 | 2589 | 2511 | 2561 |

- Maximum Direct Solar of 8627 Wh/m² on May 3

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 75 | 80 | 76 | 77 | 83 | 87 | 88 | 103 | 113 | 105 | 96 | 95 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|------|------|------|------|------|-------|-------|-------|------|------|
| Maximum | 9.0 | 9.0 | 8.0 | 9.0 | 10.0 | 9.0 | 9.0 | 8.0 | 9.0 | 10.0 | 8.0 | 9.0 |
| Day:Hour | 10:17 | 12:12 | 2:17 | 9:16 | 9:12 | 9:15 | 9:12 | 13:11 | 16:11 | 24:14 | 8:16 | 9:12 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 1:01 | 2:21 | 1:05 | 1:06 | 1:01 | 1:01 | 1:06 | 2:04 | 1:23 | 1:01 | 1:02 | 1:01 |
| Daily Avg | 2.7 | 2.6 | 2.1 | 2.3 | 2.3 | 2.5 | 2.7 | 3.3 | 3.8 | 3.7 | 3.3 | 3.4 |

- Maximum Wind Speed of 10.0 m/s on May 9

- Minimum Wind Speed of 0.0 m/s on Jan 1

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 18.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |

| | | | | | | | | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 2.0 m | 21.7 | 22.8 | 23.3 | 23.3 | 22.4 | 21.1 | 19.8 | 18.6 | 18.1 | 18.2 | 19.0 | 20.3 |
| 4.0 m | 20.9 | 21.8 | 22.3 | 22.5 | 22.1 | 21.4 | 20.5 | 19.6 | 19.0 | 18.9 | 19.3 | 20.0 |

- Climate type "Af" (Köppen classification)
- Tropical wet (no dry season, rainforest, hot all year, lat. < 10°)
- Heating may not be required

- Typical/Extreme Period Determination
- No dry season.....
 - Week closest to average annual temperature selected for Typical Period
 - Typical Week Period selected: Sep 24:Sep 30, Average Temp= 26.54°C, Deviation=| 0.110|°C
 - Week closest to maximum annual temperature selected for Typical Period
 - Extreme Hot Week Period selected: Dec 17:Dec 23, Maximum Temp= 32.20°C, Deviation=| 4.395|°C
 - Week closest to minimum annual temperature selected for Typical Period
 - Extreme Cold Week Period selected: Mar 19:Mar 25, Minimum Temp= 19.70°C, Deviation=| 5.568|°C

MACEIÓ

Statistics for maceioCSV

Location -- Maceio -TRY

{S 9° 31'} {W 35° 46'} {GMT -3.0 Hours}

Elevation -- 115m above sea level

Standard Pressure at Elevation -- 99951Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

Design Stat HDB 99.6% HDB 99%
Units {C} {C}
HEATING 16.4 17.2

Design Stat CDB .4% CDB 1% CDB 2% CDP .4% CDP 1% CDP 2%
Units {C} {C} {C} {C} {C} {C}
COOLING 33.4 32.6 32.0 23.7 23.4 23.3

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|------|-------|------|-------|-------|-------|-------|-------|-------|------|
| Maximum | 34.8 | 33.5 | 33.3 | 31.1 | 30.6 | 29.0 | 28.7 | 29.0 | 29.1 | 30.8 | 32.6 | 33.0 |
| Day:Hour | 13:14 | 25:14 | 8:14 | 4:14 | 6:14 | 11:13 | 28:14 | 25:12 | 25:14 | 6:13 | 12:12 | 5:13 |
| Minimum | 19.2 | 20.2 | 20.0 | 20.1 | 19.1 | 17.8 | 17.0 | 16.0 | 15.8 | 18.4 | 19.0 | 20.0 |
| Day:Hour | 19:06 | 1:06 | 3:07 | 13:06 | 2:07 | 19:06 | 11:06 | 17:06 | 15:06 | 10:06 | 2:06 | 4:06 |
| Daily Avg | 25.9 | 25.9 | 25.6 | 24.8 | 24.0 | 22.9 | 22.3 | 22.3 | 22.9 | 24.2 | 24.9 | 25.4 |

- Maximum Dry Bulb temperature of 34.8°C on Jan 13
- Minimum Dry Bulb temperature of 15.8°C on Sep 15

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 22.8 | 23.2 | 23.2 | 22.4 | 22.1 | 21.7 | 20.2 | 20.2 | 20.5 | 21.5 | 22.0 | 22.7 |
| 1:01- 2:00 | 22.5 | 22.9 | 23.0 | 22.2 | 21.9 | 21.6 | 20.0 | 20.0 | 20.4 | 21.3 | 21.7 | 22.5 |
| 2:01- 3:00 | 22.2 | 22.6 | 22.7 | 22.0 | 21.7 | 21.4 | 20.0 | 19.7 | 20.1 | 21.0 | 21.4 | 22.3 |
| 3:01- 4:00 | 21.9 | 22.3 | 22.4 | 21.8 | 21.5 | 21.2 | 19.8 | 19.4 | 19.8 | 20.8 | 21.2 | 22.1 |
| 4:01- 5:00 | 21.6 | 22.1 | 22.2 | 21.6 | 21.4 | 21.0 | 19.7 | 19.2 | 19.6 | 20.5 | 21.0 | 21.8 |
| 5:01- 6:00 | 21.3 | 21.9 | 22.1 | 21.4 | 21.2 | 20.8 | 19.5 | 19.0 | 19.5 | 20.4 | 20.8 | 21.8 |
| 6:01- 7:00 | 22.2 | 22.2 | 22.2 | 21.4 | 21.3 | 20.8 | 19.5 | 19.2 | 19.7 | 21.2 | 22.3 | 22.5 |
| 7:01- 8:00 | 24.2 | 24.1 | 23.6 | 22.9 | 22.5 | 21.6 | 20.7 | 20.5 | 21.5 | 23.4 | 24.3 | 24.5 |
| 8:01- 9:00 | 26.8 | 26.6 | 26.2 | 25.1 | 24.5 | 22.9 | 22.3 | 22.6 | 23.9 | 25.8 | 26.5 | 26.5 |
| 9:01-10:00 | 28.3 | 28.1 | 27.9 | 26.8 | 25.8 | 24.3 | 23.8 | 24.6 | 25.5 | 26.9 | 27.3 | 27.8 |
| 10:01-11:00 | 29.5 | 29.3 | 28.6 | 27.7 | 26.6 | 24.8 | 24.7 | 25.2 | 26.3 | 28.0 | 28.6 | 28.9 |
| 11:01-12:00 | 30.5 | 30.1 | 29.2 | 28.4 | 27.2 | 25.1 | 25.5 | 26.1 | 26.7 | 28.5 | 29.3 | 29.6 |
| 12:01-13:00 | 31.1 | 30.7 | 29.4 | 28.9 | 27.4 | 25.2 | 25.8 | 26.1 | 26.7 | 28.7 | 29.7 | 30.0 |
| 13:01-14:00 | 31.3 | 31.0 | 29.7 | 28.8 | 27.3 | 25.3 | 25.8 | 26.0 | 26.7 | 28.7 | 29.6 | 29.8 |
| 14:01-15:00 | 31.1 | 30.7 | 29.4 | 28.7 | 27.2 | 25.2 | 25.5 | 25.8 | 26.4 | 28.4 | 29.5 | 29.6 |
| 15:01-16:00 | 30.4 | 29.9 | 29.0 | 28.3 | 26.8 | 24.8 | 25.1 | 25.5 | 25.9 | 27.9 | 28.7 | 28.8 |
| 16:01-17:00 | 29.3 | 29.2 | 28.4 | 27.3 | 26.1 | 24.5 | 24.5 | 24.9 | 25.2 | 26.9 | 27.6 | 28.0 |
| 17:01-18:00 | 27.9 | 27.9 | 27.2 | 26.3 | 25.1 | 23.5 | 23.6 | 23.7 | 24.2 | 25.6 | 26.3 | 26.7 |
| 18:01-19:00 | 26.3 | 26.4 | 26.1 | 25.0 | 24.0 | 22.8 | 22.6 | 22.4 | 23.1 | 24.2 | 24.8 | 25.6 |
| 19:01-20:00 | 25.1 | 25.2 | 25.2 | 24.3 | 23.5 | 22.5 | 21.8 | 21.7 | 22.1 | 23.4 | 23.9 | 24.6 |
| 20:01-21:00 | 24.5 | 24.7 | 24.6 | 23.8 | 23.2 | 22.3 | 21.4 | 21.3 | 21.7 | 22.8 | 23.5 | 24.1 |
| 21:01-22:00 | 24.0 | 24.3 | 24.2 | 23.4 | 22.8 | 22.2 | 21.0 | 21.0 | 21.3 | 22.4 | 23.1 | 23.7 |
| 22:01-23:00 | 23.6 | 23.9 | 23.9 | 23.1 | 22.5 | 21.9 | 20.7 | 20.8 | 21.0 | 22.0 | 22.7 | 23.3 |
| 23:01-24:00 | 23.2 | 23.6 | 23.5 | 22.7 | 22.3 | 21.9 | 20.3 | 20.6 | 20.9 | 21.7 | 22.3 | 23.0 |
| Max Hour | 14 | 14 | 14 | 13 | 13 | 14 | 13 | 13 | 13 | 13 | 13 | 13 |
| Min Hour | 6 | 6 | 6 | 6 | 6 | 7 | 6 | 6 | 6 | 6 | 6 | 6 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

Min <=-18

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|--------------|-----|------|------|------|------|------|------|------|------|------|------|------|------|
| HDD base 10C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HDD base 18C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CDD base 10C | | 493 | 447 | 483 | 443 | 433 | 387 | 380 | 382 | 386 | 442 | 448 | 478 |
| CDD base 18C | | 245 | 223 | 235 | 203 | 185 | 147 | 132 | 134 | 146 | 194 | 208 | 230 |
| CDH base 20C | | 4392 | 3996 | 4151 | 3430 | 2965 | 2102 | 1823 | 1898 | 2187 | 3181 | 3546 | 4037 |
| CDH base 23C | | 2378 | 2126 | 2053 | 1553 | 1136 | 542 | 572 | 687 | 866 | 1484 | 1755 | 2010 |
| CDH base 27C | | 825 | 692 | 521 | 312 | 150 | 15 | 13 | 18 | 66 | 289 | 450 | 553 |

- 5200 annual cooling degree-days (10°C baseline)

- 0 annual heating degree-days (10°C baseline)

- 2280 annual cooling degree-days (18°C baseline)

- 0 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|
| 4am | 93 | 93 | 94 | 96 | 96 | 96 | 96 | 96 | 96 | 95 | 94 | 94 |
| 10am | 65 | 69 | 72 | 78 | 81 | 84 | 82 | 76 | 73 | 66 | 67 | 67 |
| 3pm | 56 | 58 | 64 | 67 | 73 | 80 | 72 | 68 | 67 | 61 | 59 | 60 |
| 10pm | 83 | 85 | 88 | 91 | 93 | 94 | 93 | 92 | 91 | 89 | 86 | 88 |
| Maximum | 99 | 98 | 100 | 99 | 100 | 100 | 100 | 100 | 100 | 99 | 100 | 100 |
| Day:Hour | 22:01 | 16:09 | 29:13 | 9:19 | 15:06 | 4:24 | 5:05 | 6:04 | 4:06 | 30:08 | 29:08 | 31:05 |
| Minimum | 42 | 48 | 47 | 52 | 57 | 56 | 47 | 43 | 42 | 48 | 46 | 45 |
| Day:Hour | 14:13 | 1:14 | 7:13 | 21:15 | 2:16 | 19:15 | 13:13 | 23:16 | 8:16 | 26:13 | 12:12 | 5:13 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2.5 | 2.5 | 2.6 | 2.6 | 2.5 | 2.5 | 2.3 | 2.2 | 2.2 | 2.3 | 2.4 | 2.4 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Direct Avg | 5993 | 5010 | 5420 | 3789 | 3199 | 2302 | 2837 | 3267 | 4626 | 5274 | 5674 | 5562 |
| Direct Max | 8214 | 7056 | 8630 | 6913 | 6443 | 5671 | 5289 | 6594 | 8106 | 8414 | 7936 | 9394 |
| Day | 13 | 4 | 6 | 6 | 7 | 11 | 20 | 25 | 22 | 5 | 16 | 5 |
| Diffuse Avg | 2439 | 2738 | 2446 | 2405 | 2395 | 2354 | 2013 | 2244 | 2362 | 2238 | 2309 | 2489 |

- Maximum Direct Solar of 9394 Wh/m² on Dec 5

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 56 | 56 | 55 | 60 | 58 | 79 | 67 | 64 | 64 | 59 | 53 | 57 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|------|------|------|------|-------|-------|-------|------|------|------|-------|------|
| Maximum | 9.0 | 8.0 | 8.0 | 6.0 | 8.0 | 9.0 | 8.0 | 9.0 | 8.0 | 8.0 | 9.0 | 8.0 |
| Day:Hour | 6:16 | 4:16 | 8:18 | 1:15 | 10:11 | 27:16 | 15:13 | 4:12 | 4:16 | 2:12 | 11:16 | 5:18 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:06 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 |
| Daily Avg | 2.8 | 2.2 | 1.8 | 1.5 | 1.6 | 2.1 | 1.6 | 1.8 | 2.0 | 2.2 | 2.5 | 2.4 |

- Maximum Wind Speed of 9.0 m/s on Jan 6

- Minimum Wind Speed of 0.0 m/s on Jan 1

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 18.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |

| | | | | | | | | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 2.0 m | 21.7 | 22.8 | 23.3 | 23.3 | 22.4 | 21.1 | 19.8 | 18.6 | 18.1 | 18.2 | 19.0 | 20.3 |
| 4.0 m | 20.9 | 21.8 | 22.3 | 22.5 | 22.1 | 21.4 | 20.5 | 19.6 | 19.0 | 18.9 | 19.3 | 20.0 |

- Climate type "Am" (Köppen classification)
- Tropical monsoonal or tradewind-coastal (short dry season, lat. 5-25°)
- Heating may not be required

- Typical/Extreme Period Determination
- No discernible dry period.....
 - Week closest to average annual temperature selected for Typical Period
 - Typical Week Period selected: Apr 9:Apr 15, Average Temp= 24.25°C, Deviation=| 0.007|°C
- Extremes Selected from annual Min/Max
 - Week closest to maximum annual temperature selected for Typical Period
 - Extreme Hot Week Period selected: Mar 5:Mar 11, Maximum Temp= 34.80°C, Deviation=| 8.452|°C
 - Week closest to minimum annual temperature selected for Typical Period
 - Extreme Cold Week Period selected: Jul 30:Aug 5, Minimum Temp= 15.80°C, Deviation=| 6.087|°C

NATAL

Statistics for natalCSV

Location -- Natal -TRY

{S 5° 55'} {W 35° 15'} {GMT -3.0 Hours}

Elevation -- 49m above sea level

Standard Pressure at Elevation -- 100738Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

Design Stat HDB 99.6% HDB 99%
Units {C} {C}
HEATING 19.1 19.5

Design Stat CDB .4% CDB 1% CDB 2% CDP .4% CDP 1% CDP 2%
Units {C} {C} {C} {C} {C} {C}
COOLING 31.9 31.7 31.5 24.8 24.4 24.2

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| Maximum | 32.0 | 32.3 | 32.6 | 31.5 | 30.9 | 30.2 | 29.8 | 29.4 | 30.2 | 31.7 | 31.4 | 31.2 |
| Day:Hour | 2:13 | 9:12 | 27:14 | 7:13 | 3:14 | 1:12 | 11:14 | 4:13 | 26:13 | 19:13 | 8:14 | 8:14 |
| Minimum | 22.4 | 21.8 | 22.4 | 21.6 | 21.4 | 21.0 | 19.0 | 18.7 | 19.2 | 20.8 | 20.0 | 21.6 |
| Day:Hour | 3:07 | 4:06 | 9:05 | 30:06 | 17:06 | 27:06 | 27:07 | 22:07 | 2:06 | 13:07 | 26:06 | 1:06 |
| Daily Avg | 26.8 | 27.1 | 27.0 | 25.9 | 25.3 | 24.6 | 23.9 | 24.1 | 24.7 | 26.0 | 26.2 | 26.7 |

- Maximum Dry Bulb temperature of 32.6°C on Mar 27
- Minimum Dry Bulb temperature of 18.7°C on Aug 22

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 25.3 | 25.5 | 25.5 | 24.3 | 23.4 | 23.0 | 21.8 | 22.0 | 22.6 | 24.0 | 24.3 | 24.8 |
| 1:01- 2:00 | 25.1 | 25.2 | 25.1 | 24.0 | 23.1 | 22.7 | 21.5 | 21.7 | 22.2 | 23.9 | 24.2 | 24.7 |
| 2:01- 3:00 | 24.9 | 24.9 | 24.6 | 23.6 | 22.9 | 22.5 | 21.3 | 21.4 | 22.0 | 23.7 | 24.1 | 24.4 |
| 3:01- 4:00 | 24.7 | 24.6 | 24.2 | 23.3 | 22.7 | 22.3 | 21.2 | 21.1 | 21.8 | 23.5 | 24.0 | 24.3 |
| 4:01- 5:00 | 24.5 | 24.3 | 23.9 | 23.1 | 22.6 | 22.2 | 21.1 | 20.9 | 21.6 | 23.2 | 23.7 | 24.2 |
| 5:01- 6:00 | 24.4 | 23.8 | 23.7 | 22.9 | 22.6 | 22.0 | 21.0 | 20.7 | 21.4 | 22.9 | 23.4 | 23.8 |
| 6:01- 7:00 | 24.4 | 23.8 | 23.7 | 23.0 | 22.7 | 22.2 | 21.1 | 20.7 | 21.6 | 23.4 | 23.8 | 24.1 |
| 7:01- 8:00 | 25.7 | 25.2 | 25.4 | 24.2 | 24.0 | 23.4 | 22.3 | 22.1 | 23.2 | 25.1 | 25.4 | 25.9 |
| 8:01- 9:00 | 27.3 | 27.5 | 27.5 | 26.4 | 25.7 | 24.6 | 24.0 | 24.5 | 25.3 | 27.3 | 27.3 | 27.8 |
| 9:01-10:00 | 28.2 | 28.7 | 28.7 | 27.4 | 26.9 | 25.8 | 25.3 | 25.9 | 26.5 | 28.3 | 28.2 | 28.8 |
| 10:01-11:00 | 28.9 | 29.7 | 29.5 | 28.3 | 27.8 | 26.7 | 26.2 | 26.9 | 27.5 | 29.0 | 28.8 | 29.4 |
| 11:01-12:00 | 29.3 | 30.5 | 30.2 | 29.2 | 28.4 | 27.4 | 27.0 | 27.4 | 28.4 | 29.4 | 29.3 | 29.8 |
| 12:01-13:00 | 29.8 | 30.8 | 30.5 | 29.6 | 28.7 | 27.5 | 27.6 | 28.1 | 28.7 | 29.5 | 29.3 | 30.0 |
| 13:01-14:00 | 29.9 | 30.8 | 30.4 | 29.3 | 28.6 | 27.6 | 27.5 | 28.1 | 28.8 | 29.4 | 29.5 | 30.0 |
| 14:01-15:00 | 29.4 | 30.5 | 30.1 | 29.1 | 28.6 | 27.7 | 27.5 | 28.1 | 28.4 | 29.2 | 29.3 | 29.8 |
| 15:01-16:00 | 29.1 | 30.0 | 29.8 | 28.4 | 28.1 | 27.4 | 27.3 | 27.5 | 27.9 | 28.7 | 28.8 | 29.3 |
| 16:01-17:00 | 28.5 | 29.1 | 29.1 | 28.0 | 27.3 | 26.9 | 26.5 | 26.5 | 26.9 | 27.7 | 27.9 | 28.7 |
| 17:01-18:00 | 27.6 | 28.0 | 28.3 | 27.0 | 26.3 | 25.9 | 25.4 | 25.5 | 25.9 | 26.5 | 26.7 | 27.5 |
| 18:01-19:00 | 26.5 | 27.2 | 27.2 | 26.1 | 25.6 | 25.0 | 24.4 | 24.4 | 24.9 | 25.3 | 25.6 | 26.2 |
| 19:01-20:00 | 26.1 | 26.6 | 26.6 | 25.6 | 25.1 | 24.4 | 23.6 | 23.8 | 24.3 | 24.9 | 25.2 | 25.7 |
| 20:01-21:00 | 25.9 | 26.4 | 26.4 | 25.3 | 24.7 | 23.9 | 23.3 | 23.4 | 24.0 | 24.7 | 25.0 | 25.4 |
| 21:01-22:00 | 25.8 | 26.2 | 26.3 | 25.0 | 24.4 | 23.7 | 22.8 | 23.1 | 23.7 | 24.6 | 24.8 | 25.2 |
| 22:01-23:00 | 25.6 | 26.1 | 26.0 | 24.7 | 24.1 | 23.4 | 22.4 | 22.7 | 23.4 | 24.5 | 24.7 | 25.1 |
| 23:01-24:00 | 25.5 | 25.9 | 25.8 | 24.5 | 23.7 | 23.2 | 22.0 | 22.4 | 23.0 | 24.2 | 24.5 | 25.0 |
| Max Hour | 14 | 14 | 13 | 13 | 13 | 15 | 13 | 15 | 14 | 13 | 14 | 14 |
| Min Hour | 6 | 7 | 7 | 6 | 6 | 6 | 6 | 7 | 6 | 6 | 6 | 6 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

Min <=-18

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|--------------|-----|------|------|------|------|------|------|------|------|------|------|------|------|
| HDD base 10C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HDD base 18C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CDD base 10C | | 520 | 480 | 528 | 478 | 475 | 439 | 432 | 438 | 442 | 495 | 485 | 517 |
| CDD base 18C | | 272 | 256 | 280 | 238 | 227 | 199 | 184 | 190 | 202 | 247 | 245 | 269 |
| CDH base 20C | | 5035 | 4793 | 5225 | 4264 | 3968 | 3341 | 2928 | 3076 | 3420 | 4431 | 4434 | 4957 |
| CDH base 23C | | 2806 | 2782 | 2998 | 2136 | 1827 | 1352 | 1176 | 1298 | 1551 | 2246 | 2310 | 2740 |
| CDH base 27C | | 598 | 741 | 810 | 492 | 358 | 181 | 147 | 181 | 264 | 484 | 479 | 656 |

- 5727 annual cooling degree-days (10°C baseline)

- 0 annual heating degree-days (10°C baseline)

- 2807 annual cooling degree-days (18°C baseline)

- 0 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 4am | 87 | 89 | 92 | 95 | 95 | 95 | 94 | 95 | 92 | 84 | 83 | 83 |
| 10am | 73 | 71 | 74 | 80 | 79 | 82 | 79 | 80 | 75 | 65 | 66 | 65 |
| 3pm | 66 | 62 | 66 | 70 | 71 | 73 | 69 | 70 | 67 | 62 | 61 | 61 |
| 10pm | 82 | 82 | 83 | 88 | 89 | 90 | 90 | 89 | 87 | 80 | 80 | 81 |
| Maximum | 100 | 100 | 99 | 100 | 99 | 100 | 99 | 99 | 99 | 96 | 96 | 92 |
| Day:Hour | 22:06 | 15:06 | 7:09 | 2:16 | 7:16 | 16:03 | 16:24 | 10:06 | 9:05 | 19:05 | 10:22 | 7:21 |
| Minimum | 51 | 51 | 50 | 50 | 56 | 59 | 44 | 58 | 53 | 46 | 46 | 51 |
| Day:Hour | 15:14 | 26:16 | 27:14 | 14:14 | 18:15 | 17:14 | 2:13 | 12:14 | 29:14 | 2:13 | 8:14 | 20:11 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2.7 | 2.7 | 2.8 | 2.8 | 2.7 | 2.6 | 2.5 | 2.6 | 2.5 | 2.4 | 2.4 | 2.5 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Direct Avg | 4501 | 4706 | 4309 | 3317 | 2969 | 3171 | 3315 | 2907 | 3500 | 4456 | 4870 | 4718 |
| Direct Max | 8100 | 7936 | 8410 | 7086 | 5934 | 7437 | 6998 | 5559 | 6155 | 7931 | 7091 | 7876 |
| Day | 22 | 2 | 15 | 27 | 16 | 17 | 2 | 29 | 5 | 13 | 9 | 17 |
| Diffuse Avg | 2751 | 2656 | 2746 | 2813 | 2602 | 2319 | 2151 | 2569 | 2748 | 2711 | 2529 | 2595 |

- Maximum Direct Solar of 8410 Wh/m² on Mar 15

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 109 | 97 | 124 | 158 | 163 | 153 | 166 | 134 | 146 | 108 | 110 | 102 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|------|------|------|-------|-------|-------|------|-------|-------|-------|------|------|
| Maximum | 8.0 | 8.0 | 10.0 | 9.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 8.0 | 9.0 |
| Day:Hour | 1:17 | 2:17 | 2:19 | 12:11 | 16:11 | 21:10 | 1:15 | 12:10 | 11:13 | 31:12 | 1:13 | 5:14 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 8:08 | 1:01 | 1:05 | 1:01 | 2:05 | 1:20 | 4:03 | 2:03 | 1:03 | 1:01 | 1:01 | 2:01 |
| Daily Avg | 3.5 | 2.9 | 3.0 | 3.3 | 3.9 | 3.6 | 4.2 | 3.6 | 4.2 | 3.9 | 4.1 | 3.7 |

- Maximum Wind Speed of 10.0 m/s on Mar 2

- Minimum Wind Speed of 0.0 m/s on Jan 8

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 18.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |

| | | | | | | | | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 2.0 m | 21.7 | 22.8 | 23.3 | 23.3 | 22.4 | 21.1 | 19.8 | 18.6 | 18.1 | 18.2 | 19.0 | 20.3 |
| 4.0 m | 20.9 | 21.8 | 22.3 | 22.5 | 22.1 | 21.4 | 20.5 | 19.6 | 19.0 | 18.9 | 19.3 | 20.0 |

- Climate type "Af" (Köppen classification)
- Tropical wet (no dry season, rainforest, hot all year, lat. < 10°)
- Heating may not be required

- Typical/Extreme Period Determination
- No dry season.....
 - Week closest to average annual temperature selected for Typical Period
 - Typical Week Period selected: Apr 2:Apr 8, Average Temp= 25.69°C, Deviation=| 0.016|°C
 - Week closest to maximum annual temperature selected for Typical Period
 - Extreme Hot Week Period selected: Feb 12:Feb 18, Maximum Temp= 32.60°C, Deviation=| 5.099|°C
 - Week closest to minimum annual temperature selected for Typical Period
 - Extreme Cold Week Period selected: Jul 16:Jul 22, Minimum Temp= 18.70°C, Deviation=| 4.574|°C

PORTO ALEGRE

Statistics for porto alegreCSV
 Location -- PortoAlegre -TRY
 {S 30° 0'} {W 51° 10'} {GMT -3.0 Hours}
 Elevation -- 4m above sea level
 Standard Pressure at Elevation -- 101277Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

Design Stat HDB 99.6% HDB 99%
 Units {C} {C}
 HEATING 2.4 3.1

Design Stat CDB .4% CDB 1% CDB 2% CDP .4% CDP 1% CDP 2%
 Units {C} {C} {C} {C} {C} {C}
 COOLING 36.1 35.1 33.6 24.7 24.1 23.8

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|-------|
| Maximum | 36.5 | 35.0 | 33.5 | 32.0 | 29.5 | 26.0 | 27.5 | 31.0 | 27.3 | 30.4 | 33.5 | 36.5 |
| Day:Hour | 24:16 | 24:18 | 14:14 | 9:14 | 27:16 | 27:16 | 10:14 | 17:17 | 3:14 | 15:15 | 14:16 | 5:17 |
| Minimum | 12.5 | 16.0 | 14.7 | 8.0 | 1.3 | 2.5 | 4.2 | 3.5 | 8.7 | 7.3 | 11.0 | 9.4 |
| Day:Hour | 4:07 | 1:07 | 29:08 | 30:23 | 20:04 | 7:07 | 6:06 | 11:08 | 7:06 | 12:07 | 3:05 | 21:07 |
| Daily Avg | 24.6 | 24.3 | 23.4 | 19.8 | 14.4 | 14.9 | 13.7 | 16.2 | 16.9 | 18.3 | 21.3 | 23.2 |

- Maximum Dry Bulb temperature of 36.5°C on Jan 24
- Minimum Dry Bulb temperature of 1.3°C on May 20

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 22.1 | 22.3 | 21.4 | 18.0 | 11.6 | 13.5 | 12.3 | 14.3 | 15.5 | 16.2 | 18.3 | 20.1 |
| 1:01- 2:00 | 21.6 | 22.0 | 21.1 | 17.7 | 11.2 | 13.4 | 12.1 | 13.9 | 15.3 | 15.9 | 17.8 | 19.4 |
| 2:01- 3:00 | 21.2 | 21.6 | 20.7 | 17.5 | 10.7 | 13.2 | 11.8 | 13.5 | 15.1 | 15.5 | 17.2 | 19.0 |
| 3:01- 4:00 | 21.0 | 21.2 | 20.2 | 17.0 | 10.4 | 13.1 | 11.7 | 13.1 | 14.7 | 15.2 | 16.7 | 18.4 |
| 4:01- 5:00 | 20.8 | 21.1 | 19.9 | 16.8 | 10.2 | 13.0 | 11.5 | 12.8 | 14.4 | 14.9 | 16.4 | 18.0 |
| 5:01- 6:00 | 20.5 | 21.0 | 19.7 | 16.5 | 10.1 | 12.6 | 11.2 | 12.4 | 14.3 | 14.8 | 16.2 | 17.9 |
| 6:01- 7:00 | 20.5 | 20.7 | 19.5 | 16.1 | 10.1 | 12.7 | 11.1 | 12.0 | 14.1 | 14.6 | 16.2 | 17.7 |
| 7:01- 8:00 | 21.6 | 21.2 | 19.5 | 15.9 | 10.4 | 12.8 | 11.1 | 11.9 | 14.5 | 15.5 | 18.2 | 19.7 |
| 8:01- 9:00 | 23.2 | 22.8 | 21.0 | 17.2 | 10.9 | 12.9 | 11.3 | 12.8 | 15.2 | 16.9 | 20.2 | 21.9 |
| 9:01-10:00 | 24.7 | 24.3 | 23.0 | 19.1 | 12.7 | 13.7 | 12.2 | 14.8 | 16.3 | 18.5 | 21.9 | 23.5 |
| 10:01-11:00 | 25.9 | 25.6 | 24.8 | 21.2 | 14.8 | 14.7 | 13.4 | 16.9 | 17.6 | 19.9 | 23.6 | 25.1 |
| 11:01-12:00 | 27.1 | 26.6 | 26.2 | 22.3 | 16.7 | 15.8 | 14.6 | 18.7 | 18.5 | 21.0 | 24.9 | 26.3 |
| 12:01-13:00 | 28.1 | 27.6 | 27.2 | 23.4 | 18.1 | 17.1 | 15.7 | 19.9 | 19.6 | 21.9 | 25.9 | 27.4 |
| 13:01-14:00 | 28.8 | 28.4 | 27.7 | 24.0 | 19.3 | 17.7 | 16.5 | 20.9 | 20.3 | 22.5 | 26.7 | 28.1 |
| 14:01-15:00 | 29.2 | 28.3 | 28.2 | 24.4 | 20.2 | 18.2 | 16.9 | 21.4 | 20.4 | 22.8 | 26.9 | 28.7 |
| 15:01-16:00 | 28.9 | 28.2 | 27.9 | 24.3 | 20.9 | 18.4 | 17.6 | 21.7 | 20.2 | 22.4 | 26.5 | 29.1 |
| 16:01-17:00 | 28.9 | 28.0 | 27.6 | 24.1 | 20.8 | 18.1 | 17.4 | 21.4 | 20.0 | 21.8 | 26.3 | 29.0 |
| 17:01-18:00 | 28.5 | 27.4 | 26.9 | 23.5 | 19.7 | 17.3 | 16.7 | 20.6 | 19.4 | 21.1 | 25.3 | 28.3 |
| 18:01-19:00 | 27.9 | 26.9 | 25.9 | 22.1 | 17.7 | 16.3 | 15.6 | 18.9 | 18.5 | 20.2 | 23.9 | 27.3 |
| 19:01-20:00 | 26.5 | 25.5 | 24.4 | 20.3 | 15.9 | 15.4 | 14.6 | 17.0 | 17.6 | 19.0 | 22.4 | 25.2 |
| 20:01-21:00 | 24.8 | 24.4 | 23.3 | 19.6 | 14.7 | 15.0 | 13.8 | 16.1 | 17.0 | 18.0 | 20.9 | 23.5 |
| 21:01-22:00 | 23.6 | 23.4 | 22.5 | 18.8 | 13.7 | 14.4 | 13.4 | 15.2 | 16.3 | 17.4 | 19.9 | 21.8 |
| 22:01-23:00 | 22.9 | 23.1 | 22.1 | 18.4 | 13.0 | 14.0 | 13.1 | 14.9 | 16.1 | 17.0 | 19.3 | 21.1 |
| 23:01-24:00 | 22.3 | 22.7 | 21.7 | 17.9 | 12.5 | 13.7 | 12.8 | 14.5 | 15.8 | 16.5 | 18.8 | 20.4 |
| Max Hour | 15 | 14 | 15 | 15 | 16 | 16 | 16 | 16 | 15 | 15 | 15 | 16 |
| Min Hour | 6 | 7 | 7 | 8 | 6 | 6 | 7 | 8 | 7 | 7 | 7 | 7 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

Min <=-18

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|--------------|-----|------|------|------|------|-----|-----|-----|-----|-----|-----|------|------|
| HDD base 10C | | 0 | 0 | 0 | 0 | 5 | 0 | 3 | 0 | 0 | 0 | 0 | 0 |
| HDD base 18C | | 0 | 0 | 0 | 6 | 118 | 94 | 135 | 78 | 42 | 27 | 2 | 0 |
| CDD base 10C | | 453 | 402 | 416 | 295 | 142 | 147 | 118 | 194 | 208 | 258 | 338 | 409 |
| CDD base 18C | | 205 | 178 | 168 | 61 | 7 | 1 | 1 | 24 | 11 | 37 | 101 | 161 |
| CDH base 20C | | 3643 | 2986 | 2747 | 1081 | 333 | 118 | 153 | 695 | 326 | 668 | 1788 | 2970 |
| CDH base 23C | | 2027 | 1378 | 1324 | 345 | 100 | 19 | 45 | 350 | 80 | 219 | 837 | 1653 |
| CDH base 27C | | 761 | 364 | 370 | 48 | 8 | 0 | 1 | 99 | 0 | 25 | 191 | 679 |

- 3379 annual cooling degree-days (10°C baseline)

- 9 annual heating degree-days (10°C baseline)

- 954 annual cooling degree-days (18°C baseline)

- 504 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|------|------|-------|------|-------|------|-------|-------|-------|------|-------|------|
| 4am | 94 | 94 | 94 | 94 | 97 | 96 | 95 | 93 | 94 | 94 | 93 | 88 |
| 10am | 78 | 81 | 82 | 83 | 88 | 94 | 93 | 85 | 87 | 79 | 74 | 68 |
| 3pm | 63 | 67 | 62 | 64 | 63 | 76 | 75 | 67 | 73 | 64 | 53 | 54 |
| 10pm | 85 | 86 | 86 | 90 | 90 | 93 | 90 | 90 | 89 | 85 | 80 | 77 |
| Maximum | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Day:Hour | 4:04 | 1:07 | 3:07 | 4:04 | 1:03 | 1:06 | 1:19 | 1:03 | 1:08 | 5:06 | 4:06 | 4:04 |
| Minimum | 34 | 35 | 43 | 46 | 37 | 53 | 39 | 34 | 46 | 21 | 20 | 29 |
| Day:Hour | 9:19 | 2:15 | 15:17 | 9:14 | 11:18 | 2:14 | 10:14 | 18:16 | 15:14 | 4:16 | 27:16 | 5:17 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2.5 | 2.5 | 2.3 | 1.9 | 1.5 | 1.6 | 1.4 | 1.7 | 1.7 | 1.7 | 1.8 | 2.0 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Direct Avg | 4526 | 4258 | 4419 | 3252 | 2158 | 1417 | 1702 | 2956 | 2519 | 3956 | 4906 | 6340 |
| Direct Max | 8823 | 9224 | 8215 | 7237 | 4432 | 3936 | 4735 | 5323 | 7897 | 9019 | 6917 | 10683 |
| Day | 4 | 22 | 2 | 8 | 1 | 1 | 28 | 31 | 24 | 19 | 12 | 14 |
| Diffuse Avg | 2926 | 2777 | 2232 | 1893 | 1487 | 1480 | 1333 | 1487 | 2410 | 2335 | 2854 | 2501 |

- Maximum Direct Solar of 10683 Wh/m² on Dec 14

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 136 | 112 | 116 | 124 | 132 | 133 | 131 | 123 | 137 | 135 | 131 | 154 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|------|------|-------|-------|-------|-------|-------|-------|------|------|-------|
| Maximum | 13.0 | 11.0 | 13.0 | 11.0 | 10.0 | 12.0 | 12.0 | 13.0 | 13.0 | 12.0 | 13.0 | 13.0 |
| Day:Hour | 25:15 | 2:23 | 4:16 | 28:15 | 28:02 | 16:24 | 11:22 | 26:13 | 22:10 | 7:14 | 9:06 | 13:14 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 1:06 | 1:02 | 1:01 | 3:06 | 1:01 | 1:06 | 2:09 | 1:03 | 1:03 | 1:07 | 2:22 | 2:09 |
| Daily Avg | 2.8 | 2.7 | 2.9 | 2.9 | 2.0 | 2.9 | 2.7 | 3.0 | 3.4 | 3.2 | 3.7 | 3.3 |

- Maximum Wind Speed of 13.0 m/s on Jan 25

- Minimum Wind Speed of 0.0 m/s on Jan 1

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 18.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |

| | | | | | | | | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 2.0 m | 21.7 | 22.8 | 23.3 | 23.3 | 22.4 | 21.1 | 19.8 | 18.6 | 18.1 | 18.2 | 19.0 | 20.3 |
| 4.0 m | 20.9 | 21.8 | 22.3 | 22.5 | 22.1 | 21.4 | 20.5 | 19.6 | 19.0 | 18.9 | 19.3 | 20.0 |

- Climate type "Cfa" (Köppen classification)
- Humid subtropical (mild with no dry season, hot summer, lat. 20-35°S)

- Typical/Extreme Period Determination

- Summer is Dec:Feb
 - Extreme Summer Week (nearest maximum temperature for summer)
 - Extreme Hot Week Period selected: Jan 20:Jan 26, Maximum Temp= 36.50°C, Deviation=| 9.489|°C
 - Typical Summer Week (nearest average temperature for summer)
 - Typical Week Period selected: Feb 3:Feb 9, Average Temp= 24.04°C, Deviation=| 0.137|°C

- Winter is Jun:Aug
 - Extreme Winter Week (nearest minimum temperature for winter)
 - Extreme Cold Week Period selected: Jun 29:Jul 5, Minimum Temp= 2.50°C, Deviation=| 8.918|°C
 - Typical Winter Week (nearest average temperature for winter)
 - Typical Week Period selected: Jun 22:Jun 28, Average Temp= 14.94°C, Deviation=| 0.537|°C

- Autumn is Mar:May
 - Typical Autumn Week (nearest average temperature for autumn)
 - Typical Week Period selected: Apr 12:Apr 18, Average Temp= 19.22°C, Deviation=| 0.731|°C

- Spring is Sep:Nov
 - Typical Spring Week (nearest average temperature for spring)
 - Typical Week Period selected: Sep 29:Oct 5, Average Temp= 18.84°C, Deviation=| 0.315|°C

RECIFE

Statistics for RecifeCSV

Location -- Recife -TRY

{S 8° 7'} {W 34° 55'} {GMT -3.0 Hours}

Elevation -- 11m above sea level

Standard Pressure at Elevation -- 101193Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

| | | |
|-------------|-----------|---------|
| Design Stat | HDB 99.6% | HDB 99% |
| Units | {C} | {C} |
| HEATING | 19.9 | 20.3 |

| | | | | | | |
|-------------|---------|--------|--------|---------|--------|--------|
| Design Stat | CDB .4% | CDB 1% | CDB 2% | CDP .4% | CDP 1% | CDP 2% |
| Units | {C} | {C} | {C} | {C} | {C} | {C} |
| COOLING | 29.6 | 29.4 | 29.1 | 25.4 | 24.7 | 24.2 |

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Maximum | 29.0 | 29.9 | 29.5 | 29.5 | 28.8 | 28.2 | 27.2 | 27.9 | 28.2 | 28.5 | 31.4 | 30.2 |
| Day:Hour | 6:15 | 24:13 | 4:13 | 2:11 | 8:12 | 4:13 | 5:14 | 13:13 | 27:15 | 30:12 | 16:15 | 6:15 |
| Minimum | 22.4 | 23.1 | 22.1 | 21.7 | 21.4 | 19.8 | 19.9 | 19.6 | 20.0 | 21.5 | 23.1 | 23.0 |
| Day:Hour | 26:07 | 16:08 | 15:07 | 10:07 | 26:06 | 19:07 | 13:07 | 30:04 | 14:05 | 4:07 | 19:11 | 17:03 |
| Daily Avg | 26.7 | 26.9 | 26.7 | 26.0 | 25.7 | 24.6 | 24.0 | 24.3 | 25.1 | 26.0 | 26.3 | 26.5 |

- Maximum Dry Bulb temperature of 31.4°C on Nov 16
- Minimum Dry Bulb temperature of 19.6°C on Aug 30

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 25.8 | 26.3 | 26.0 | 25.3 | 25.1 | 23.8 | 23.0 | 23.4 | 24.2 | 25.1 | 25.4 | 25.7 |
| 1:01- 2:00 | 25.7 | 26.1 | 25.7 | 25.0 | 24.7 | 23.6 | 22.9 | 23.3 | 24.1 | 25.0 | 25.2 | 25.6 |
| 2:01- 3:00 | 25.5 | 25.9 | 25.3 | 24.6 | 24.5 | 23.4 | 22.6 | 23.1 | 23.9 | 24.8 | 25.1 | 25.5 |
| 3:01- 4:00 | 25.3 | 25.6 | 25.1 | 24.3 | 24.0 | 23.3 | 22.4 | 22.8 | 23.7 | 24.7 | 25.0 | 25.4 |
| 4:01- 5:00 | 25.0 | 25.5 | 24.9 | 23.9 | 23.8 | 23.2 | 22.2 | 22.7 | 23.6 | 24.5 | 24.9 | 25.2 |
| 5:01- 6:00 | 24.7 | 25.2 | 24.8 | 23.7 | 23.6 | 23.1 | 21.9 | 22.6 | 23.5 | 24.4 | 24.8 | 25.0 |
| 6:01- 7:00 | 24.8 | 25.1 | 24.8 | 23.8 | 23.6 | 23.1 | 21.8 | 22.6 | 23.8 | 24.8 | 25.3 | 25.3 |
| 7:01- 8:00 | 26.0 | 26.1 | 25.6 | 24.8 | 24.5 | 24.0 | 22.5 | 23.3 | 24.7 | 25.8 | 26.2 | 26.3 |
| 8:01- 9:00 | 27.0 | 26.9 | 26.8 | 26.0 | 25.7 | 24.9 | 23.8 | 24.5 | 25.6 | 26.8 | 26.8 | 26.9 |
| 9:01-10:00 | 27.8 | 27.6 | 27.6 | 27.1 | 26.6 | 25.7 | 24.9 | 25.4 | 26.0 | 27.2 | 27.3 | 27.4 |
| 10:01-11:00 | 28.0 | 28.0 | 28.0 | 27.6 | 27.1 | 26.0 | 25.4 | 25.9 | 26.4 | 27.5 | 27.3 | 27.7 |
| 11:01-12:00 | 28.2 | 28.4 | 28.3 | 27.7 | 27.4 | 26.2 | 25.8 | 26.0 | 26.6 | 27.6 | 27.7 | 28.0 |
| 12:01-13:00 | 28.3 | 28.6 | 28.3 | 27.6 | 27.5 | 26.2 | 26.0 | 26.1 | 26.6 | 27.6 | 27.9 | 28.1 |
| 13:01-14:00 | 28.5 | 28.6 | 28.3 | 27.8 | 27.4 | 26.2 | 26.1 | 26.3 | 26.5 | 27.5 | 27.9 | 28.2 |
| 14:01-15:00 | 28.3 | 28.4 | 28.1 | 27.8 | 27.3 | 26.1 | 26.0 | 26.2 | 26.3 | 27.5 | 28.0 | 28.0 |
| 15:01-16:00 | 28.2 | 28.4 | 28.0 | 27.7 | 27.2 | 26.1 | 25.6 | 25.8 | 26.1 | 27.2 | 27.5 | 27.7 |
| 16:01-17:00 | 27.9 | 28.0 | 27.8 | 27.3 | 26.8 | 25.8 | 25.4 | 25.5 | 25.8 | 26.9 | 27.0 | 27.3 |
| 17:01-18:00 | 27.3 | 27.5 | 27.2 | 26.8 | 26.4 | 25.1 | 24.7 | 24.8 | 25.4 | 26.2 | 26.6 | 26.9 |
| 18:01-19:00 | 26.7 | 27.0 | 26.8 | 26.4 | 26.1 | 24.8 | 24.3 | 24.4 | 25.0 | 25.8 | 26.1 | 26.5 |
| 19:01-20:00 | 26.4 | 26.8 | 26.7 | 26.2 | 25.9 | 24.5 | 24.2 | 24.2 | 24.9 | 25.6 | 26.0 | 26.2 |
| 20:01-21:00 | 26.3 | 26.5 | 26.5 | 26.1 | 25.8 | 24.4 | 24.1 | 24.0 | 24.8 | 25.5 | 25.8 | 26.1 |
| 21:01-22:00 | 26.2 | 26.5 | 26.5 | 26.0 | 25.6 | 24.1 | 23.8 | 24.0 | 24.6 | 25.4 | 25.7 | 25.9 |
| 22:01-23:00 | 26.1 | 26.5 | 26.4 | 25.8 | 25.4 | 24.0 | 23.6 | 23.8 | 24.7 | 25.3 | 25.6 | 25.8 |
| 23:01-24:00 | 26.0 | 26.3 | 26.2 | 25.6 | 25.1 | 23.9 | 23.4 | 23.7 | 24.5 | 25.2 | 25.5 | 25.7 |
| Max Hour | 14 | 13 | 13 | 14 | 13 | 12 | 14 | 14 | 12 | 12 | 15 | 14 |
| Min Hour | 6 | 7 | 6 | 6 | 6 | 6 | 7 | 7 | 6 | 6 | 6 | 6 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Maximum | 24.2 | 25.4 | 25.5 | 24.5 | 24.9 | 23.5 | 24.8 | 23.4 | 23.3 | 23.6 | 23.9 | 24.1 |
| Day:Hour | 13:12 | 26:15 | 1:13 | 26:12 | 8:23 | 11:11 | 28:15 | 19:17 | 12:19 | 30:05 | 18:12 | 16:20 |
| Minimum | 19.4 | 20.1 | 20.2 | 20.0 | 19.3 | 17.8 | 18.2 | 16.7 | 16.7 | 18.4 | 19.3 | 18.6 |
| Day:Hour | 31:10 | 4:14 | 15:02 | 10:11 | 26:07 | 18:23 | 9:20 | 16:11 | 8:23 | 15:05 | 20:08 | 6:18 |

Daily Avg 21.8 22.1 22.7 22.4 22.1 21.5 20.8 20.4 20.6 20.9 21.5 21.9

- Maximum Dew Point temperature of 25.5°C on Mar 1
- Minimum Dew Point temperature of 16.7°C on Aug 16

- Monthly Statistics for Wind Chill/Heat Index temperatures °C **

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------|-------|-------|-------|------|-------|------|-------|-------|-------|-------|-------|-------|
| Minimum WC | | | | | | | | | | | | |
| Day:Hour | | | | | | | | | | | | |
| Average WC | | | | | | | | | | | | |
| Avg Del WC | | | | | | | | | | | | |
| # Hours WC | | | | | | | | | | | | |
| Maximum HI | 34 | 36 | 35 | 34 | 33 | 31 | 31 | 30 | 31 | 32 | 34 | 34 |
| Day:Hour | 13:12 | 26:14 | 26:14 | 2:11 | 20:13 | 4:13 | 28:15 | 13:13 | 30:12 | 30:12 | 16:15 | 31:14 |
| Average HI | 31 | 31 | 31 | 31 | 31 | 30 | 30 | 29 | 29 | 30 | 30 | 31 |
| Avg Del HI | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 3 |
| # Hours HI | 308 | 319 | 361 | 237 | 194 | 64 | 7 | 22 | 68 | 233 | 234 | 271 |

- **WindChill/HeatIndex Temps -- statistics...only those different from Air Temps

- Monthly Statistics for Extreme temperatures °C

| #Days | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Max >= 32 | | | | | | | | | | | | |
| Max <= 0 | | | | | | | | | | | | |
| Min <= 0 | | | | | | | | | | | | |
| Min <=-18 | | | | | | | | | | | | |

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| HDD base 10C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HDD base 18C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CDD base 10C | | 517 | 474 | 516 | 481 | 487 | 439 | 435 | 445 | 452 | 496 | 489 |
| CDD base 18C | | 269 | 250 | 268 | 241 | 239 | 199 | 187 | 197 | 212 | 248 | 249 |

| | | | | | | | | | | | | |
|--------------|------|------|------|------|------|------|------|------|------|------|------|------|
| CDH base 20C | 4959 | 4647 | 4950 | 4347 | 4252 | 3344 | 2994 | 3238 | 3645 | 4459 | 4527 | 4854 |
| CDH base 23C | 2728 | 2631 | 2724 | 2197 | 2048 | 1319 | 1030 | 1217 | 1551 | 2236 | 2367 | 2622 |
| CDH base 27C | 307 | 335 | 342 | 208 | 138 | 24 | 1 | 6 | 18 | 111 | 169 | 243 |

- 5742 annual cooling degree-days (10°C baseline)
- 0 annual heating degree-days (10°C baseline)
- 2822 annual cooling degree-days (18°C baseline)
- 0 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 4am | 82 | 81 | 87 | 89 | 91 | 90 | 91 | 86 | 82 | 80 | 82 | 82 |
| 10am | 72 | 75 | 77 | 78 | 79 | 80 | 82 | 76 | 75 | 71 | 73 | 74 |
| 3pm | 70 | 71 | 75 | 76 | 76 | 79 | 77 | 74 | 75 | 69 | 70 | 71 |
| 10pm | 78 | 78 | 82 | 83 | 83 | 88 | 85 | 81 | 79 | 78 | 79 | 81 |
| Maximum | 98 | 99 | 100 | 100 | 99 | 100 | 100 | 100 | 100 | 99 | 98 | 99 |
| Day:Hour | 14:02 | 9:08 | 12:15 | 11:21 | 22:02 | 22:19 | 1:03 | 1:18 | 18:07 | 30:05 | 19:11 | 17:02 |
| Minimum | 60 | 61 | 64 | 65 | 63 | 60 | 66 | 56 | 57 | 57 | 54 | 56 |
| Day:Hour | 31:10 | 4:13 | 11:15 | 27:12 | 11:13 | 19:14 | 11:13 | 16:11 | 24:14 | 9:13 | 16:15 | 6:15 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2.6 | 2.7 | 2.8 | 2.7 | 2.7 | 2.6 | 2.5 | 2.5 | 2.5 | 2.5 | 2.6 | 2.6 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Direct Avg | 4806 | 5038 | 4294 | 3543 | 2991 | 2473 | 1977 | 3245 | 4566 | 5275 | 4829 | 4746 |
| Direct Max | 6586 | 8312 | 8420 | 7533 | 6252 | 5608 | 4854 | 6251 | 6987 | 7115 | 7326 | 9033 |
| Day | 17 | 4 | 29 | 8 | 2 | 26 | 28 | 24 | 14 | 20 | 3 | 27 |
| Diffuse Avg | 2630 | 2580 | 2761 | 2567 | 2478 | 2337 | 2099 | 2233 | 2373 | 2429 | 2562 | 2518 |

- Maximum Direct Solar of 9033 Wh/m² on Dec 27

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 91 | 108 | 133 | 156 | 151 | 165 | 162 | 146 | 133 | 127 | 88 | 103 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|------|-------|-------|------|------|-------|-------|------|-------|-------|
| Maximum | 10.0 | 9.0 | 10.0 | 10.0 | 9.0 | 10.0 | 11.0 | 10.0 | 10.0 | 9.0 | 10.0 | 13.0 |
| Day:Hour | 13:16 | 25:18 | 7:18 | 15:17 | 25:14 | 2:14 | 1:05 | 4:04 | 18:15 | 6:16 | 12:17 | 16:09 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 2:03 | 1:02 | 7:02 | 2:21 | 4:03 | 9:14 | 1:20 | 12:04 | 1:01 | 1:03 | 4:04 | 3:02 |
| Daily Avg | 3.4 | 3.3 | 3.6 | 3.6 | 3.6 | 4.4 | 4.3 | 4.5 | 4.3 | 4.3 | 4.1 | 4.5 |

- Maximum Wind Speed of 13.0 m/s on Dec 16

- Minimum Wind Speed of 0.0 m/s on Jan 2

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 18.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |
| 2.0 m | 21.7 | 22.8 | 23.3 | 23.3 | 22.4 | 21.1 | 19.8 | 18.6 | 18.1 | 18.2 | 19.0 | 20.3 |
| 4.0 m | 20.9 | 21.8 | 22.3 | 22.5 | 22.1 | 21.4 | 20.5 | 19.6 | 19.0 | 18.9 | 19.3 | 20.0 |

- Climate type "Af" (Köppen classification)

- Tropical wet (no dry season, rainforest, hot all year, lat. < 10°)

- Unbearably humid periods in summer, but passive cooling is possible

- Heating may not be required

- Typical/Extreme Period Determination

- No dry season.....

Week closest to average annual temperature selected for Typical Period

Typical Week Period selected: Oct 1:Oct 7, Average Temp= 25.73°C, Deviation=| 0.063|°C

Week closest to maximum annual temperature selected for Typical Period

Extreme Hot Week Period selected: Mar 5:Mar 11, Maximum Temp= 31.40°C, Deviation=| 3.910|°C

Week closest to minimum annual temperature selected for Typical Period

Extreme Cold Week Period selected: Jun 18:Jun 24, Minimum Temp= 19.60°C, Deviation=| 4.094|°C

RIO DE JANEIRO

Statistics for rio de janeiroCSV
 Location -- RiodeJaneiro -TRY
 {S 22° 49'} {W 43° 15'} {GMT -3.0 Hours}
 Elevation -- 5m above sea level
 Standard Pressure at Elevation -- 101265Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

| | | |
|-------------|-----------|---------|
| Design Stat | HDB 99.6% | HDB 99% |
| Units | {C} | {C} |
| HEATING | 14.4 | 14.9 |

| | | | | | | |
|-------------|---------|--------|--------|---------|--------|--------|
| Design Stat | CDB .4% | CDB 1% | CDB 2% | CDP .4% | CDP 1% | CDP 2% |
| Units | {C} | {C} | {C} | {C} | {C} | {C} |
| COOLING | 36.3 | 35.1 | 33.9 | 26.9 | 26.2 | 25.3 |

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Maximum | 37.5 | 35.0 | 35.0 | 31.7 | 32.0 | 29.0 | 33.2 | 35.0 | 31.8 | 34.0 | 37.3 | 38.2 |
| Day:Hour | 8:16 | 19:16 | 9:13 | 12:14 | 13:15 | 17:13 | 22:13 | 12:15 | 6:15 | 27:15 | 26:18 | 5:15 |
| Minimum | 22.5 | 20.3 | 22.0 | 19.0 | 15.7 | 13.9 | 14.2 | 13.0 | 16.5 | 18.7 | 17.4 | 16.6 |
| Day:Hour | 16:02 | 10:07 | 29:24 | 19:07 | 6:08 | 24:09 | 8:08 | 8:07 | 19:07 | 2:06 | 16:06 | 23:08 |
| Daily Avg | 27.2 | 25.8 | 26.9 | 24.1 | 21.8 | 20.5 | 20.5 | 21.0 | 22.9 | 23.0 | 24.6 | 24.6 |

- Maximum Dry Bulb temperature of 38.2°C on Dec 5
- Minimum Dry Bulb temperature of 13.0°C on Aug 8

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 25.5 | 24.5 | 25.8 | 23.2 | 20.8 | 19.5 | 19.6 | 19.9 | 21.6 | 22.0 | 23.2 | 23.3 |
| 1:01- 2:00 | 25.3 | 24.2 | 25.5 | 22.8 | 20.6 | 19.1 | 19.2 | 19.5 | 21.3 | 21.8 | 23.0 | 23.2 |
| 2:01- 3:00 | 25.1 | 24.1 | 25.2 | 22.6 | 20.2 | 18.8 | 18.8 | 19.1 | 21.0 | 21.5 | 22.9 | 23.0 |
| 3:01- 4:00 | 24.7 | 23.9 | 24.7 | 22.2 | 19.5 | 18.4 | 18.2 | 18.8 | 20.7 | 21.4 | 22.6 | 22.7 |
| 4:01- 5:00 | 24.4 | 23.6 | 24.5 | 21.9 | 19.1 | 18.0 | 17.8 | 18.4 | 20.5 | 21.2 | 22.6 | 22.4 |
| 5:01- 6:00 | 24.3 | 23.5 | 24.3 | 21.7 | 18.8 | 17.7 | 17.5 | 18.1 | 20.3 | 21.1 | 22.5 | 22.2 |
| 6:01- 7:00 | 24.4 | 23.3 | 24.1 | 21.4 | 18.4 | 17.5 | 17.2 | 17.8 | 20.2 | 21.1 | 22.6 | 22.4 |
| 7:01- 8:00 | 25.2 | 23.7 | 24.6 | 21.7 | 18.4 | 17.5 | 17.0 | 17.9 | 20.6 | 21.5 | 23.4 | 23.2 |
| 8:01- 9:00 | 26.5 | 24.9 | 26.0 | 22.6 | 19.8 | 18.2 | 17.9 | 18.9 | 21.6 | 22.3 | 24.5 | 24.4 |
| 9:01-10:00 | 27.9 | 26.0 | 27.0 | 24.1 | 21.4 | 19.5 | 19.5 | 20.5 | 22.7 | 23.2 | 25.5 | 25.7 |
| 10:01-11:00 | 29.0 | 26.9 | 27.8 | 24.9 | 22.8 | 21.0 | 20.7 | 21.7 | 23.9 | 24.2 | 26.2 | 26.2 |
| 11:01-12:00 | 30.0 | 27.6 | 28.6 | 25.8 | 23.9 | 22.1 | 22.2 | 22.7 | 24.8 | 24.6 | 26.8 | 26.6 |
| 12:01-13:00 | 30.2 | 28.1 | 29.0 | 26.3 | 24.6 | 23.1 | 23.2 | 23.5 | 25.4 | 24.9 | 26.8 | 27.1 |
| 13:01-14:00 | 30.7 | 28.7 | 29.4 | 26.7 | 24.8 | 23.6 | 23.7 | 24.3 | 25.6 | 25.2 | 26.9 | 27.0 |
| 14:01-15:00 | 30.4 | 28.7 | 29.5 | 26.5 | 25.1 | 24.0 | 23.9 | 24.4 | 25.9 | 25.2 | 26.7 | 27.0 |
| 15:01-16:00 | 30.2 | 28.6 | 29.7 | 26.5 | 25.0 | 23.8 | 23.8 | 24.2 | 25.9 | 25.0 | 26.5 | 26.7 |
| 16:01-17:00 | 29.8 | 28.1 | 29.3 | 26.2 | 24.5 | 23.4 | 23.5 | 23.9 | 25.3 | 24.8 | 25.8 | 26.2 |
| 17:01-18:00 | 29.0 | 27.5 | 28.8 | 25.6 | 24.0 | 22.6 | 22.8 | 23.4 | 24.9 | 24.2 | 25.8 | 25.9 |
| 18:01-19:00 | 28.3 | 26.8 | 28.1 | 25.0 | 23.3 | 21.9 | 22.1 | 22.6 | 23.9 | 23.8 | 25.3 | 25.4 |
| 19:01-20:00 | 27.6 | 26.0 | 27.7 | 24.7 | 22.8 | 21.6 | 21.6 | 22.0 | 23.5 | 23.5 | 24.8 | 24.9 |
| 20:01-21:00 | 26.9 | 25.5 | 27.1 | 24.3 | 22.4 | 21.2 | 21.2 | 21.5 | 23.1 | 22.9 | 24.3 | 24.4 |
| 21:01-22:00 | 26.4 | 25.1 | 26.6 | 23.8 | 21.8 | 20.7 | 20.8 | 21.1 | 22.8 | 22.6 | 24.0 | 24.1 |
| 22:01-23:00 | 26.2 | 24.9 | 26.4 | 23.5 | 21.4 | 20.2 | 20.3 | 20.7 | 22.5 | 22.4 | 23.8 | 23.7 |
| 23:01-24:00 | 25.9 | 24.8 | 26.0 | 23.4 | 21.0 | 19.8 | 19.8 | 20.2 | 22.2 | 22.3 | 23.4 | 23.6 |
| Max Hour | 14 | 15 | 16 | 14 | 15 | 15 | 15 | 15 | 16 | 15 | 14 | 13 |
| Min Hour | 6 | 7 | 7 | 7 | 8 | 7 | 8 | 7 | 7 | 7 | 6 | 6 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Maximum | 28.3 | 26.7 | 28.7 | 23.8 | 26.0 | 21.9 | 23.3 | 27.7 | 23.3 | 27.2 | 25.4 | 28.2 |
| Day:Hour | 1:13 | 2:17 | 7:21 | 10:21 | 15:17 | 8:15 | 21:15 | 12:15 | 25:18 | 27:15 | 29:12 | 30:11 |
| Minimum | 18.4 | 17.3 | 18.0 | 15.3 | 12.4 | 9.0 | 12.3 | 10.1 | 11.5 | 16.7 | 15.4 | 14.7 |
| Day:Hour | 10:12 | 9:18 | 26:16 | 18:13 | 5:11 | 22:10 | 5:11 | 6:18 | 21:16 | 20:01 | 16:06 | 23:16 |

Daily Avg 22.8 21.7 22.0 20.2 18.5 17.1 17.7 17.8 19.3 20.6 21.2 20.3

- Maximum Dew Point temperature of 28.7°C on Mar 7
- Minimum Dew Point temperature of 9.0°C on Jun 22

- Monthly Statistics for Wind Chill/Heat Index temperatures °C **

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------|------|-------|-------|-------|-------|------|-------|-------|------|-------|-------|-------|
| Minimum WC | | | | | | | | | | | | |
| Day:Hour | | | | | | | | | | | | |
| Average WC | | | | | | | | | | | | |
| Avg Del WC | | | | | | | | | | | | |
| # Hours WC | | | | | | | | | | | | |
| Maximum HI | 46 | 41 | 40 | 36 | 37 | 30 | 39 | 49 | 36 | 46 | 42 | 44 |
| Day:Hour | 9:13 | 19:14 | 28:17 | 12:14 | 13:15 | 9:14 | 22:13 | 12:15 | 6:14 | 27:15 | 26:18 | 30:11 |
| Average HI | 35 | 33 | 33 | 30 | 31 | 29 | 34 | 32 | 31 | 33 | 33 | 33 |
| Avg Del HI | 5 | 4 | 3 | 2 | 3 | 1 | 4 | 3 | 2 | 4 | 4 | 4 |
| # Hours HI | 342 | 206 | 338 | 73 | 44 | 14 | 13 | 29 | 73 | 55 | 144 | 163 |

- **WindChill/HeatIndex Temps -- statistics...only those different from Air Temps

- Monthly Statistics for Extreme temperatures °C

| #Days | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Max >= 32 | 14 | 5 | 7 | | 1 | | 2 | 1 | | 3 | 5 | 5 |
| Max <= 0 | | | | | | | | | | | | |
| Min <= 0 | | | | | | | | | | | | |
| Min <=-18 | | | | | | | | | | | | |

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| HDD base 10C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HDD base 18C | | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 |
| CDD base 10C | | 534 | 442 | 524 | 422 | 367 | 316 | 326 | 342 | 388 | 404 | 437 |
| CDD base 18C | | 286 | 218 | 276 | 182 | 119 | 77 | 78 | 97 | 148 | 156 | 197 |

| | | | | | | | | | | | | |
|--------------|------|------|------|------|------|-----|------|------|------|------|------|------|
| CDH base 20C | 5386 | 3890 | 5138 | 2934 | 1728 | 984 | 1062 | 1392 | 2171 | 2274 | 3320 | 3468 |
| CDH base 23C | 3160 | 1940 | 2915 | 1093 | 538 | 216 | 284 | 449 | 747 | 741 | 1512 | 1668 |
| CDH base 27C | 1079 | 453 | 743 | 63 | 54 | 10 | 38 | 59 | 123 | 113 | 314 | 428 |

- 4956 annual cooling degree-days (10°C baseline)
- 0 annual heating degree-days (10°C baseline)
- 2040 annual cooling degree-days (18°C baseline)
- 4 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 4am | 90 | 89 | 86 | 89 | 92 | 92 | 93 | 91 | 90 | 94 | 91 | 87 |
| 10am | 77 | 79 | 77 | 81 | 83 | 84 | 86 | 83 | 82 | 86 | 80 | 76 |
| 3pm | 68 | 68 | 66 | 71 | 71 | 69 | 77 | 74 | 72 | 83 | 76 | 70 |
| 10pm | 83 | 83 | 78 | 83 | 85 | 84 | 86 | 84 | 83 | 91 | 86 | 81 |
| Maximum | 98 | 99 | 100 | 101 | 100 | 100 | 100 | 100 | 100 | 100 | 123 | 98 |
| Day:Hour | 17:21 | 7:01 | 29:24 | 12:02 | 12:08 | 1:23 | 3:07 | 15:06 | 1:08 | 1:21 | 30:04 | 6:21 |
| Minimum | 43 | 49 | 40 | 46 | 52 | 47 | 55 | 45 | 33 | 46 | 41 | 35 |
| Day:Hour | 10:12 | 19:16 | 27:16 | 16:14 | 5:15 | 22:14 | 11:16 | 28:16 | 21:16 | 28:11 | 26:18 | 5:15 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2.8 | 2.6 | 2.6 | 2.4 | 2.2 | 2.0 | 2.2 | 2.2 | 2.3 | 2.6 | 2.6 | 2.4 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Direct Avg | 5463 | 5706 | 3697 | 3764 | 2407 | 2948 | 1959 | 4306 | 2602 | 3680 | 3849 | 4750 |
| Direct Max | 9223 | 9723 | 5459 | 6270 | 3364 | 4658 | 2825 | 7530 | 3711 | 9563 | 8364 | 9525 |
| Day | 10 | 17 | 7 | 9 | 6 | 6 | 30 | 31 | 29 | 31 | 24 | 3 |
| Diffuse Avg | 2686 | 2528 | 2683 | 1956 | 1863 | 1330 | 1661 | 1557 | 2537 | 2493 | 2863 | 2631 |

- Maximum Direct Solar of 9723 Wh/m² on Feb 17

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 130 | 124 | 127 | 142 | 127 | 141 | 129 | 135 | 129 | 146 | 131 | 147 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|------|------|-------|-------|-------|-------|-------|-------|------|-------|
| Maximum | 11.0 | 11.0 | 10.0 | 10.0 | 9.0 | 9.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 17.0 |
| Day:Hour | 11:17 | 24:16 | 4:16 | 2:17 | 22:18 | 21:16 | 26:17 | 27:18 | 13:18 | 17:20 | 3:14 | 11:20 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 1:01 | 1:01 | 1:06 | 1:01 | 1:01 | 1:21 | 1:06 | 1:01 | 1:02 | 1:02 | 1:02 | 1:02 |
| Daily Avg | 2.8 | 3.0 | 2.9 | 2.9 | 2.0 | 2.3 | 2.2 | 2.6 | 2.8 | 3.0 | 3.1 | 3.9 |

- Maximum Wind Speed of 17.0 m/s on Dec 11

- Minimum Wind Speed of 0.0 m/s on Jan 1

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 16.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |
| 2.0 m | 21.7 | 22.8 | 23.4 | 23.3 | 22.4 | 21.1 | 19.8 | 18.6 | 18.1 | 18.2 | 19.0 | 20.3 |
| 4.0 m | 20.9 | 21.8 | 22.3 | 22.5 | 22.1 | 21.4 | 20.5 | 19.6 | 19.0 | 18.9 | 19.3 | 20.0 |

- Climate type "Aw" (Köppen classification)

- Tropical savanna (pronounced wet & dry seasons, lat. 15-20°)

- Typical/Extreme Period Determination

- No discernible dry period.....

Week closest to average annual temperature selected for Typical Period

Typical Week Period selected: Nov 12:Nov 18, Average Temp= 23.58°C, Deviation=| 0.005|°C

- Extremes Selected from annual Min/Max

Week closest to maximum annual temperature selected for Typical Period

Extreme Hot Week Period selected: Jan 8:Jan 14, Maximum Temp= 38.20°C, Deviation=| 9.242|°C

Week closest to minimum annual temperature selected for Typical Period

Extreme Cold Week Period selected: Jun 18:Jun 24, Minimum Temp= 13.00°C, Deviation=| 6.203|°C

SALVADOR

Statistics for salvadorCSV
 Location -- Salvador -TRY
 {S 12° 53'} {W 38° 19'} {GMT -3.0 Hours}
 Elevation -- 13m above sea level
 Standard Pressure at Elevation -- 101169Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

| | | |
|-------------|-----------|---------|
| Design Stat | HDB 99.6% | HDB 99% |
| Units | {C} | {C} |
| HEATING | 15.3 | 16.2 |

| | | | | | | |
|-------------|---------|--------|--------|---------|--------|--------|
| Design Stat | CDB .4% | CDB 1% | CDB 2% | CDP .4% | CDP 1% | CDP 2% |
| Units | {C} | {C} | {C} | {C} | {C} | {C} |
| COOLING | 31.6 | 31.3 | 31.0 | 26.1 | 25.8 | 25.6 |

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Maximum | 32.3 | 32.4 | 33.6 | 30.4 | 29.9 | 29.0 | 28.1 | 27.6 | 29.3 | 29.4 | 30.2 | 30.4 |
| Day:Hour | 19:13 | 25:15 | 3:13 | 5:14 | 20:14 | 2:11 | 6:14 | 22:14 | 28:14 | 26:15 | 9:13 | 16:15 |
| Minimum | 18.6 | 18.8 | 18.7 | 19.3 | 18.0 | 17.2 | 15.4 | 14.2 | 15.4 | 18.3 | 19.0 | 18.8 |
| Day:Hour | 30:07 | 2:06 | 13:06 | 30:06 | 13:07 | 15:07 | 22:05 | 22:06 | 12:07 | 25:06 | 22:06 | 27:06 |
| Daily Avg | 26.6 | 26.7 | 26.8 | 26.2 | 25.2 | 24.4 | 23.2 | 23.4 | 24.2 | 25.3 | 25.9 | 25.9 |

- Maximum Dry Bulb temperature of 33.6°C on Mar 3
- Minimum Dry Bulb temperature of 14.2°C on Aug 22

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 25.0 | 25.6 | 25.7 | 25.3 | 24.1 | 23.2 | 21.7 | 22.0 | 22.7 | 23.8 | 24.3 | 24.8 |
| 1:01- 2:00 | 24.8 | 25.3 | 25.4 | 24.7 | 23.7 | 23.0 | 21.2 | 21.7 | 22.5 | 23.7 | 23.9 | 24.6 |
| 2:01- 3:00 | 24.5 | 24.7 | 24.8 | 24.4 | 23.4 | 23.0 | 21.1 | 21.6 | 22.1 | 23.5 | 23.7 | 24.4 |
| 3:01- 4:00 | 23.9 | 23.9 | 24.4 | 24.2 | 23.0 | 22.7 | 21.1 | 21.3 | 21.3 | 23.1 | 23.1 | 24.0 |
| 4:01- 5:00 | 23.3 | 23.5 | 23.9 | 23.8 | 22.5 | 22.4 | 20.6 | 21.0 | 20.8 | 22.9 | 22.5 | 23.2 |
| 5:01- 6:00 | 22.8 | 22.7 | 23.4 | 23.4 | 22.2 | 22.2 | 20.4 | 20.7 | 20.3 | 22.8 | 21.9 | 22.6 |
| 6:01- 7:00 | 22.9 | 22.3 | 23.1 | 23.1 | 22.0 | 22.5 | 20.7 | 20.7 | 20.3 | 23.2 | 22.9 | 22.7 |
| 7:01- 8:00 | 25.2 | 24.3 | 24.8 | 24.7 | 23.6 | 23.7 | 21.7 | 21.7 | 22.7 | 25.3 | 25.9 | 25.4 |
| 8:01- 9:00 | 27.5 | 27.4 | 27.7 | 27.0 | 25.9 | 25.0 | 23.7 | 23.9 | 25.1 | 26.4 | 27.5 | 27.0 |
| 9:01-10:00 | 28.7 | 28.5 | 28.9 | 27.9 | 26.9 | 25.9 | 25.1 | 25.1 | 26.5 | 27.1 | 28.0 | 27.5 |
| 10:01-11:00 | 29.2 | 28.9 | 29.7 | 28.5 | 27.6 | 26.5 | 25.5 | 25.7 | 27.1 | 27.5 | 28.6 | 28.3 |
| 11:01-12:00 | 29.9 | 29.7 | 29.6 | 28.6 | 27.9 | 26.6 | 25.7 | 26.2 | 27.5 | 27.9 | 28.9 | 28.6 |
| 12:01-13:00 | 29.9 | 29.8 | 29.9 | 28.7 | 28.0 | 26.9 | 26.0 | 26.3 | 27.6 | 27.9 | 29.1 | 28.7 |
| 13:01-14:00 | 29.9 | 30.1 | 29.8 | 28.8 | 28.0 | 27.0 | 26.0 | 26.5 | 27.6 | 28.2 | 29.1 | 28.6 |
| 14:01-15:00 | 29.8 | 29.7 | 29.4 | 28.4 | 27.7 | 26.8 | 25.7 | 26.1 | 27.4 | 27.9 | 28.9 | 28.5 |
| 15:01-16:00 | 29.0 | 29.4 | 29.2 | 28.3 | 27.3 | 26.4 | 25.4 | 25.5 | 26.9 | 27.3 | 28.4 | 28.0 |
| 16:01-17:00 | 28.6 | 29.0 | 28.4 | 28.0 | 26.9 | 25.8 | 25.0 | 25.1 | 26.2 | 26.6 | 27.7 | 27.5 |
| 17:01-18:00 | 28.0 | 28.3 | 27.6 | 27.2 | 26.0 | 25.0 | 24.2 | 23.9 | 25.0 | 25.6 | 26.9 | 26.8 |
| 18:01-19:00 | 26.7 | 27.2 | 26.6 | 26.3 | 25.3 | 24.0 | 23.5 | 23.2 | 24.1 | 24.5 | 25.6 | 25.8 |
| 19:01-20:00 | 26.0 | 26.3 | 26.2 | 25.9 | 25.1 | 23.7 | 23.2 | 22.9 | 23.8 | 24.3 | 25.1 | 25.3 |
| 20:01-21:00 | 25.8 | 26.1 | 26.2 | 25.7 | 24.9 | 23.6 | 22.8 | 22.6 | 23.6 | 24.3 | 24.9 | 25.0 |
| 21:01-22:00 | 25.5 | 26.0 | 26.2 | 25.6 | 24.6 | 23.5 | 22.5 | 22.5 | 23.5 | 24.3 | 24.9 | 24.9 |
| 22:01-23:00 | 25.4 | 25.8 | 26.0 | 25.5 | 24.4 | 23.3 | 22.3 | 22.4 | 23.4 | 24.1 | 24.8 | 24.8 |
| 23:01-24:00 | 25.3 | 25.8 | 25.9 | 25.5 | 24.2 | 23.2 | 21.9 | 22.2 | 23.1 | 24.0 | 24.6 | 24.7 |
| Max Hour | 13 | 14 | 13 | 14 | 13 | 14 | 13 | 14 | 13 | 14 | 14 | 13 |
| Min Hour | 6 | 7 | 7 | 7 | 7 | 6 | 6 | 6 | 7 | 6 | 6 | 6 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Maximum | 26.4 | 26.0 | 26.1 | 26.6 | 25.5 | 24.6 | 24.2 | 22.8 | 23.7 | 25.3 | 24.6 | 26.0 |
| Day:Hour | 27:12 | 5:12 | 9:10 | 21:13 | 5:12 | 3:13 | 5:11 | 29:13 | 27:13 | 13:14 | 15:13 | 1:12 |
| Minimum | 18.3 | 18.3 | 18.4 | 18.9 | 17.2 | 17.1 | 15.0 | 13.8 | 15.2 | 17.6 | 18.1 | 17.8 |
| Day:Hour | 30:07 | 2:06 | 13:06 | 26:07 | 13:07 | 15:06 | 22:04 | 22:06 | 11:07 | 25:06 | 12:06 | 27:05 |

Daily Avg 23.5 23.3 23.7 23.4 22.3 21.7 20.3 20.1 20.7 21.8 22.0 22.7

- Maximum Dew Point temperature of 26.6°C on Apr 21
- Minimum Dew Point temperature of 13.8°C on Aug 22

- Monthly Statistics for Wind Chill/Heat Index temperatures °C **

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------|-------|-------|------|-------|------|------|------|-------|-------|-------|-------|------|
| Minimum WC | | | | | | | | | | | | |
| Day:Hour | | | | | | | | | | | | |
| Average WC | | | | | | | | | | | | |
| Avg Del WC | | | | | | | | | | | | |
| # Hours WC | | | | | | | | | | | | |
| Maximum HI | 37 | 38 | 39 | 37 | 35 | 32 | 30 | 29 | 32 | 34 | 34 | 35 |
| Day:Hour | 27:12 | 13:12 | 3:13 | 21:13 | 5:12 | 4:14 | 6:14 | 30:14 | 28:14 | 13:14 | 15:15 | 1:12 |
| Average HI | 33 | 33 | 33 | 32 | 31 | 30 | 29 | 28 | 29 | 30 | 31 | 31 |
| Avg Del HI | 3 | 3 | 4 | 3 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 3 |
| # Hours HI | 308 | 280 | 291 | 255 | 196 | 106 | 33 | 32 | 154 | 205 | 279 | 259 |

- **WindChill/HeatIndex Temps -- statistics...only those different from Air Temps

- Monthly Statistics for Extreme temperatures °C

| #Days | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Max >= 32 | 1 | 2 | 1 | | | | | | | | | |
| Max <= 0 | | | | | | | | | | | | |
| Min <= 0 | | | | | | | | | | | | |
| Min <=-18 | | | | | | | | | | | | |

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| HDD base 10C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HDD base 18C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CDD base 10C | | 514 | 467 | 520 | 487 | 471 | 432 | 409 | 414 | 426 | 473 | 477 |
| CDD base 18C | | 266 | 243 | 272 | 247 | 223 | 192 | 161 | 166 | 186 | 225 | 237 |

| | | | | | | | | | | | | |
|--------------|------|------|------|------|------|------|------|------|------|------|------|------|
| CDH base 20C | 4891 | 4485 | 5051 | 4486 | 3889 | 3201 | 2543 | 2625 | 3154 | 3922 | 4241 | 4395 |
| CDH base 23C | 2729 | 2550 | 2877 | 2390 | 1871 | 1250 | 807 | 823 | 1269 | 1752 | 2198 | 2242 |
| CDH base 27C | 674 | 638 | 696 | 418 | 231 | 64 | 8 | 7 | 108 | 214 | 414 | 371 |

- 5584 annual cooling degree-days (10°C baseline)
- 0 annual heating degree-days (10°C baseline)
- 2664 annual cooling degree-days (18°C baseline)
- 0 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 4am | 89 | 86 | 87 | 87 | 87 | 86 | 84 | 82 | 85 | 83 | 83 | 85 |
| 10am | 68 | 69 | 70 | 74 | 73 | 74 | 71 | 70 | 66 | 68 | 65 | 70 |
| 3pm | 65 | 65 | 68 | 72 | 70 | 71 | 69 | 66 | 63 | 66 | 62 | 66 |
| 10pm | 83 | 80 | 81 | 82 | 81 | 85 | 80 | 79 | 77 | 78 | 76 | 82 |
| Maximum | 98 | 100 | 99 | 100 | 100 | 100 | 100 | 100 | 99 | 97 | 97 | 97 |
| Day:Hour | 23:06 | 6:06 | 9:05 | 1:01 | 3:06 | 14:07 | 9:02 | 27:04 | 12:04 | 23:06 | 21:05 | 9:10 |
| Minimum | 55 | 52 | 54 | 57 | 54 | 56 | 54 | 52 | 48 | 53 | 51 | 53 |
| Day:Hour | 3:14 | 25:13 | 3:13 | 30:13 | 11:12 | 24:14 | 14:12 | 10:15 | 20:11 | 25:12 | 18:07 | 24:15 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 3.1 | 3.0 | 3.1 | 3.0 | 2.9 | 2.8 | 2.6 | 2.5 | 2.6 | 2.8 | 2.8 | 2.9 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Direct Avg | 4629 | 4986 | 4299 | 3902 | 2443 | 2193 | 2921 | 3329 | 4782 | 5097 | 5651 | 4195 |
| Direct Max | 8669 | 7231 | 8975 | 7886 | 6154 | 5050 | 5760 | 6884 | 7566 | 9061 | 8791 | 9772 |
| Day | 2 | 16 | 7 | 5 | 11 | 14 | 31 | 31 | 29 | 25 | 15 | 21 |
| Diffuse Avg | 2825 | 2763 | 2699 | 2345 | 2379 | 1977 | 1946 | 2122 | 2237 | 2349 | 2411 | 2902 |

- Maximum Direct Solar of 9772 Wh/m² on Dec 21

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 94 | 120 | 124 | 125 | 129 | 138 | 133 | 139 | 126 | 140 | 120 | 116 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|------|------|-------|------|-------|------|-------|------|-------|-------|-------|------|
| Maximum | 11.0 | 9.0 | 11.0 | 8.0 | 9.0 | 10.0 | 10.0 | 10.0 | 11.0 | 13.0 | 12.0 | 11.0 |
| Day:Hour | 8:15 | 2:12 | 29:21 | 6:05 | 23:23 | 8:05 | 14:05 | 7:15 | 30:14 | 28:16 | 11:14 | 8:16 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 2:03 | 1:06 | 1:02 | 1:01 | 1:02 | 1:01 | 4:04 | 2:12 | 1:01 | 2:06 | 5:05 | 1:05 |
| Daily Avg | 4.1 | 3.3 | 3.6 | 2.7 | 2.8 | 3.4 | 3.2 | 3.5 | 3.8 | 4.6 | 4.5 | 3.9 |

- Maximum Wind Speed of 13.0 m/s on Oct 28

- Minimum Wind Speed of 0.0 m/s on Jan 2

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 18.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |
| 2.0 m | 21.7 | 22.8 | 23.3 | 23.3 | 22.4 | 21.1 | 19.8 | 18.6 | 18.1 | 18.2 | 19.0 | 20.3 |
| 4.0 m | 20.9 | 21.8 | 22.3 | 22.5 | 22.1 | 21.4 | 20.5 | 19.6 | 19.0 | 18.9 | 19.3 | 20.0 |

- Climate type "Af" (Köppen classification)

- Tropical wet (no dry season, rainforest, hot all year, lat. < 10°)

- Heating may not be required

- Typical/Extreme Period Determination

- No dry season.....

Week closest to average annual temperature selected for Typical Period

Typical Week Period selected: Oct 8:Oct 14, Average Temp= 25.30°C, Deviation=| 0.004|°C

Week closest to maximum annual temperature selected for Typical Period

Extreme Hot Week Period selected: Mar 19:Mar 25, Maximum Temp= 33.60°C, Deviation=| 6.348|°C

Week closest to minimum annual temperature selected for Typical Period

Extreme Cold Week Period selected: Jul 16:Jul 22, Minimum Temp= 14.20°C, Deviation=| 8.527|°C

SÃO LUÍS

Statistics for sao luisCSV
 Location -- Sao Luis -TRY
 {S 2° 34'} {W 44° 13'} {GMT -3.0 Hours}
 Elevation -- 53m above sea level
 Standard Pressure at Elevation -- 100690Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

Design Stat HDB 99.6% HDB 99%
 Units {C} {C}
 HEATING 21.3 21.8

Design Stat CDB .4% CDB 1% CDB 2% CDP .4% CDP 1% CDP 2%
 Units {C} {C} {C} {C} {C} {C}
 COOLING 33.6 33.2 33.1 25.9 25.5 25.2

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|-------|
| Maximum | 33.3 | 33.9 | 33.1 | 33.0 | 33.7 | 33.0 | 32.6 | 33.0 | 33.5 | 33.7 | 34.2 | 35.0 |
| Day:Hour | 13:14 | 28:15 | 12:14 | 18:14 | 12:16 | 14:15 | 28:15 | 18:15 | 27:14 | 1:15 | 7:14 | 7:15 |
| Minimum | 23.5 | 22.3 | 20.3 | 22.0 | 22.7 | 21.0 | 21.0 | 22.0 | 22.2 | 22.4 | 21.7 | 22.4 |
| Day:Hour | 10:06 | 12:06 | 9:07 | 14:20 | 31:06 | 6:05 | 5:08 | 20:07 | 20:05 | 6:05 | 16:21 | 11:03 |
| Daily Avg | 27.5 | 26.6 | 26.2 | 26.3 | 26.4 | 26.5 | 26.5 | 26.7 | 26.9 | 27.2 | 27.2 | 27.0 |

- Maximum Dry Bulb temperature of 35.0°C on Dec 7
- Minimum Dry Bulb temperature of 20.3°C on Mar 9

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 25.3 | 24.9 | 24.4 | 24.6 | 24.5 | 24.3 | 24.4 | 24.4 | 24.3 | 24.7 | 25.0 | 25.0 |
| 1:01- 2:00 | 24.9 | 24.7 | 24.2 | 24.3 | 24.4 | 24.1 | 24.3 | 24.1 | 24.1 | 24.5 | 24.8 | 24.8 |
| 2:01- 3:00 | 24.5 | 24.4 | 24.0 | 24.1 | 24.2 | 23.9 | 24.0 | 23.9 | 24.0 | 24.2 | 24.7 | 24.6 |
| 3:01- 4:00 | 24.3 | 24.2 | 23.9 | 23.9 | 24.1 | 23.7 | 23.8 | 23.6 | 23.8 | 24.1 | 24.5 | 24.4 |
| 4:01- 5:00 | 24.2 | 24.0 | 23.7 | 23.7 | 23.9 | 23.5 | 23.7 | 23.4 | 23.7 | 23.9 | 24.4 | 24.3 |
| 5:01- 6:00 | 24.1 | 23.8 | 23.5 | 23.6 | 23.7 | 23.4 | 23.5 | 23.4 | 23.6 | 23.7 | 24.2 | 24.2 |
| 6:01- 7:00 | 24.5 | 24.2 | 23.7 | 23.9 | 23.8 | 23.5 | 23.8 | 23.5 | 24.0 | 23.8 | 24.2 | 24.4 |
| 7:01- 8:00 | 25.5 | 24.9 | 24.6 | 24.7 | 24.9 | 24.6 | 24.6 | 24.6 | 25.5 | 25.5 | 24.5 | 25.6 |
| 8:01- 9:00 | 27.2 | 26.3 | 26.3 | 26.4 | 26.6 | 26.5 | 26.7 | 27.0 | 27.4 | 27.8 | 25.8 | 27.4 |
| 9:01-10:00 | 28.5 | 27.4 | 27.6 | 27.6 | 28.1 | 27.9 | 28.0 | 28.1 | 28.6 | 29.1 | 27.8 | 28.6 |
| 10:01-11:00 | 29.6 | 28.2 | 28.8 | 29.0 | 29.0 | 29.0 | 28.9 | 29.2 | 29.7 | 30.0 | 28.8 | 29.5 |
| 11:01-12:00 | 30.4 | 29.3 | 29.5 | 29.7 | 29.8 | 29.8 | 29.8 | 30.1 | 30.5 | 30.8 | 30.1 | 30.3 |
| 12:01-13:00 | 31.3 | 30.0 | 30.0 | 29.9 | 30.1 | 30.6 | 30.4 | 30.8 | 31.3 | 31.4 | 30.8 | 30.6 |
| 13:01-14:00 | 31.8 | 30.3 | 30.1 | 30.1 | 30.2 | 30.7 | 30.3 | 31.3 | 31.6 | 31.7 | 31.4 | 30.8 |
| 14:01-15:00 | 31.8 | 29.8 | 29.8 | 29.4 | 29.6 | 30.5 | 30.6 | 31.4 | 31.7 | 31.8 | 31.6 | 30.7 |
| 15:01-16:00 | 31.5 | 29.2 | 29.0 | 28.3 | 29.0 | 29.8 | 29.6 | 30.7 | 31.2 | 31.2 | 31.5 | 30.3 |
| 16:01-17:00 | 30.8 | 29.1 | 28.1 | 27.8 | 28.1 | 29.0 | 29.3 | 29.8 | 30.2 | 30.1 | 30.9 | 29.5 |
| 17:01-18:00 | 29.5 | 28.3 | 26.9 | 27.2 | 27.1 | 27.6 | 28.2 | 28.3 | 28.8 | 28.8 | 29.8 | 28.4 |
| 18:01-19:00 | 28.0 | 27.1 | 26.0 | 26.4 | 26.3 | 26.5 | 26.6 | 26.9 | 27.0 | 27.1 | 28.5 | 27.1 |
| 19:01-20:00 | 27.1 | 26.4 | 25.6 | 26.0 | 25.8 | 25.8 | 25.8 | 26.2 | 26.1 | 26.2 | 26.9 | 26.4 |
| 20:01-21:00 | 26.5 | 26.0 | 25.2 | 25.6 | 25.4 | 25.4 | 25.4 | 25.4 | 25.4 | 25.7 | 26.1 | 26.0 |
| 21:01-22:00 | 26.1 | 25.7 | 24.9 | 25.3 | 25.0 | 25.1 | 25.1 | 25.1 | 25.1 | 25.3 | 25.7 | 25.7 |
| 22:01-23:00 | 25.8 | 25.5 | 24.7 | 25.0 | 24.8 | 24.9 | 24.8 | 24.9 | 24.7 | 25.1 | 25.4 | 25.5 |
| 23:01-24:00 | 25.5 | 25.2 | 24.5 | 24.8 | 24.6 | 24.7 | 24.6 | 24.6 | 24.5 | 24.9 | 25.2 | 25.2 |
| Max Hour | 15 | 14 | 14 | 14 | 14 | 14 | 15 | 15 | 15 | 15 | 15 | 14 |
| Min Hour | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 6 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|
| Maximum | 25.8 | 26.3 | 26.8 | 26.5 | 25.9 | 26.0 | 25.0 | 24.7 | 24.2 | 24.2 | 24.0 | 24.7 |
| Day:Hour | 10:09 | 4:14 | 12:15 | 2:15 | 6:18 | 17:15 | 3:19 | 2:15 | 28:08 | 22:13 | 29:21 | 10:12 |
| Minimum | 20.7 | 19.5 | 19.4 | 20.7 | 21.0 | 20.7 | 19.9 | 20.4 | 19.3 | 19.9 | 20.1 | 20.0 |
| Day:Hour | 13:12 | 25:20 | 9:07 | 15:10 | 6:05 | 6:05 | 26:16 | 10:16 | 29:11 | 17:12 | 21:13 | 7:18 |

Daily Avg 22.6 22.8 23.0 23.4 23.5 23.1 23.0 22.8 22.3 22.1 22.3 22.8

- Maximum Dew Point temperature of 26.8°C on Mar 12
- Minimum Dew Point temperature of 19.3°C on Sep 29

- Monthly Statistics for Wind Chill/Heat Index temperatures °C **

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------|-------|-------|-------|-------|-------|------|------|------|-------|------|------|------|
| Minimum WC | | | | | | | | | | | | |
| Day:Hour | | | | | | | | | | | | |
| Average WC | | | | | | | | | | | | |
| Avg Del WC | | | | | | | | | | | | |
| # Hours WC | | | | | | | | | | | | |
| Maximum HI | 40 | 40 | 41 | 40 | 41 | 38 | 37 | 39 | 38 | 38 | 38 | 39 |
| Day:Hour | 17:15 | 28:15 | 12:15 | 21:15 | 12:16 | 4:16 | 1:15 | 1:16 | 14:15 | 8:15 | 6:15 | 5:13 |
| Average HI | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 |
| Avg Del HI | 4 | 4 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| # Hours HI | 366 | 252 | 258 | 244 | 273 | 276 | 293 | 312 | 315 | 329 | 315 | 318 |

- **WindChill/HeatIndex Temps -- statistics...only those different from Air Temps

- Monthly Statistics for Extreme temperatures °C

| #Days | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Max >= 32 | 23 | 12 | 13 | 6 | 6 | 10 | 11 | 19 | 18 | 23 | 23 | 14 |
| Max <= 0 | | | | | | | | | | | | |
| Min <= 0 | | | | | | | | | | | | |
| Min <=-18 | | | | | | | | | | | | |

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| HDD base 10C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HDD base 18C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CDD base 10C | | 541 | 465 | 503 | 489 | 507 | 494 | 511 | 517 | 508 | 532 | 516 |
| CDD base 18C | | 293 | 241 | 255 | 249 | 259 | 254 | 263 | 269 | 268 | 284 | 276 |

| | | | | | | | | | | | | |
|--------------|------|------|------|------|------|------|------|------|------|------|------|------|
| CDH base 20C | 5545 | 4452 | 4623 | 4539 | 4733 | 4645 | 4832 | 4980 | 5002 | 5320 | 5180 | 5241 |
| CDH base 23C | 3313 | 2440 | 2441 | 2388 | 2503 | 2497 | 2607 | 2759 | 2846 | 3090 | 3035 | 3012 |
| CDH base 27C | 1053 | 641 | 643 | 569 | 625 | 727 | 727 | 848 | 938 | 1030 | 976 | 854 |

- 6112 annual cooling degree-days (10°C baseline)
- 0 annual heating degree-days (10°C baseline)

- 3192 annual cooling degree-days (18°C baseline)
- 0 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|------|
| 4am | 92 | 91 | 94 | 95 | 96 | 96 | 95 | 95 | 94 | 90 | 90 | 92 |
| 10am | 73 | 79 | 80 | 80 | 80 | 79 | 77 | 75 | 70 | 66 | 74 | 74 |
| 3pm | 60 | 71 | 72 | 74 | 74 | 67 | 64 | 61 | 57 | 58 | 58 | 65 |
| 10pm | 83 | 85 | 91 | 91 | 93 | 93 | 92 | 90 | 88 | 85 | 84 | 86 |
| Maximum | 97 | 99 | 99 | 100 | 100 | 100 | 100 | 99 | 97 | 97 | 99 | 98 |
| Day:Hour | 3:07 | 13:08 | 4:22 | 14:18 | 4:08 | 6:05 | 5:08 | 6:05 | 1:07 | 1:02 | 17:03 | 9:05 |
| Minimum | 52 | 52 | 54 | 55 | 56 | 53 | 48 | 49 | 49 | 48 | 46 | 45 |
| Day:Hour | 2:15 | 3:14 | 19:14 | 17:15 | 12:15 | 14:15 | 29:16 | 10:16 | 29:12 | 3:15 | 7:14 | 7:15 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2.8 | 2.9 | 2.9 | 3.0 | 3.0 | 2.8 | 2.7 | 2.7 | 2.6 | 2.6 | 2.6 | 2.8 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Direct Avg | 3148 | 3871 | 3117 | 3164 | 3327 | 3647 | 3884 | 4661 | 4484 | 4669 | 4311 | 3785 |
| Direct Max | 6491 | 7964 | 6108 | 6262 | 6069 | 5946 | 7692 | 6479 | 7422 | 7438 | 8006 | 7836 |
| Day | 1 | 28 | 31 | 17 | 8 | 13 | 30 | 18 | 30 | 28 | 6 | 8 |
| Diffuse Avg | 2927 | 2961 | 3136 | 2977 | 2641 | 2294 | 2234 | 2368 | 2623 | 2641 | 2677 | 2746 |

- Maximum Direct Solar of 8006 Wh/m² on Nov 6

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 52 | 57 | 54 | 57 | 66 | 51 | 74 | 65 | 68 | 59 | 55 | 55 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|------|-------|-------|-------|------|-------|-------|-------|-------|------|------|-------|
| Maximum | 10.0 | 15.0 | 11.0 | 9.0 | 9.0 | 9.0 | 10.0 | 10.0 | 13.0 | 13.0 | 10.0 | 13.0 |
| Day:Hour | 1:10 | 22:24 | 25:15 | 19:10 | 9:23 | 25:10 | 11:11 | 10:11 | 29:12 | 1:10 | 1:11 | 10:24 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 1:02 | 1:01 | 1:04 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 1:01 | 2:21 | 1:20 | 1:01 |
| Daily Avg | 3.5 | 2.6 | 2.8 | 2.2 | 2.4 | 1.9 | 3.1 | 3.6 | 4.8 | 4.4 | 3.7 | 3.3 |

- Maximum Wind Speed of 15.0 m/s on Feb 22

- Minimum Wind Speed of 0.0 m/s on Jan 1

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 18.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |
| 2.0 m | 21.7 | 22.8 | 23.3 | 23.3 | 22.4 | 21.1 | 19.8 | 18.6 | 18.1 | 18.2 | 19.0 | 20.3 |
| 4.0 m | 20.9 | 21.8 | 22.3 | 22.5 | 22.1 | 21.4 | 20.5 | 19.6 | 19.0 | 18.9 | 19.3 | 20.0 |

- Climate type "Af" (Köppen classification)

- Tropical wet (no dry season, rainforest, hot all year, lat. < 10°)

- Heating may not be required

- Typical/Extreme Period Determination

- No dry season.....

Week closest to average annual temperature selected for Typical Period

Typical Week Period selected: Jul 30:Aug 5, Average Temp= 26.75°C, Deviation=| 0.008|°C

Week closest to maximum annual temperature selected for Typical Period

Extreme Hot Week Period selected: Nov 5:Nov 11, Maximum Temp= 35.00°C, Deviation=| 7.200|°C

Week closest to minimum annual temperature selected for Typical Period

Extreme Cold Week Period selected: Mar 5:Mar 11, Minimum Temp= 20.30°C, Deviation=| 4.483|°C

SÃO PAULO

Statistics for sao pauloCSV
 Location -- Sao Paulo -TRY
 {S 23° 37'} {W 46° 39'} {GMT -3.0 Hours}
 Elevation -- 802m above sea level
 Standard Pressure at Elevation -- 92054Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

| | | |
|-------------|-----------|---------|
| Design Stat | HDB 99.6% | HDB 99% |
| Units | {C} | {C} |
| HEATING | 9.0 | 9.6 |

| | | | | | | |
|-------------|---------|--------|--------|---------|--------|--------|
| Design Stat | CDB .4% | CDB 1% | CDB 2% | CDP .4% | CDP 1% | CDP 2% |
| Units | {C} | {C} | {C} | {C} | {C} | {C} |
| COOLING | 32.1 | 31.4 | 30.7 | 23.1 | 22.3 | 21.7 |

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Maximum | 32.5 | 32.8 | 31.0 | 28.8 | 27.0 | 25.0 | 27.1 | 27.9 | 32.0 | 31.0 | 32.6 | 31.4 |
| Day:Hour | 26:15 | 25:15 | 3:16 | 11:16 | 5:16 | 12:17 | 15:16 | 4:14 | 18:16 | 9:16 | 9:15 | 26:15 |
| Minimum | 15.5 | 16.5 | 15.0 | 11.5 | 9.2 | 8.7 | 9.1 | 7.5 | 9.4 | 10.0 | 12.5 | 12.4 |
| Day:Hour | 4:07 | 12:07 | 22:08 | 18:07 | 24:08 | 21:06 | 8:08 | 30:08 | 1:08 | 24:06 | 21:07 | 30:06 |
| Daily Avg | 22.5 | 22.1 | 21.2 | 18.5 | 16.7 | 16.8 | 16.0 | 17.2 | 18.1 | 17.9 | 18.9 | 20.0 |

- Maximum Dry Bulb temperature of 32.8°C on Feb 25
- Minimum Dry Bulb temperature of 7.5°C on Aug 30

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 20.3 | 20.4 | 19.4 | 16.8 | 15.4 | 15.0 | 14.2 | 15.2 | 16.1 | 16.1 | 16.6 | 18.0 |
| 1:01- 2:00 | 20.0 | 20.2 | 19.2 | 16.6 | 15.2 | 14.8 | 13.8 | 14.8 | 15.9 | 15.8 | 16.4 | 17.8 |
| 2:01- 3:00 | 19.6 | 20.0 | 18.9 | 16.3 | 15.1 | 14.6 | 13.5 | 14.2 | 15.7 | 15.6 | 16.1 | 17.5 |
| 3:01- 4:00 | 19.3 | 19.8 | 18.7 | 16.1 | 14.8 | 14.4 | 13.3 | 13.7 | 15.6 | 15.5 | 15.9 | 17.3 |
| 4:01- 5:00 | 19.2 | 19.6 | 18.5 | 15.9 | 14.7 | 14.2 | 13.1 | 13.4 | 15.5 | 15.4 | 15.7 | 17.1 |
| 5:01- 6:00 | 19.1 | 19.4 | 18.4 | 15.8 | 14.7 | 14.0 | 12.8 | 13.1 | 15.2 | 15.2 | 15.5 | 16.7 |
| 6:01- 7:00 | 19.0 | 19.1 | 18.3 | 15.7 | 14.6 | 13.9 | 12.8 | 12.8 | 15.0 | 15.3 | 15.5 | 16.7 |
| 7:01- 8:00 | 19.6 | 19.4 | 18.4 | 16.0 | 14.7 | 13.7 | 12.7 | 12.9 | 15.1 | 15.9 | 16.7 | 17.6 |
| 8:01- 9:00 | 21.0 | 20.5 | 19.3 | 16.7 | 15.1 | 14.0 | 13.2 | 13.8 | 16.0 | 16.8 | 17.9 | 19.1 |
| 9:01-10:00 | 22.6 | 22.2 | 20.7 | 18.0 | 16.2 | 15.3 | 14.4 | 15.6 | 17.5 | 18.1 | 19.6 | 20.6 |
| 10:01-11:00 | 24.7 | 23.9 | 22.5 | 19.5 | 17.3 | 16.9 | 16.0 | 18.1 | 19.3 | 19.6 | 21.2 | 22.1 |
| 11:01-12:00 | 26.0 | 25.0 | 24.0 | 20.7 | 18.5 | 18.6 | 17.6 | 20.0 | 20.9 | 20.9 | 22.9 | 23.1 |
| 12:01-13:00 | 26.9 | 25.8 | 25.3 | 21.7 | 19.7 | 19.9 | 19.1 | 21.4 | 22.5 | 21.7 | 24.1 | 23.6 |
| 13:01-14:00 | 27.8 | 26.2 | 26.2 | 22.5 | 20.4 | 20.8 | 20.4 | 22.7 | 23.6 | 22.2 | 24.5 | 24.2 |
| 14:01-15:00 | 27.6 | 25.9 | 25.9 | 22.9 | 20.6 | 21.2 | 21.5 | 23.0 | 23.7 | 22.1 | 23.9 | 24.0 |
| 15:01-16:00 | 26.8 | 25.8 | 25.6 | 22.9 | 20.3 | 21.5 | 21.5 | 23.0 | 22.8 | 21.3 | 22.5 | 23.5 |
| 16:01-17:00 | 25.5 | 25.0 | 24.3 | 22.2 | 19.4 | 21.0 | 21.0 | 22.5 | 21.1 | 20.5 | 21.2 | 23.0 |
| 17:01-18:00 | 24.3 | 24.1 | 22.8 | 20.5 | 18.3 | 19.7 | 19.9 | 21.1 | 20.0 | 19.4 | 20.4 | 22.0 |
| 18:01-19:00 | 23.1 | 22.9 | 21.4 | 19.2 | 17.2 | 18.1 | 18.0 | 19.2 | 18.8 | 18.3 | 19.1 | 21.1 |
| 19:01-20:00 | 22.3 | 22.0 | 20.7 | 18.4 | 16.6 | 16.9 | 16.5 | 17.9 | 17.8 | 17.5 | 18.2 | 19.9 |
| 20:01-21:00 | 21.6 | 21.5 | 20.3 | 17.9 | 16.1 | 16.5 | 15.8 | 17.0 | 17.2 | 17.1 | 17.8 | 19.3 |
| 21:01-22:00 | 21.3 | 21.1 | 20.1 | 17.6 | 15.9 | 16.1 | 15.2 | 16.4 | 16.9 | 16.7 | 17.4 | 18.9 |
| 22:01-23:00 | 21.0 | 20.9 | 19.8 | 17.3 | 15.6 | 15.7 | 14.7 | 15.9 | 16.6 | 16.5 | 17.1 | 18.6 |
| 23:01-24:00 | 20.7 | 20.7 | 19.6 | 17.1 | 15.4 | 15.3 | 14.3 | 15.6 | 16.3 | 16.4 | 16.8 | 18.3 |
| Max Hour | 14 | 14 | 14 | 16 | 15 | 16 | 15 | 15 | 15 | 14 | 14 | 14 |
| Min Hour | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 7 | 7 | 6 | 6 | 7 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Maximum | 23.4 | 23.9 | 23.0 | 20.0 | 19.4 | 18.3 | 16.0 | 17.0 | 17.7 | 19.8 | 19.0 | 22.8 |
| Day:Hour | 29:18 | 21:16 | 14:17 | 10:20 | 13:14 | 2:14 | 8:12 | 23:17 | 21:20 | 9:18 | 15:15 | 12:19 |
| Minimum | 11.2 | 14.1 | 13.9 | 10.4 | 9.0 | 3.9 | 7.4 | 2.0 | 6.7 | 7.5 | 5.6 | 6.1 |
| Day:Hour | 16:16 | 2:13 | 15:16 | 17:09 | 23:12 | 20:18 | 10:10 | 17:15 | 10:13 | 22:13 | 3:15 | 5:15 |

Daily Avg 18.1 18.8 18.2 15.3 14.3 13.6 11.8 10.9 13.7 14.7 15.0 15.6

- Maximum Dew Point temperature of 23.9°C on Feb 21
- Minimum Dew Point temperature of 2.0°C on Aug 17

- Monthly Statistics for Wind Chill/Heat Index temperatures °C **

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------|-------|-------|------|-------|------|-------|------|-------|-------|------|-------|-------|
| Minimum WC | | | | | | 7 | 4 | 1 | 9 | | | |
| Day:Hour | | | | | | 28:08 | 5:10 | 29:08 | 1:08 | | | |
| Average WC | | | | | | 7 | 8 | 4 | 9 | | | |
| Avg Del WC | | | | | | 3 | 2 | 5 | 0 | | | |
| # Hours WC | | | | | | 1 | 6 | 10 | 1 | | | |
| Maximum HI | 34 | 39 | 33 | 28 | 27 | | | 27 | 30 | 32 | 30 | 33 |
| Day:Hour | 29:16 | 21:16 | 5:13 | 25:16 | 5:16 | | | 9:16 | 25:14 | 9:16 | 23:14 | 27:17 |
| Average HI | 30 | 31 | 30 | 28 | 27 | | | 27 | 28 | 29 | 28 | 29 |
| Avg Del HI | 1 | 2 | 1 | 0 | 0 | | | 0 | 0 | 0 | 0 | 1 |
| # Hours HI | 104 | 68 | 69 | 13 | 1 | | | 2 | 13 | 27 | 13 | 46 |

- **WindChill/HeatIndex Temps -- statistics...only those different from Air Temps

- Monthly Statistics for Extreme temperatures °C

| #Days | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Max >= 32 | 2 | 2 | | | | | | | | 1 | | 2 |
| Max <= 0 | | | | | | | | | | | | |
| Min <= 0 | | | | | | | | | | | | |
| Min <=-18 | | | | | | | | | | | | |

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| HDD base 10C | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HDD base 18C | | | 1 | 0 | 1 | 23 | 51 | 42 | 64 | 43 | 29 | 36 |
| CDD base 10C | | | 387 | 340 | 346 | 255 | 209 | 203 | 188 | 224 | 244 | 266 |
| CDD base 18C | | | 140 | 116 | 99 | 38 | 12 | 4 | 4 | 19 | 33 | 33 |

| | | | | | | | | | | | | |
|--------------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CDH base 20C | 2136 | 1619 | 1401 | 615 | 305 | 318 | 379 | 781 | 867 | 741 | 772 | 1202 |
| CDH base 23C | 1033 | 670 | 602 | 214 | 66 | 39 | 75 | 288 | 415 | 336 | 301 | 482 |
| CDH base 27C | 267 | 164 | 110 | 7 | 0 | 0 | 0 | 3 | 108 | 61 | 74 | 82 |

- 3217 annual cooling degree-days (10°C baseline)
- 0 annual heating degree-days (10°C baseline)
- 601 annual cooling degree-days (18°C baseline)
- 304 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|-------|-------|-------|------|-------|-------|-------|------|-------|------|------|
| 4am | 94 | 94 | 96 | 95 | 97 | 96 | 93 | 88 | 91 | 95 | 94 | 90 |
| 10am | 78 | 82 | 85 | 85 | 89 | 89 | 84 | 77 | 78 | 82 | 75 | 74 |
| 3pm | 58 | 70 | 66 | 64 | 71 | 65 | 55 | 46 | 59 | 69 | 62 | 62 |
| 10pm | 86 | 90 | 92 | 91 | 94 | 89 | 86 | 75 | 88 | 90 | 90 | 86 |
| Maximum | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Day:Hour | 8:03 | 4:17 | 3:07 | 4:07 | 5:22 | 4:05 | 1:24 | 1:01 | 2:23 | 1:01 | 9:01 | 3:24 |
| Minimum | 32 | 37 | 37 | 39 | 47 | 35 | 32 | 21 | 25 | 31 | 22 | 30 |
| Day:Hour | 16:16 | 25:15 | 15:16 | 11:16 | 5:16 | 29:16 | 15:16 | 17:15 | 4:16 | 26:15 | 3:15 | 5:15 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2.1 | 2.2 | 2.1 | 1.7 | 1.7 | 1.6 | 1.3 | 1.2 | 1.6 | 1.7 | 1.8 | 1.8 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Direct Avg | 4109 | 3642 | 3553 | 3663 | 2201 | 2742 | 2883 | 4220 | 3807 | 3912 | 4564 | 4853 |
| Direct Max | 8654 | 8938 | 7480 | 8077 | 5021 | 5094 | 5488 | 6620 | 7726 | 9441 | 8724 | 11033 |
| Day | 29 | 25 | 15 | 9 | 24 | 20 | 21 | 19 | 8 | 17 | 20 | 6 |
| Diffuse Avg | 3089 | 3133 | 2668 | 2091 | 1963 | 1456 | 1383 | 1533 | 2038 | 2710 | 2758 | 3074 |

- Maximum Direct Solar of 11033 Wh/m² on Dec 6

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 171 | 144 | 148 | 148 | 152 | 158 | 156 | 127 | 149 | 161 | 133 | 172 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| Maximum | 15.0 | 18.0 | 10.0 | 11.0 | 12.0 | 12.0 | 14.0 | 14.0 | 12.0 | 17.0 | 11.0 | 14.0 |
| Day:Hour | 6:14 | 7:15 | 2:17 | 2:18 | 10:15 | 19:15 | 15:16 | 29:12 | 11:17 | 28:01 | 23:22 | 29:15 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 1:04 | 4:11 | 1:01 | 2:07 | 4:15 | 1:24 | 1:21 | 1:02 | 1:04 | 4:20 | 2:10 | 4:04 |
| Daily Avg | 3.7 | 3.8 | 3.6 | 3.9 | 4.1 | 3.2 | 3.8 | 3.9 | 4.3 | 4.6 | 4.5 | 4.5 |

- Maximum Wind Speed of 18.0 m/s on Feb 7

- Minimum Wind Speed of 0.0 m/s on Jan 1

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 18.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |
| 2.0 m | 21.7 | 22.8 | 23.3 | 23.3 | 22.4 | 21.1 | 19.8 | 18.6 | 18.1 | 18.2 | 19.0 | 20.3 |
| 4.0 m | 20.9 | 21.8 | 22.3 | 22.5 | 22.1 | 21.4 | 20.5 | 19.6 | 19.0 | 18.9 | 19.3 | 20.0 |

- Climate type "Cfa" (Köppen classification)

- Humid subtropical (mild with no dry season, hot summer, lat. 20-35°S)

- Unbearably humid periods in summer, but passive cooling is possible

- Typical/Extreme Period Determination

- Summer is Jan:Feb

Extreme Summer Week (nearest maximum temperature for summer)

Extreme Hot Week Period selected: Feb 19:Feb 25, Maximum Temp= 32.80°C, Deviation=| 8.538|°C

Typical Summer Week (nearest average temperature for summer)

Typical Week Period selected: Jan 8:Jan 14, Average Temp= 22.31°C, Deviation=| 0.325|°C

- Winter is Jun:Aug
 - Extreme Winter Week (nearest minimum temperature for winter)
 - Extreme Cold Week Period selected: Aug 24:Aug 30, Minimum Temp= 7.50°C, Deviation=| 6.996|°C
 - Typical Winter Week (nearest average temperature for winter)
 - Typical Week Period selected: Jul 6:Jul 12, Average Temp= 16.68°C, Deviation=| 0.330|°C

- Autumn is Mar:May
 - Typical Autumn Week (nearest average temperature for autumn)
 - Typical Week Period selected: May 3:May 9, Average Temp= 18.81°C, Deviation=| 0.081|°C

- Spring is Sep:Nov
 - Typical Spring Week (nearest average temperature for spring)
 - Typical Week Period selected: Nov 10:Nov 16, Average Temp= 18.30°C, Deviation=| 0.041|°C

VITÓRIA

Statistics for vitoriaCSV
 Location -- Vitoria -TRY
 {S 20° 16'} {W 40° 16'} {GMT -3.0 Hours}
 Elevation -- 5m above sea level
 Standard Pressure at Elevation -- 101265Pa

WMO Station *unknown*

- Using Design Conditions calculated from this weather file.
- The following design temperature statistics are calculated based on THIS weather file ONLY
- and may not be representative of a long-term period of record normally used for
- design temperatures. Also, note that dew point temperatures are listed where
- wet-bulb temperatures are normally presented.

| | | |
|-------------|-----------|---------|
| Design Stat | HDB 99.6% | HDB 99% |
| Units | {C} | {C} |
| HEATING | 12.4 | 14.3 |

| | | | | | | |
|-------------|---------|--------|--------|---------|--------|--------|
| Design Stat | CDB .4% | CDB 1% | CDB 2% | CDP .4% | CDP 1% | CDP 2% |
| Units | {C} | {C} | {C} | {C} | {C} | {C} |
| COOLING | 33.1 | 32.6 | 32.3 | 26.6 | 26.0 | 25.4 |

- Monthly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|------|-------|------|-------|-------|-------|-------|-------|-------|------|-------|------|
| Maximum | 35.6 | 33.7 | 33.4 | 33.9 | 32.4 | 28.8 | 29.0 | 33.0 | 32.3 | 32.2 | 32.8 | 33.8 |
| Day:Hour | 3:16 | 23:14 | 4:13 | 2:14 | 3:17 | 22:14 | 6:14 | 30:15 | 28:13 | 3:15 | 3:14 | 3:14 |
| Minimum | 19.9 | 20.9 | 19.4 | 17.1 | 16.4 | 14.5 | 11.2 | 14.3 | 15.6 | 15.6 | 17.4 | 18.8 |
| Day:Hour | 2:05 | 28:24 | 2:07 | 22:07 | 10:07 | 16:04 | 30:05 | 8:06 | 18:04 | 8:06 | 15:06 | 8:05 |
| Daily Avg | 25.7 | 26.0 | 25.5 | 24.3 | 22.5 | 20.0 | 20.1 | 21.4 | 22.0 | 22.6 | 24.1 | 24.6 |

- Maximum Dry Bulb temperature of 35.6°C on Jan 3
- Minimum Dry Bulb temperature of 11.2°C on Jul 30

- Average Hourly Statistics for Dry Bulb temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0:01- 1:00 | 23.8 | 24.2 | 23.5 | 22.3 | 20.5 | 18.1 | 18.2 | 19.1 | 20.2 | 21.1 | 22.2 | 23.0 |
| 1:01- 2:00 | 23.5 | 24.1 | 23.2 | 22.0 | 20.3 | 17.9 | 18.0 | 18.8 | 20.0 | 20.6 | 22.0 | 22.8 |
| 2:01- 3:00 | 23.4 | 23.9 | 23.0 | 21.7 | 20.0 | 17.6 | 17.7 | 18.7 | 19.8 | 20.3 | 21.8 | 22.5 |
| 3:01- 4:00 | 23.2 | 23.7 | 22.7 | 21.3 | 19.7 | 17.4 | 17.4 | 18.3 | 19.6 | 20.1 | 21.7 | 22.4 |
| 4:01- 5:00 | 23.0 | 23.6 | 22.4 | 21.0 | 19.5 | 17.2 | 17.2 | 17.9 | 19.5 | 19.9 | 21.4 | 22.1 |
| 5:01- 6:00 | 22.8 | 23.3 | 22.1 | 20.7 | 19.2 | 17.0 | 16.9 | 17.6 | 19.4 | 19.7 | 21.3 | 22.1 |
| 6:01- 7:00 | 23.1 | 23.4 | 21.8 | 20.5 | 19.1 | 16.9 | 16.8 | 17.3 | 19.3 | 20.1 | 21.8 | 22.5 |
| 7:01- 8:00 | 24.5 | 24.5 | 23.2 | 21.7 | 19.6 | 17.4 | 17.4 | 18.2 | 20.6 | 21.6 | 23.6 | 23.9 |
| 8:01- 9:00 | 26.0 | 25.9 | 25.5 | 23.9 | 21.7 | 19.1 | 19.0 | 20.5 | 22.2 | 23.2 | 25.0 | 25.0 |
| 9:01-10:00 | 27.2 | 27.1 | 27.4 | 26.2 | 23.9 | 20.7 | 20.9 | 22.5 | 23.4 | 24.3 | 26.1 | 25.9 |
| 10:01-11:00 | 28.1 | 28.2 | 28.5 | 27.7 | 25.1 | 22.1 | 22.8 | 24.6 | 24.4 | 25.0 | 27.0 | 26.5 |
| 11:01-12:00 | 28.3 | 29.2 | 29.4 | 28.3 | 25.8 | 23.2 | 23.6 | 25.7 | 25.3 | 25.6 | 27.5 | 27.3 |
| 12:01-13:00 | 28.9 | 29.8 | 29.7 | 28.7 | 26.3 | 23.5 | 24.2 | 26.1 | 25.5 | 25.6 | 27.9 | 27.5 |
| 13:01-14:00 | 29.2 | 30.0 | 29.8 | 28.9 | 26.7 | 23.8 | 24.1 | 26.2 | 25.5 | 25.7 | 27.8 | 28.0 |
| 14:01-15:00 | 29.0 | 29.3 | 29.4 | 28.3 | 26.6 | 23.9 | 24.0 | 26.1 | 25.0 | 25.4 | 27.4 | 27.5 |
| 15:01-16:00 | 28.5 | 28.9 | 28.8 | 27.6 | 26.1 | 23.4 | 23.5 | 25.4 | 24.6 | 25.0 | 26.5 | 27.2 |
| 16:01-17:00 | 27.6 | 28.1 | 27.8 | 26.8 | 25.4 | 22.7 | 22.8 | 24.2 | 23.9 | 24.4 | 25.5 | 26.4 |
| 17:01-18:00 | 26.8 | 27.2 | 26.8 | 25.9 | 24.2 | 21.9 | 21.9 | 23.2 | 22.9 | 23.5 | 24.7 | 25.6 |
| 18:01-19:00 | 25.9 | 26.1 | 25.8 | 24.8 | 22.9 | 20.7 | 20.8 | 21.8 | 21.9 | 22.8 | 24.0 | 24.8 |
| 19:01-20:00 | 25.2 | 25.1 | 25.0 | 24.0 | 22.1 | 19.9 | 19.9 | 20.8 | 21.2 | 22.1 | 23.3 | 24.2 |
| 20:01-21:00 | 24.8 | 24.6 | 24.5 | 23.6 | 21.5 | 19.5 | 19.5 | 20.4 | 21.0 | 21.7 | 23.0 | 23.8 |
| 21:01-22:00 | 24.6 | 24.5 | 24.2 | 23.2 | 21.2 | 19.0 | 19.1 | 20.0 | 20.8 | 21.4 | 22.8 | 23.5 |
| 22:01-23:00 | 24.3 | 24.3 | 23.9 | 22.7 | 20.9 | 18.8 | 18.8 | 19.8 | 20.6 | 21.3 | 22.6 | 23.4 |
| 23:01-24:00 | 24.0 | 24.2 | 23.7 | 22.6 | 20.7 | 18.5 | 18.5 | 19.5 | 20.4 | 21.0 | 22.5 | 23.2 |
| Max Hour | 14 | 14 | 14 | 14 | 14 | 15 | 13 | 14 | 14 | 14 | 13 | 14 |
| Min Hour | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 6 | 6 | 6 |

- Monthly Statistics for Dew Point temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|-------|-------|------|-------|-------|------|-------|-------|-------|-------|-------|------|
| Maximum | 27.6 | 26.7 | 27.3 | 27.2 | 25.0 | 22.0 | 23.1 | 24.2 | 25.4 | 24.2 | 26.5 | 25.3 |
| Day:Hour | 15:16 | 18:14 | 4:14 | 30:14 | 3:12 | 7:14 | 18:18 | 30:13 | 28:13 | 5:10 | 16:11 | 3:14 |
| Minimum | 17.2 | 19.5 | 18.5 | 15.5 | 11.9 | 12.1 | 9.3 | 12.2 | 12.1 | 7.6 | 13.4 | 17.4 |
| Day:Hour | 9:08 | 19:07 | 2:07 | 4:24 | 31:14 | 1:08 | 31:08 | 25:18 | 15:17 | 22:01 | 13:05 | 7:04 |

Daily Avg 22.5 22.2 22.3 20.7 19.1 17.2 17.3 17.9 18.8 19.3 20.1 21.5

- Maximum Dew Point temperature of 27.6°C on Jan 15
- Minimum Dew Point temperature of 7.6°C on Oct 22

- Monthly Statistics for Wind Chill/Heat Index temperatures °C **

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------|-------|-------|------|-------|------|-------|-------|-------|-------|------|-------|------|
| Minimum WC | | | | | | | | | | | | |
| Day:Hour | | | | | | | | | | | | |
| Average WC | | | | | | | | | | | | |
| Avg Del WC | | | | | | | | | | | | |
| # Hours WC | | | | | | | | | | | | |
| Maximum HI | 44 | 44 | 45 | 44 | 39 | 32 | 32 | 40 | 41 | 38 | 41 | 43 |
| Day:Hour | 15:15 | 18:14 | 4:13 | 30:14 | 3:13 | 22:14 | 19:13 | 30:15 | 28:13 | 4:11 | 16:11 | 3:14 |
| Average HI | 33 | 33 | 33 | 32 | 32 | 30 | 30 | 31 | 32 | 32 | 32 | 33 |
| Avg Del HI | 4 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 4 |
| # Hours HI | 230 | 211 | 234 | 154 | 84 | 5 | 21 | 57 | 60 | 81 | 150 | 146 |

- **WindChill/HeatIndex Temps -- statistics...only those different from Air Temps

- Monthly Statistics for Extreme temperatures °C

| #Days | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Max >= 32 | 5 | 9 | 7 | 6 | 2 | | | 1 | 1 | 2 | 5 | 3 |
| Max <= 0 | | | | | | | | | | | | |
| Min <= 0 | | | | | | | | | | | | |
| Min <=-18 | | | | | | | | | | | | |

- Monthly Heating/Cooling Degree Days/Hours

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| HDD base 10C | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| HDD base 18C | | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | |
| CDD base 10C | | 485 | 447 | 480 | 430 | 386 | 300 | 314 | 352 | 359 | 389 | 424 | 454 |
| CDD base 18C | | 237 | 223 | 233 | 190 | 138 | 60 | 69 | 104 | 119 | 141 | 184 | 206 |

| | | | | | | | | | | | | |
|--------------|------|------|------|------|------|-----|-----|------|------|------|------|------|
| CDH base 20C | 4204 | 4007 | 4093 | 3159 | 2137 | 836 | 999 | 1591 | 1758 | 2157 | 3031 | 3460 |
| CDH base 23C | 2076 | 2043 | 2019 | 1448 | 843 | 165 | 291 | 624 | 619 | 814 | 1348 | 1544 |
| CDH base 27C | 466 | 530 | 513 | 308 | 158 | 5 | 15 | 97 | 91 | 149 | 311 | 318 |

- 4821 annual cooling degree-days (10°C baseline)
- 0 annual heating degree-days (10°C baseline)
- 1904 annual cooling degree-days (18°C baseline)
- 3 annual heating degree-days (18°C baseline)

- Monthly Average Daily Relative Humidity %

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------|------|-------|-------|-------|------|------|------|-------|-------|-------|-------|-------|
| 4am | 94 | 92 | 94 | 93 | 92 | 92 | 92 | 92 | 93 | 93 | 90 | 92 |
| 10am | 78 | 77 | 77 | 73 | 78 | 83 | 81 | 78 | 79 | 80 | 73 | 80 |
| 3pm | 73 | 70 | 71 | 70 | 70 | 74 | 77 | 70 | 73 | 74 | 70 | 76 |
| 10pm | 90 | 89 | 90 | 88 | 89 | 91 | 90 | 88 | 90 | 88 | 87 | 89 |
| Maximum | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 100 | 100 | 100 |
| Day:Hour | 6:05 | 1:20 | 1:01 | 18:07 | 2:01 | 7:06 | 2:03 | 6:02 | 1:05 | 13:09 | 10:21 | 25:04 |
| Minimum | 49 | 50 | 49 | 42 | 50 | 51 | 57 | 42 | 48 | 32 | 43 | 54 |
| Day:Hour | 3:16 | 13:13 | 30:14 | 26:15 | 6:16 | 3:15 | 6:14 | 27:14 | 17:15 | 22:01 | 14:12 | 18:13 |

- Monthly Indicators for Precipitation/Moisture (kPa)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2.9 | 2.8 | 2.9 | 2.6 | 2.4 | 2.2 | 2.2 | 2.3 | 2.3 | 2.3 | 2.5 | 2.7 |

- Monthly Statistics for Solar Wh/m²

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|-------|-------|------|------|------|------|------|------|------|------|------|-------|
| Direct Avg | 4974 | 4539 | 4639 | 3609 | 2271 | 2621 | 2628 | 3987 | 2754 | 3024 | 3955 | 3919 |
| Direct Max | 10369 | 10036 | 7624 | 6087 | 4598 | 5293 | 6112 | 7215 | 7324 | 9193 | 7994 | 10574 |
| Day | 15 | 3 | 15 | 16 | 2 | 22 | 26 | 30 | 28 | 8 | 14 | 31 |
| Diffuse Avg | 2967 | 2936 | 2417 | 2096 | 1995 | 1640 | 1657 | 1772 | 2347 | 2936 | 2792 | 3262 |

- Maximum Direct Solar of 10574 Wh/m² on Dec 31

- Monthly Average Daily Wind Direction ° {N=0 or 360,E=90,S=180,W=270}

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 111 | 90 | 104 | 142 | 162 | 161 | 155 | 129 | 115 | 115 | 119 | 103 |

- Monthly Statistics for Wind Speed m/s

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|-------|-------|
| Maximum | 15.0 | 14.0 | 14.0 | 14.0 | 12.0 | 11.0 | 11.0 | 12.0 | 14.0 | 15.0 | 15.0 | 12.0 |
| Day:Hour | 24:17 | 17:16 | 11:16 | 10:14 | 27:11 | 14:14 | 11:11 | 16:17 | 8:17 | 6:12 | 19:17 | 31:17 |
| Minimum | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Day:Hour | 1:23 | 1:01 | 1:02 | 1:06 | 1:01 | 1:20 | 1:02 | 1:08 | 1:21 | 1:04 | 7:06 | 1:09 |
| Daily Avg | 4.4 | 5.3 | 3.3 | 3.8 | 3.9 | 3.2 | 3.7 | 4.3 | 4.5 | 4.6 | 5.8 | 5.0 |

- Maximum Wind Speed of 15.0 m/s on Jan 24

- Minimum Wind Speed of 0.0 m/s on Jan 1

- Monthly Calculated "undisturbed" Ground Temperatures °C

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0.5 m | 22.8 | 23.9 | 24.2 | 23.9 | 22.2 | 20.4 | 18.7 | 17.5 | 17.2 | 17.8 | 19.2 | 21.0 |
| 2.0 m | 21.7 | 22.8 | 23.3 | 23.3 | 22.4 | 21.1 | 19.8 | 18.6 | 18.1 | 18.2 | 19.0 | 20.3 |
| 4.0 m | 20.9 | 21.8 | 22.3 | 22.5 | 22.1 | 21.4 | 20.5 | 19.6 | 19.0 | 18.9 | 19.3 | 20.0 |

- Climate type "Am" (Köppen classification)

- Tropical monsoonal or tradewind-coastal (short dry season, lat. 5-25°)

- Typical/Extreme Period Determination

- No discernible dry period.....

Week closest to average annual temperature selected for Typical Period

Typical Week Period selected: Sep 3:Sep 9, Average Temp= 23.21°C, Deviation=| 0.244|°C

- Extremes Selected from annual Min/Max

Week closest to maximum annual temperature selected for Typical Period

Extreme Hot Week Period selected: Feb 12:Feb 18, Maximum Temp= 35.60°C, Deviation=| 8.547|°C

Week closest to minimum annual temperature selected for Typical Period

Extreme Cold Week Period selected: Jun 11:Jun 17, Minimum Temp= 11.20°C, Deviation=| 8.217|°C



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energia@labeee.ufsc.br
Fax: (48) 331-5191

LabEEE

**ANEXO 3
Planilhas Resumo**

Resumo do Arquivo Climático

Cidade: Belem
 Ano: 1964

| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 34.9 | 28.6 | 101.5 | 10 | 1020 | 989 | 10 |
| Média | 26.0 | 23.9 | 101.0 | 6.3 | 223.7 | 146.4 | 1.6 |
| Mínima | 20 | 19.5 | 100.2 | 0 | 0 | 0 | 0 |

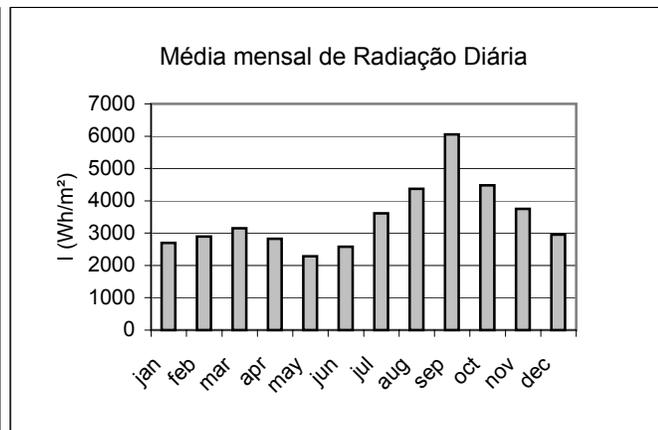
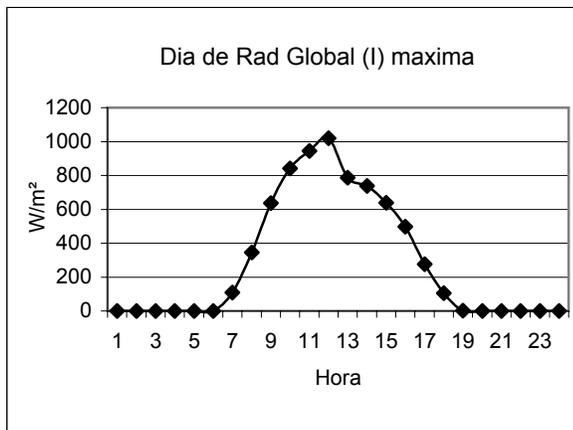
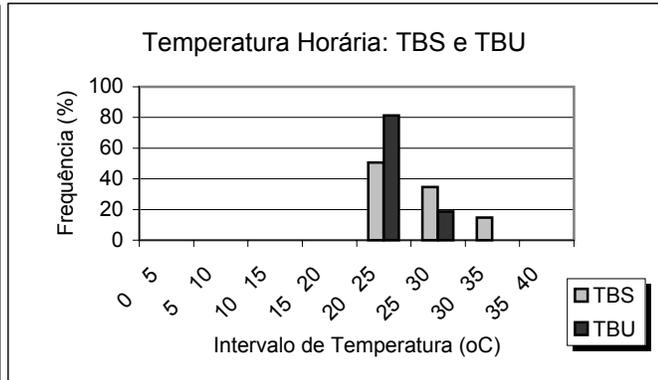
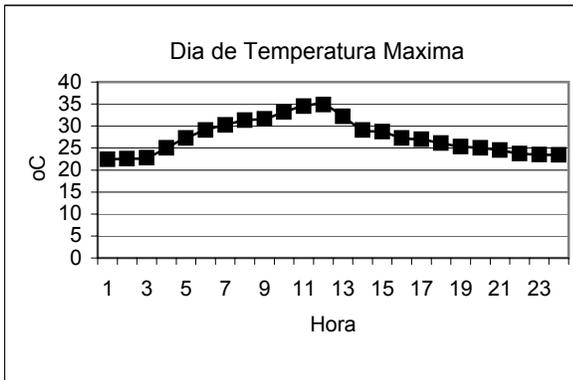
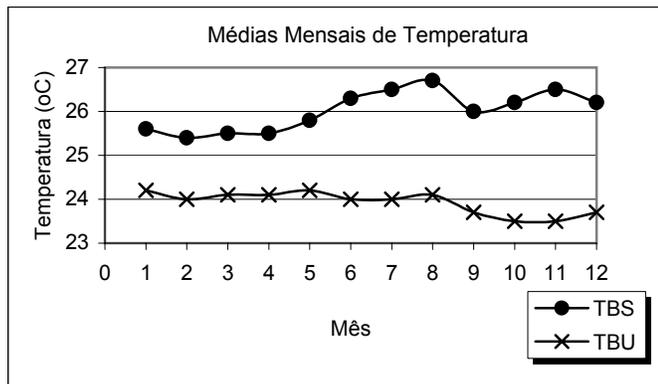
| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |
| I diurna**>0 | OK |

*Das 21 h às 4 h

**Das 8 h às 17 h

| Tmax | |
|------|-----|
| Mês | Dia |
| 1 | 6 |

| I max | |
|-------|-----|
| Mês | Dia |
| 9 | 22 |



Resumo do Arquivo Climático

Cidade: Belo Horizonte

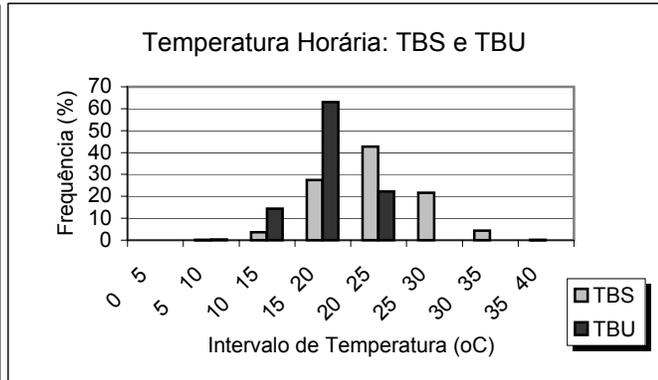
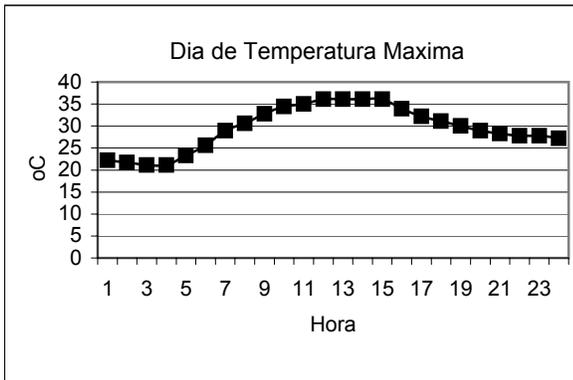
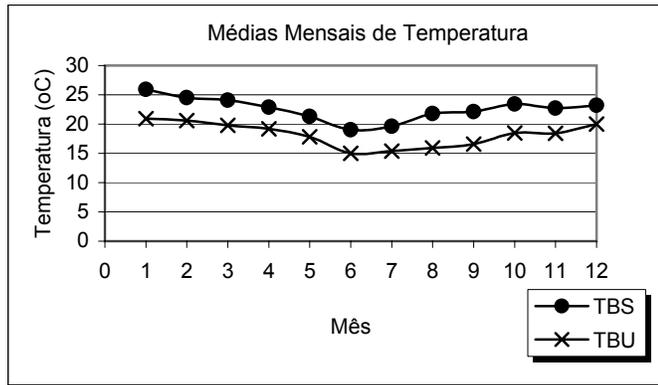
Ano: 1995

| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 36.1 | 25.6 | 101.1 | | | | 2.1 |
| Média | 22.6 | 18.2 | 101.1 | | | | 2.1 |
| Mínima | 9.4 | 8.9 | 101.1 | | | | 2.1 |

| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |

*Das 21 h às 4 h

| Tmax | |
|-------|-----|
| Mês | Dia |
| 1 | 17 |
| I max | |
| Mês | Dia |
| 9 | 22 |



Resumo do Arquivo Climático

Cidade: Brasília
 Ano: 1962

| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 33 | 24.5 | 90.5 | 10 | 1286 | 1135 | 15 |
| Média | 20.7 | 17.3 | 89.8 | 6.1 | 238.8 | 167.7 | 1.7 |
| Mínima | 6.1 | 5.1 | 89 | 0 | 0 | 0 | 0 |

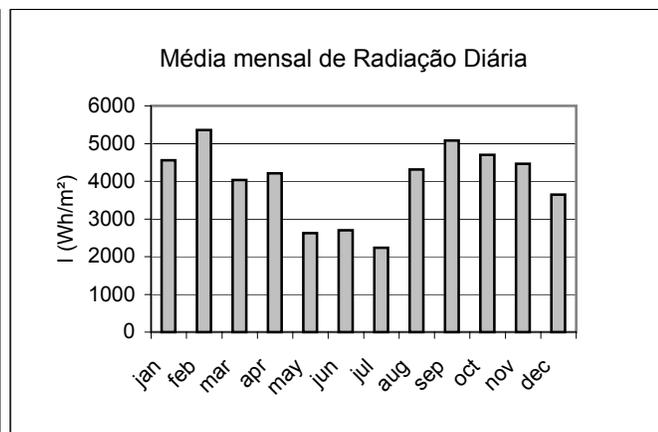
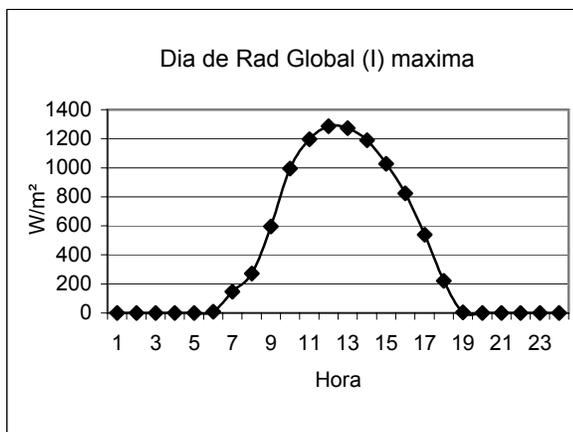
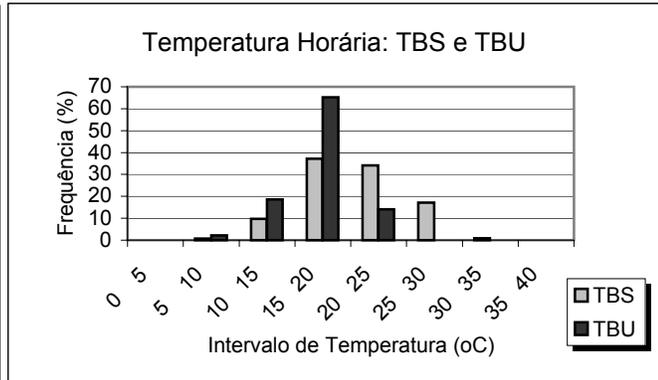
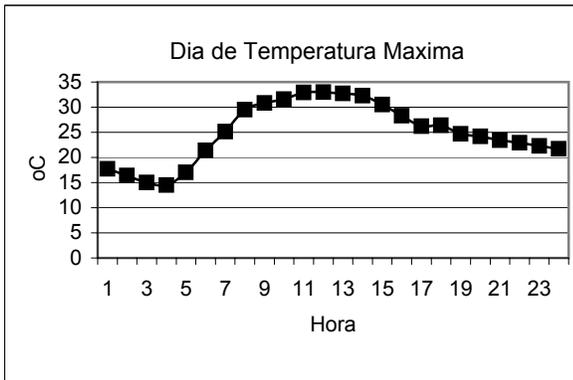
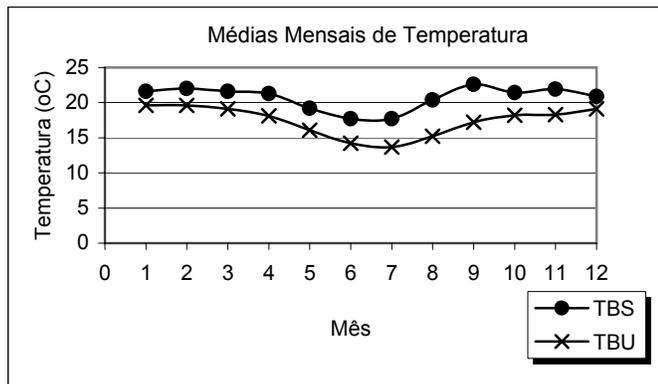
| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |
| I diurna**>0 | OK |

*Das 21 h às 4 h

**Das 8 h às 17 h

| Tmax | |
|------|-----|
| Mês | Dia |
| 9 | 22 |

| I max | |
|-------|-----|
| Mês | Dia |
| 10 | 18 |



Resumo do Arquivo Climático

Cidade: Curitiba
 Ano: 1969

| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 31 | 24.2 | 92.4 | 10 | 1237 | 1053 | 13 |
| Média | 16.3 | 14.6 | 91.2 | 6.9 | 194.7 | 128.6 | 3.4 |
| Mínima | -2.1 | -2.2 | 90 | 0 | 0 | 0 | 0 |

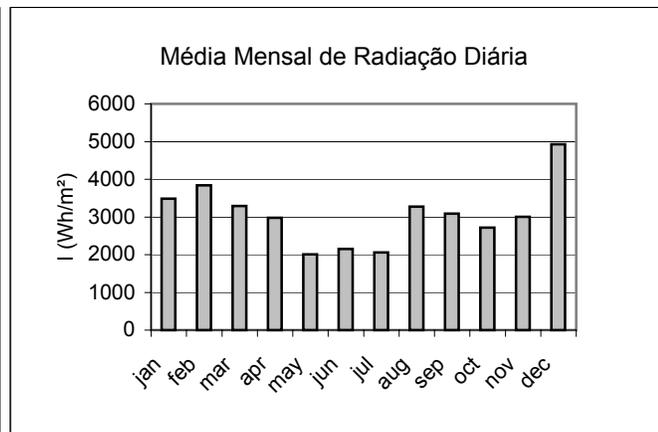
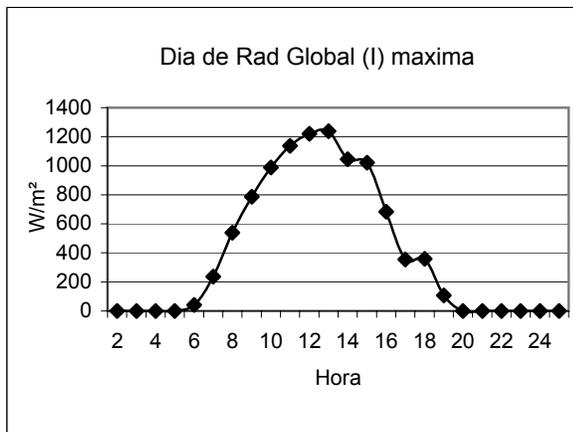
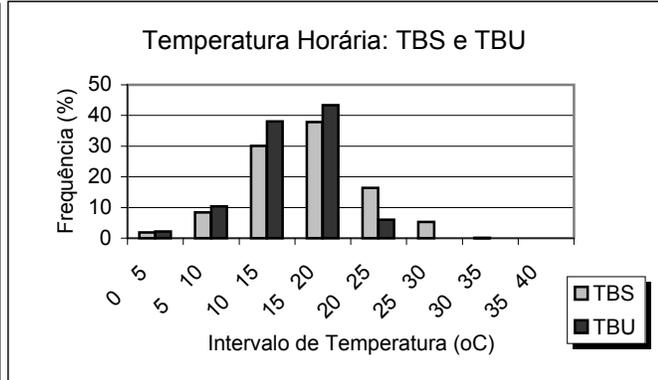
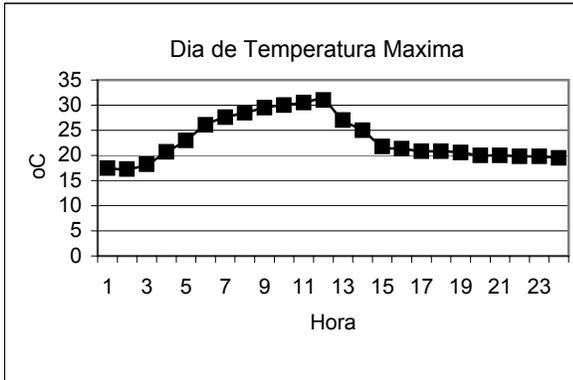
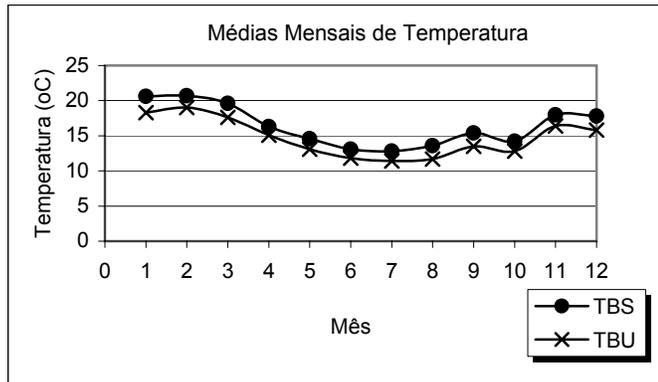
| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |
| I diurna**>0 | OK |

*Das 21 h às 4 h

**Das 8 h às 17 h

| Tmax | |
|------|-----|
| Mês | Dia |
| 1 | 30 |

| I max | |
|-------|-----|
| Mês | Dia |
| 12 | 27 |



Resumo do Arquivo Climático

Cidade: Florianópolis

Ano: 1963

| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 36 | 31.7 | 102.9 | 10 | 1062 | 980 | 13 |
| Média | 20.7 | 18.8 | 101.5 | 6.4 | 173.2 | 102.7 | 2.9 |
| Mínima | 2 | 1.6 | 99.8 | 0 | 0 | 0 | 0 |

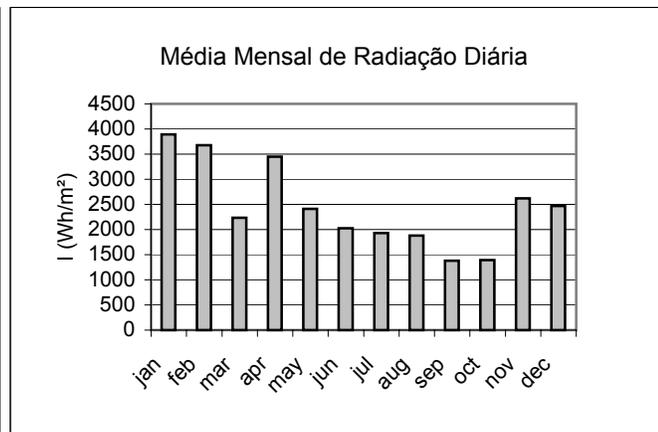
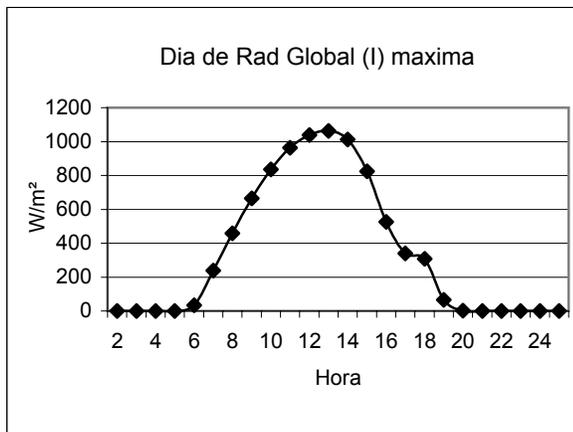
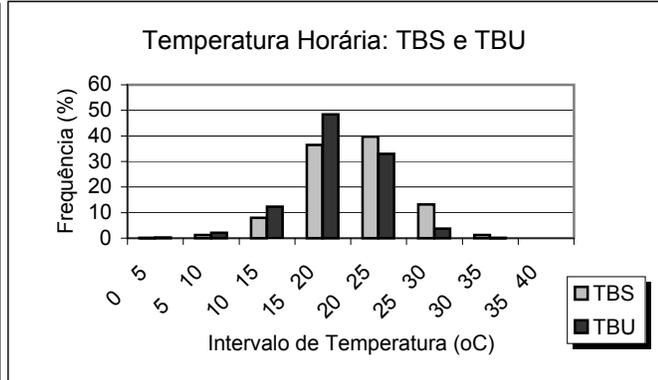
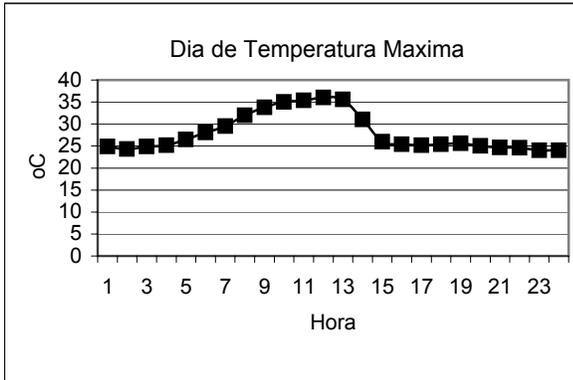
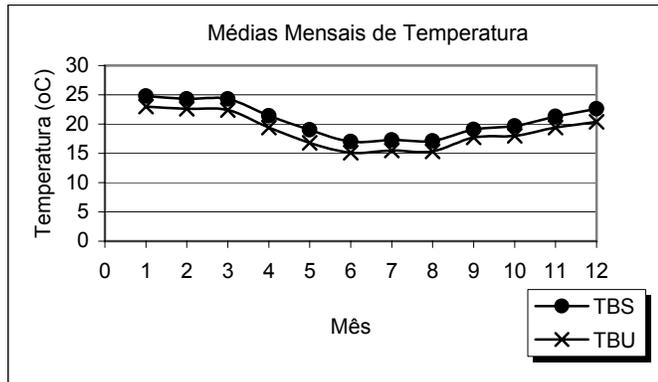
| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |
| I diurna**>0 | OK |

*Das 21 h às 4 h

**Das 8 h às 17 h

| Tmax | |
|------|-----|
| Mês | Dia |
| 1 | 8 |

| I max | |
|-------|-----|
| Mês | Dia |
| 1 | 3 |



Resumo do Arquivo Climático

Cidade: Fortaleza

Ano: 1962

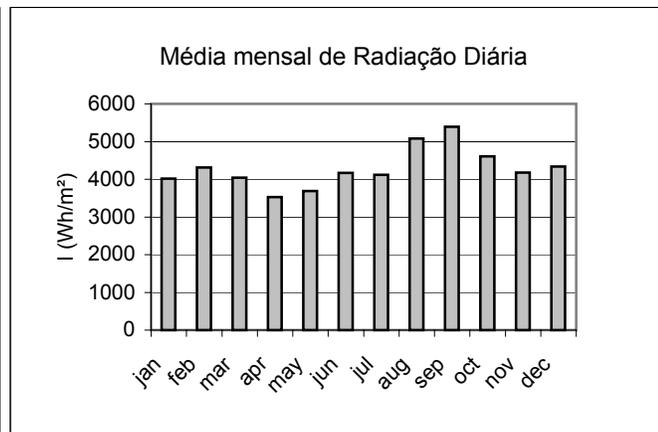
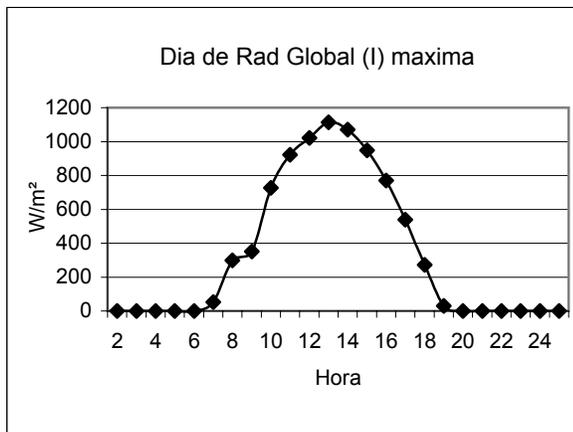
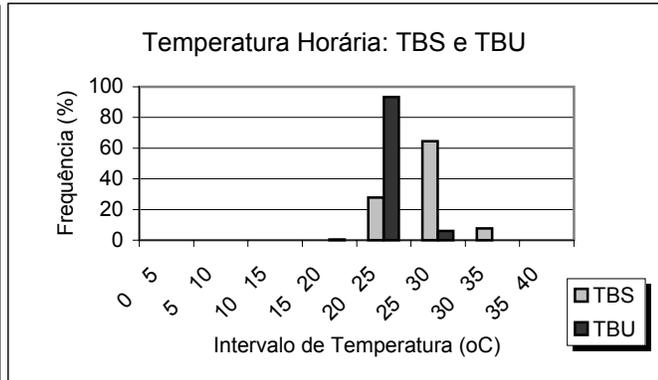
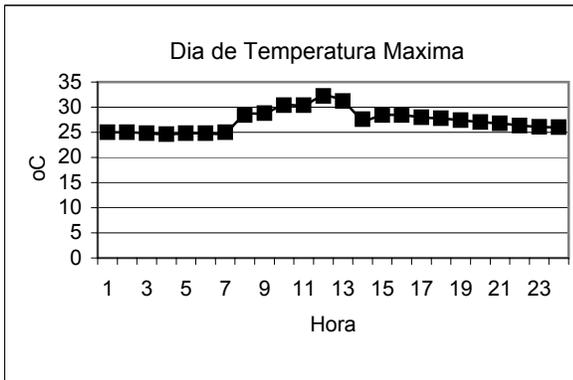
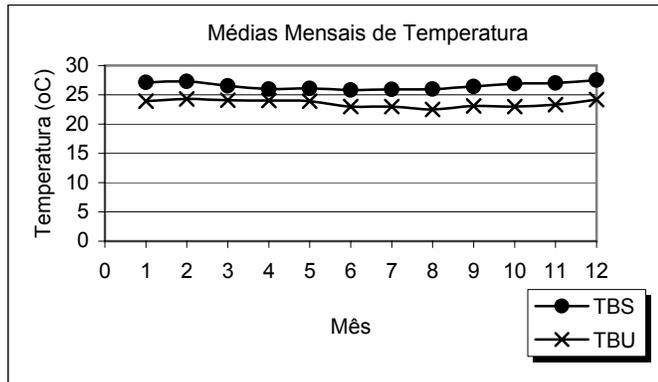
| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 32.2 | 28.5 | 101.6 | 10 | 1114 | 1023 | 10 |
| Média | 26.5 | 23.5 | 101.0 | 4.8 | 238.1 | 180.5 | 2.9 |
| Mínima | 19.7 | 17.4 | 100.4 | 0 | 0 | 0 | 0 |

| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |
| I diurna**>0 | OK |

*Das 21 h às 4 h

**Das 8 h às 17 h

| Tmax | |
|-------|-----|
| Mês | Dia |
| 3 | 9 |
| I max | |
| Mês | Dia |
| 3 | 5 |



Resumo do Arquivo Climático

Cidade: Maceió
 Ano: 1962

| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 34.8 | 26.2 | 100.8 | 10 | 1152 | 1016 | 9 |
| Média | 24.2 | 21.8 | 100.0 | 5.0 | 238.6 | 183.8 | 2.0 |
| Mínima | 15.8 | 15 | 99.2 | 0 | 0 | 0 | 0 |

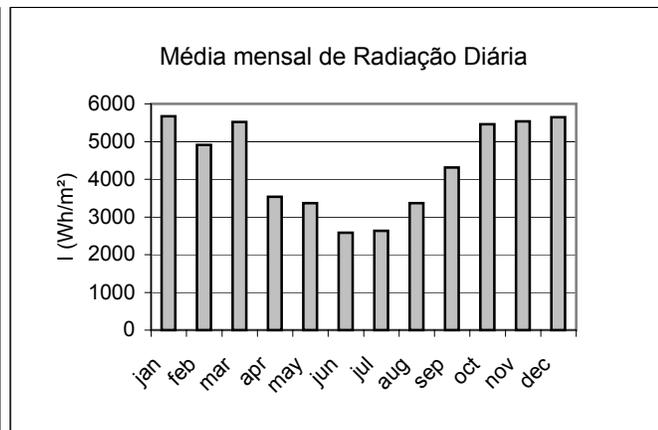
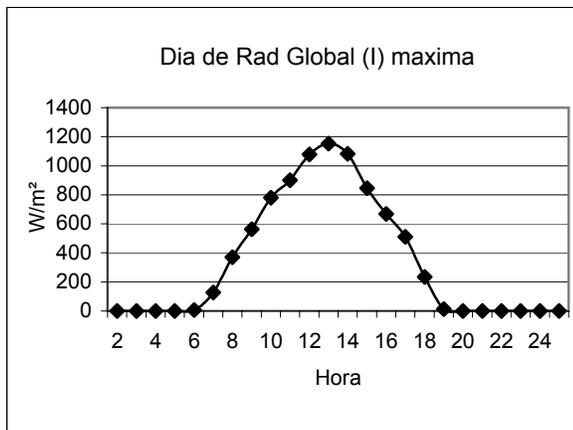
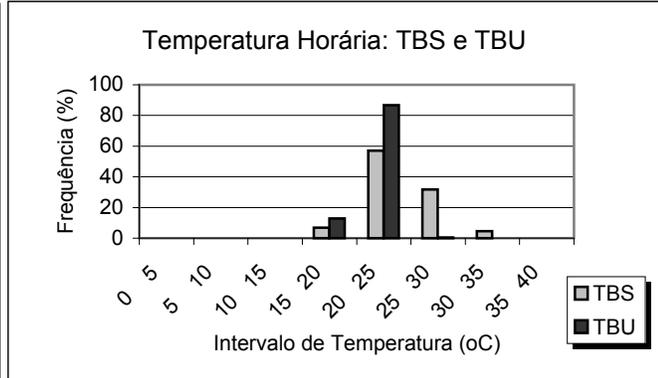
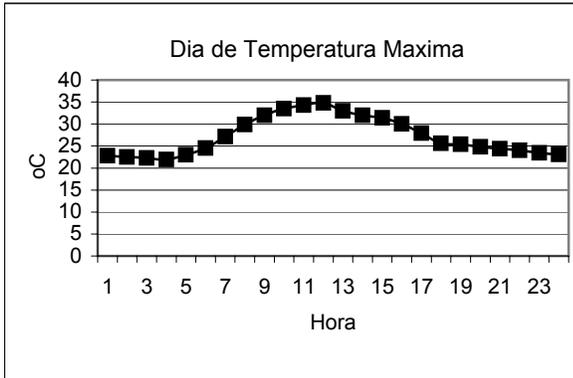
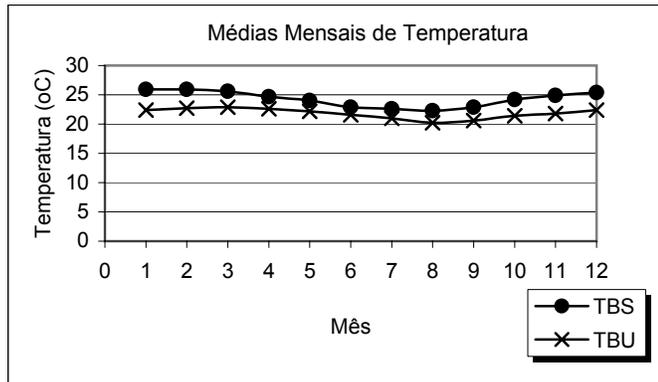
| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |
| I diurna**>0 | OK |

*Das 21 h às 4 h

**Das 8 h às 17 h

| Tmax | |
|------|-----|
| Mês | Dia |
| 1 | 13 |

| I max | |
|-------|-----|
| Mês | Dia |
| 12 | 2 |



Resumo do Arquivo Climático

Cidade: Manaus

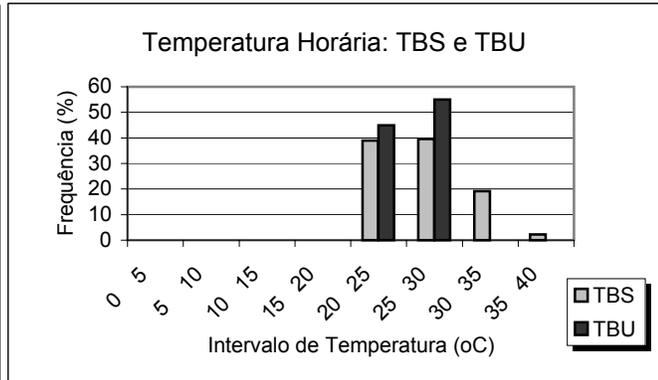
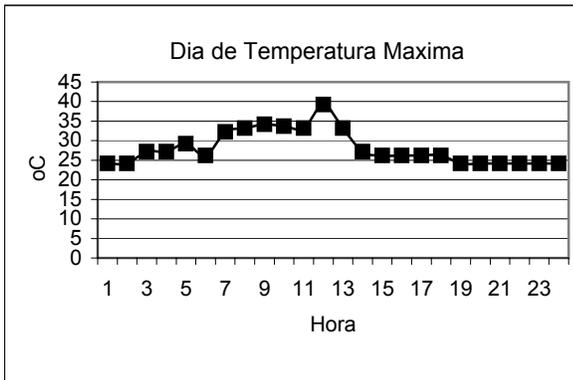
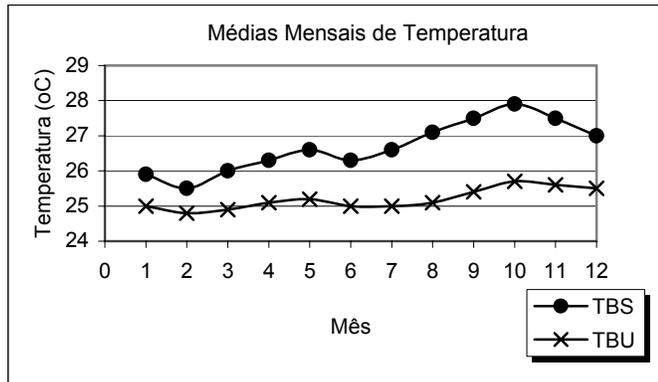
Ano: 1994

| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 39.2 | 30.6 | 101.1 | | | | 2.1 |
| Média | 26.7 | 25.2 | 101.1 | | | | 2.1 |
| Mínima | 21.2 | 21.2 | 101.1 | | | | 2.1 |

| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |

*Das 21 h às 4 h

| Tmax | |
|------|-----|
| Mês | Dia |
| 6 | 24 |



Resumo do Arquivo Climático

Cidade: Natal
 Ano: 1954

| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 32.6 | 26.5 | 101.4 | 10 | 1143 | 1016 | 10 |
| Média | 25.7 | 22.9 | 100.7 | 6.2 | 229.4 | 162.1 | 3.7 |
| Mínima | 18.7 | 17.9 | 100.1 | 0 | 0 | 0 | 0 |

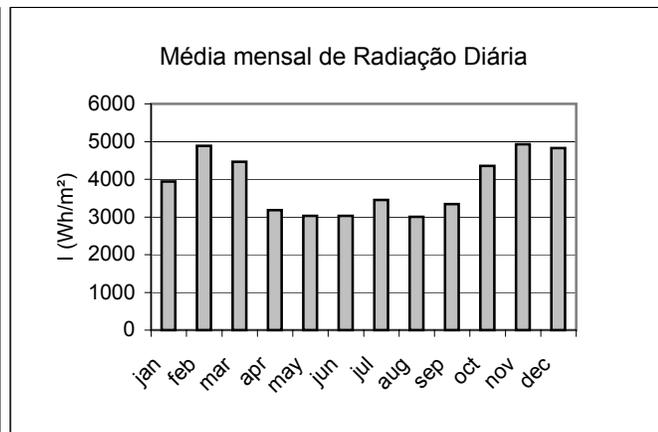
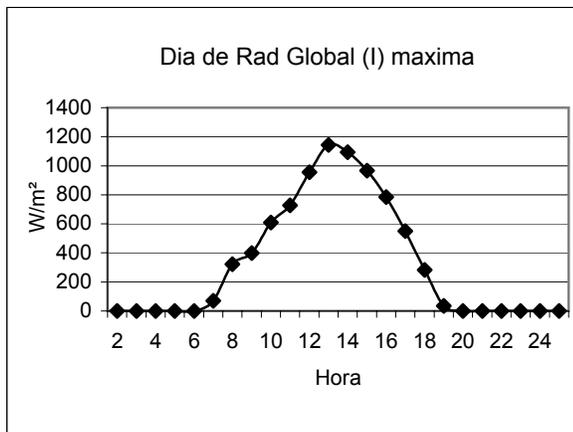
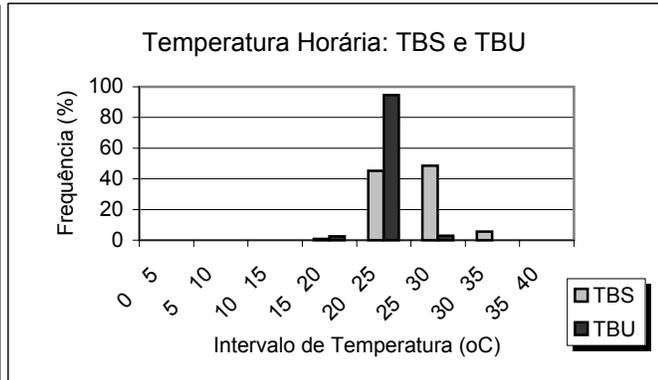
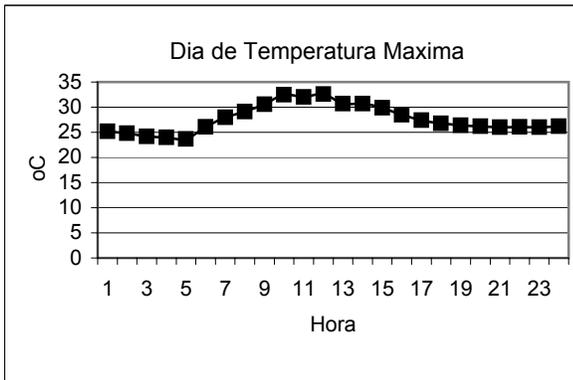
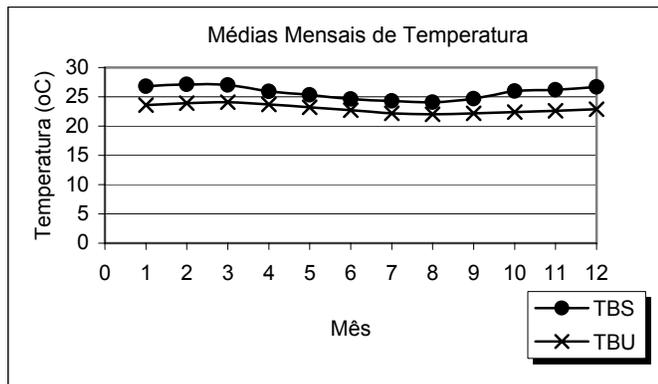
| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |
| I diurna**>0 | OK |

*Das 21 h às 4 h

**Das 8 h às 17 h

| Tmax | |
|------|-----|
| Mês | Dia |
| 3 | 27 |

| I max | |
|-------|-----|
| Mês | Dia |
| 1 | 10 |



Resumo do Arquivo Climático

Cidade: Maringá

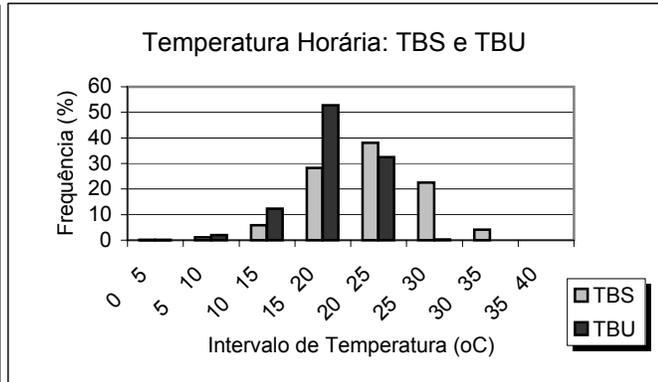
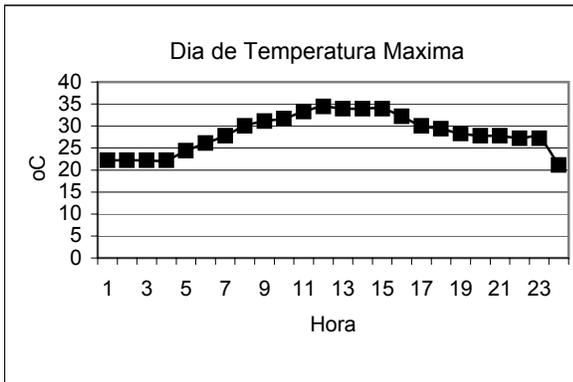
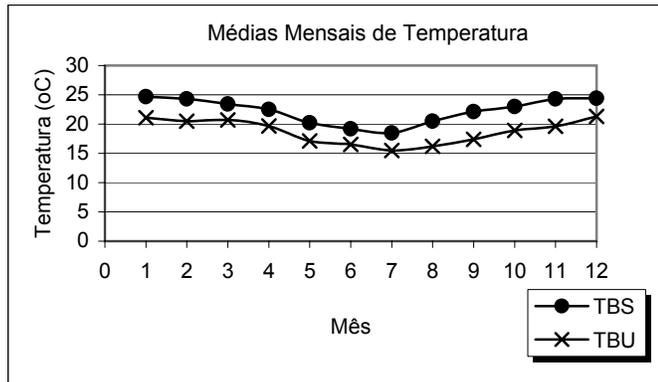
Ano: 1991

| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 34.4 | 27.2 | 101.1 | | | | 2.1 |
| Média | 22.2 | 18.6 | 101.1 | | | | 2.1 |
| Mínima | 2.8 | 1.7 | 101.1 | | | | 2.1 |

| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |

*Das 21 h às 4 h

| Tmax | |
|------|-----|
| Mês | Dia |
| 1 | 21 |
| | |
| | |



Resumo do Arquivo Climático

Cidade: Porto Alegre

Ano: 1954

| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 36.5 | 27.5 | 103.2 | 10 | 1106 | 1011 | 13 |
| Média | 19.2 | 16.9 | 101.3 | 5.1 | 197.9 | 147.2 | 3.0 |
| Mínima | 1.3 | 1.3 | 99.5 | 0 | 0 | 0 | 0 |

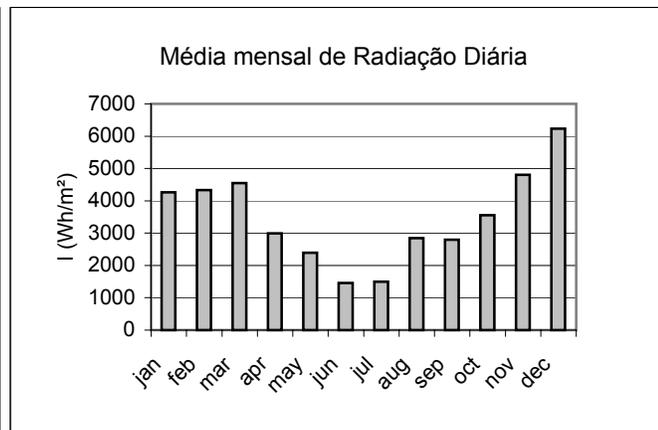
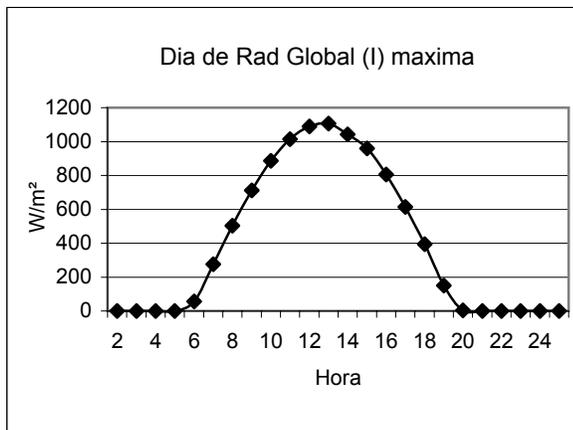
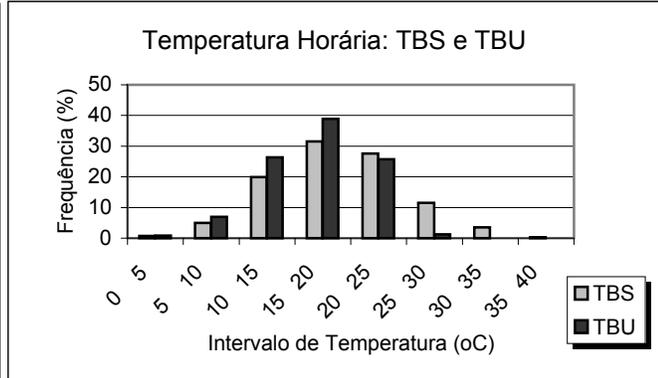
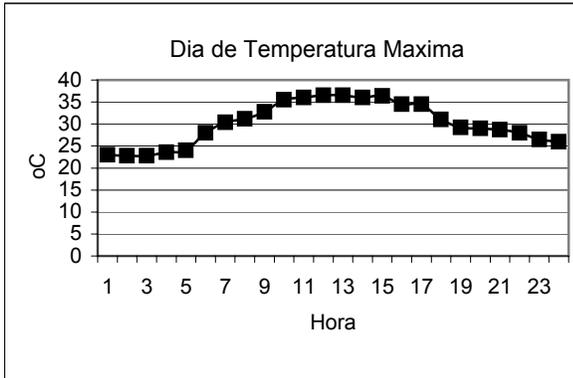
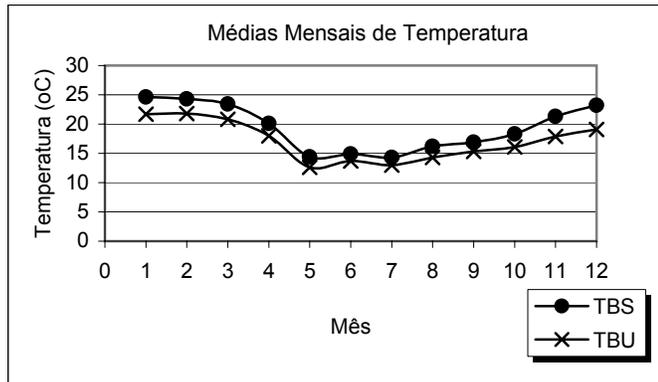
| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |
| I diurna**>0 | OK |

*Das 21 h às 4 h

**Das 8 h às 17 h

| Tmax | |
|------|-----|
| Mês | Dia |
| 1 | 24 |

| I max | |
|-------|-----|
| Mês | Dia |
| 12 | 30 |



Resumo do Arquivo Climático

Cidade: Recife
 Ano: 1962

| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 31.4 | 26.6 | 102 | 10 | 1105 | 1002 | 13 |
| Média | 25.7 | 23.0 | 101.2 | 5.8 | 227.0 | 165.6 | 4.0 |
| Mínima | 19.6 | 18.4 | 100.5 | 0 | 0 | 0 | 0 |

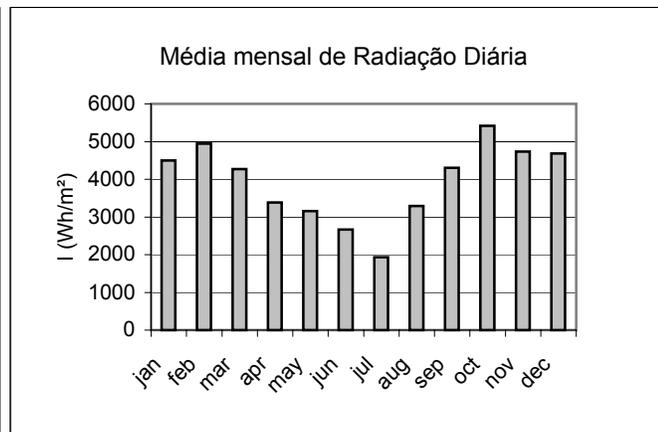
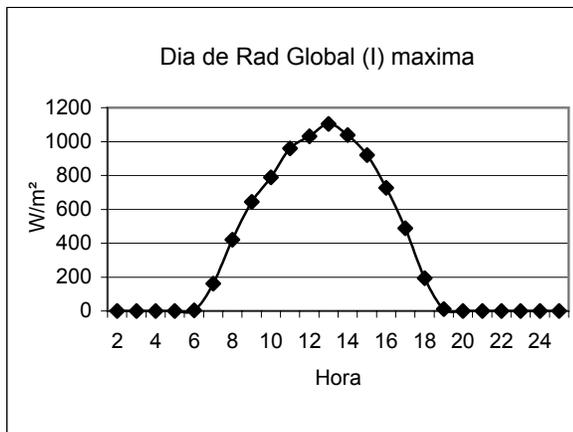
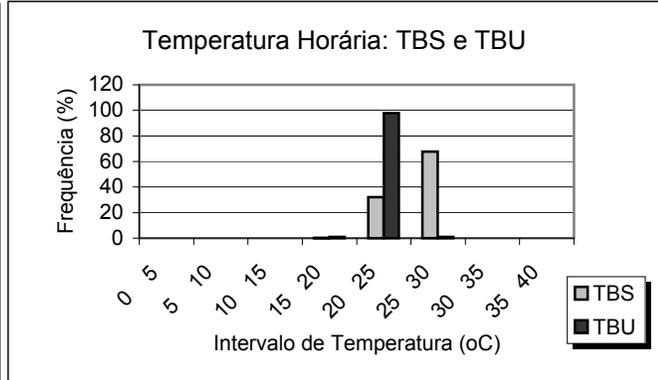
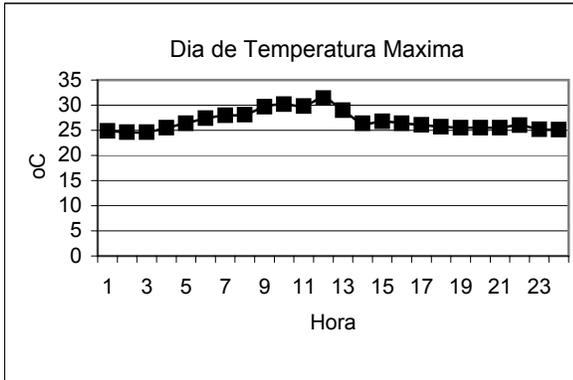
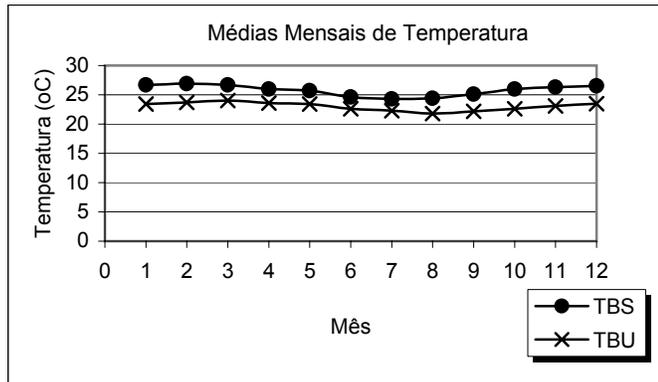
| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |
| I diurna**>0 | OK |

*Das 21 h às 4 h

**Das 8 h às 17 h

| Tmax | |
|------|-----|
| Mês | Dia |
| 11 | 16 |

| I max | |
|-------|-----|
| Mês | Dia |
| 12 | 4 |



Resumo do Arquivo Climático

Cidade: Rio de Janeiro

Ano: 1963

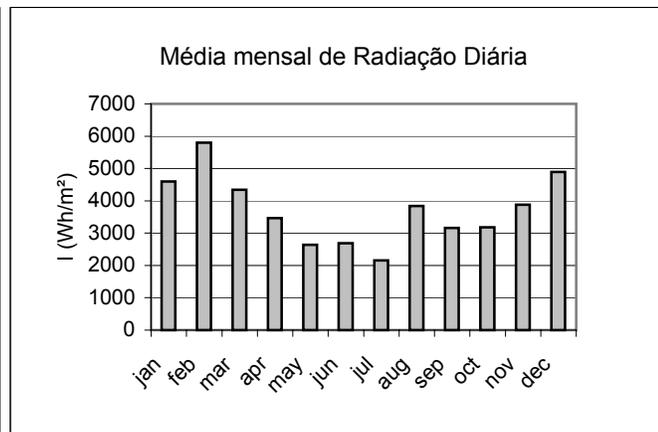
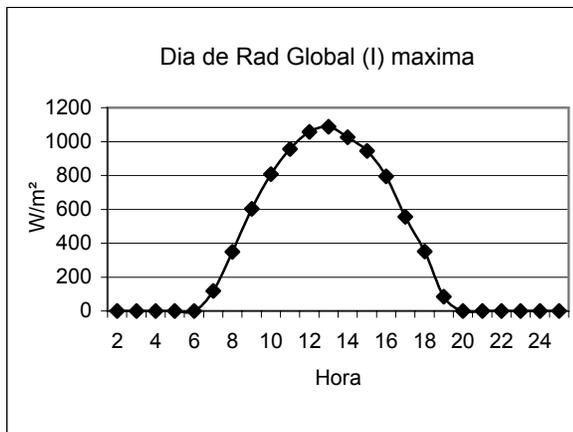
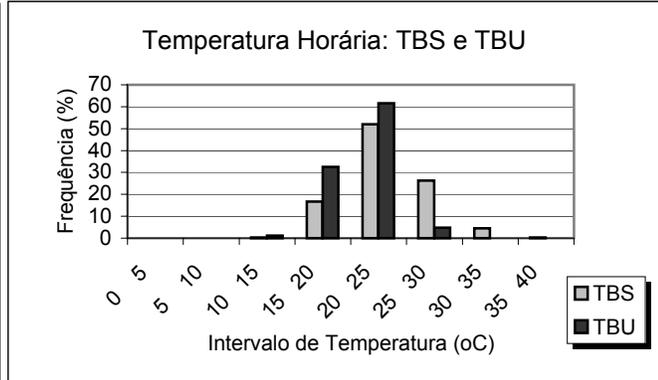
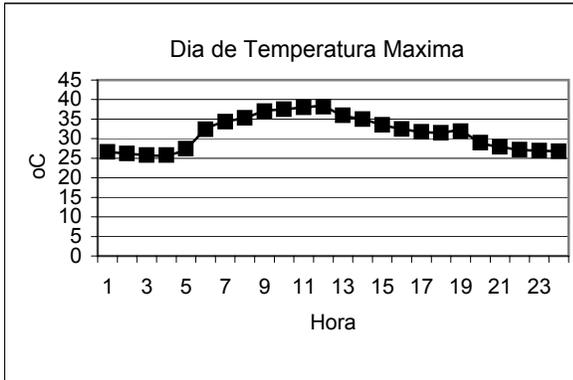
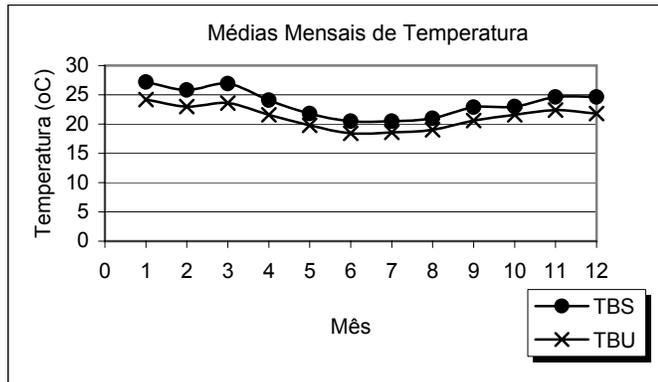
| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 38.2 | 29.6 | 102.8 | 10 | 1088 | 992 | 17 |
| Média | 23.6 | 21.2 | 101.5 | 4.5 | 209.7 | 156.3 | 2.8 |
| Mínima | 13 | 12.3 | 100 | 0 | 0 | 0 | 0 |

| | |
|--------------|---------|
| TBS>TBU | Há erro |
| I noturna*=0 | OK |
| I diurna**>0 | OK |

*Das 21 h às 4 h

**Das 8 h às 17 h

| Tmax | |
|-------|-----|
| Mês | Dia |
| 12 | 5 |
| I max | |
| Mês | Dia |
| 2 | 11 |



Resumo do Arquivo Climático

Cidade: Salvador

Ano: 1961

| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 33.6 | 26.6 | 102.2 | 10 | 1198 | 1045 | 13 |
| Média | 25.3 | 22.1 | 101.4 | 5.5 | 227.0 | 167.8 | 3.6 |
| Mínima | 14.2 | 13.8 | 100.8 | 0 | 0 | 0 | 0 |

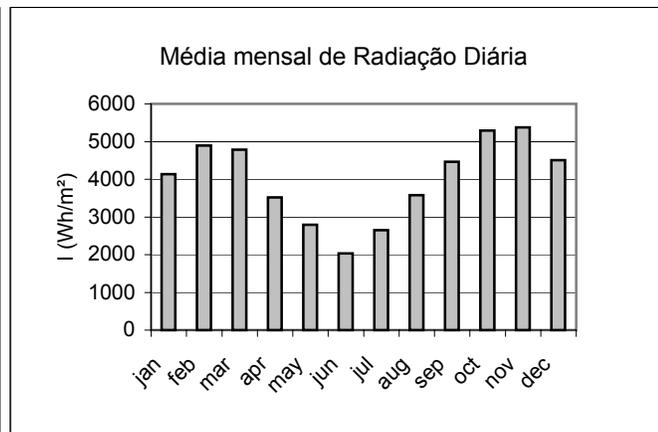
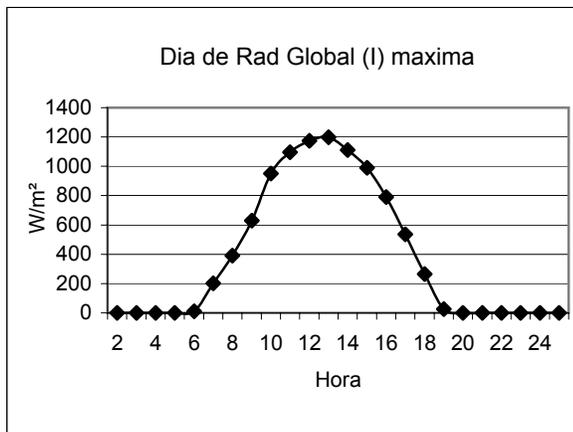
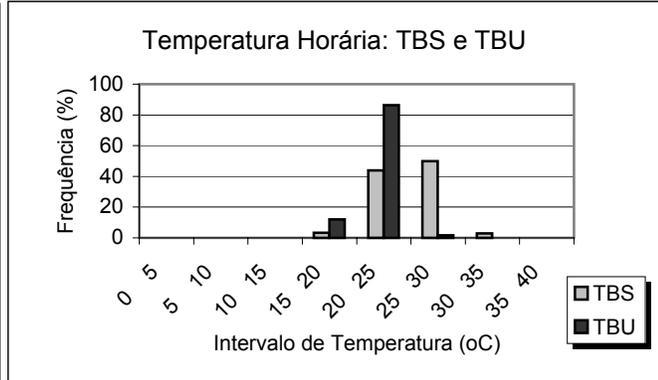
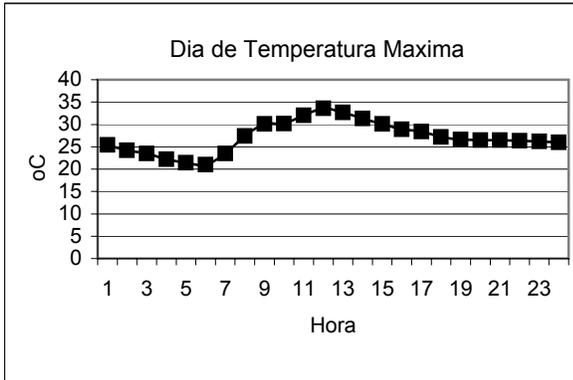
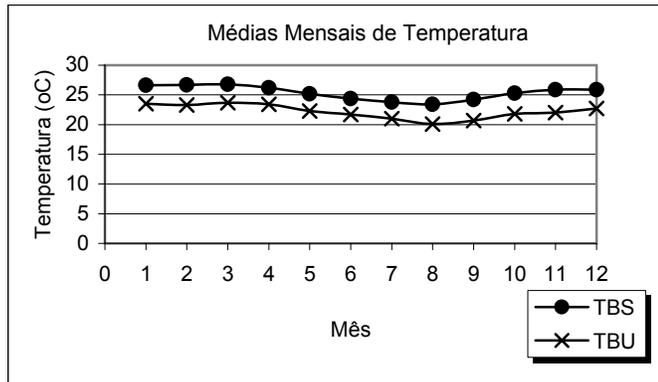
| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |
| I diurna**>0 | OK |

*Das 21 h às 4 h

**Das 8 h às 17 h

| Tmax | |
|------|-----|
| Mês | Dia |
| 3 | 3 |

| I max | |
|-------|-----|
| Mês | Dia |
| 12 | 5 |



Resumo do Arquivo Climático

Cidade: São Luís

Ano: 1966

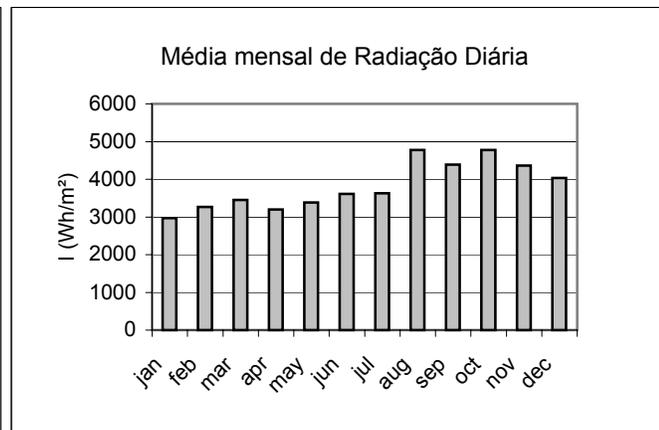
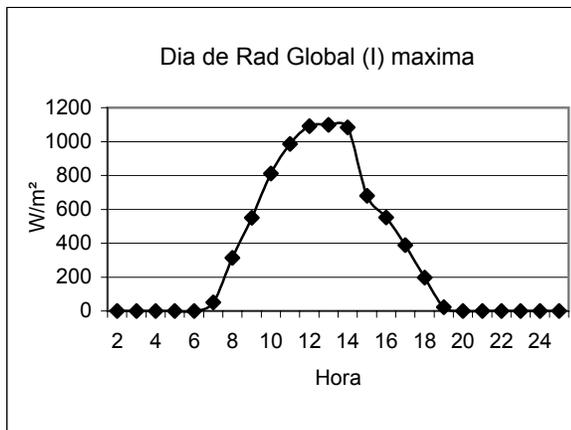
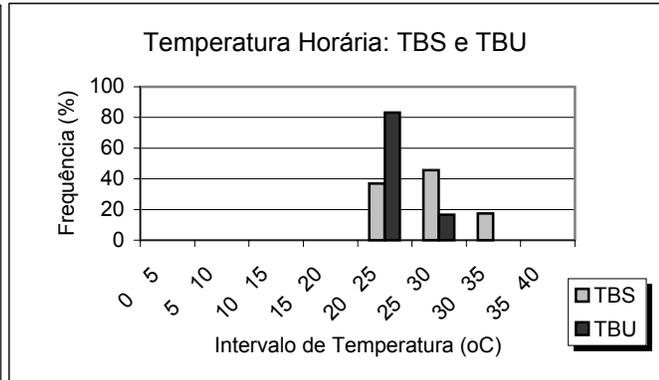
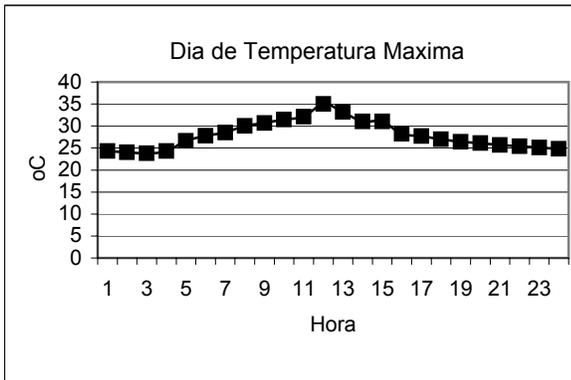
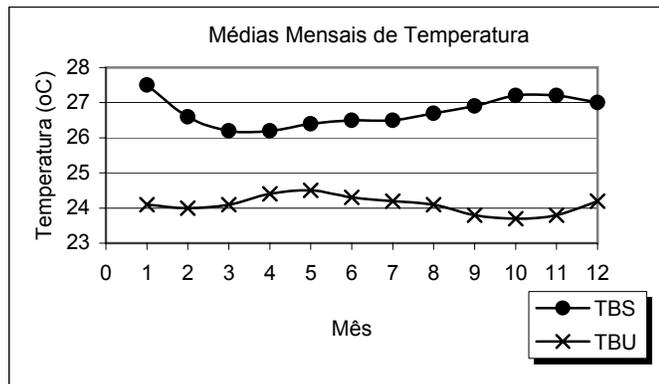
| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 35 | 28.1 | 101.1 | 10 | 1099 | 1018 | 15 |
| Média | 26.7 | 24.1 | 100.5 | 5.2 | 229.5 | 159.9 | 3.2 |
| Mínima | 20.3 | 19.9 | 99.8 | 0 | 0 | 0 | 0 |

| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |
| I diurna**>0 | OK |

*Das 21 h às 4 h

**Das 8 h às 17 h

| Tmax | |
|-------|-----|
| Mês | Dia |
| 12 | 7 |
| I max | |
| Mês | Dia |
| 2 | 28 |



Resumo do Arquivo Climático

Cidade: São Paulo

Ano: 1954

| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 33 | 24.5 | 90.5 | 10 | 1286 | 1135 | 15 |
| Média | 20.7 | 17.3 | 89.8 | 6.1 | 238.8 | 167.7 | 1.7 |
| Mínima | 6.1 | 5.1 | 89 | 0 | 0 | 0 | 0 |

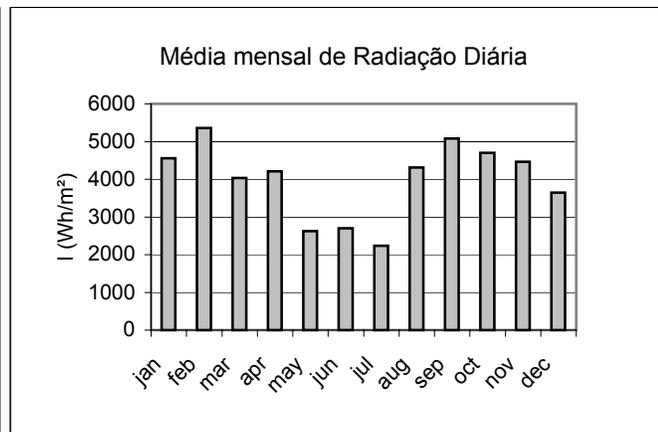
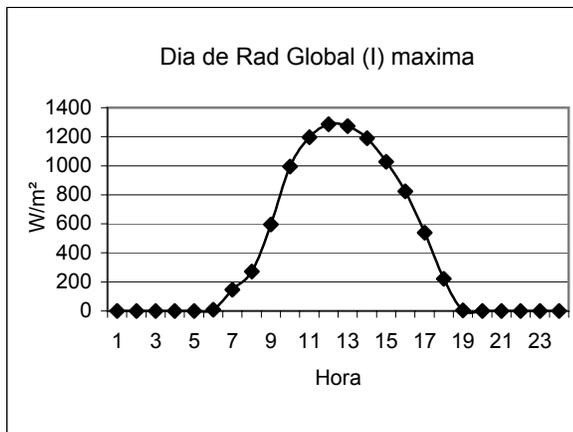
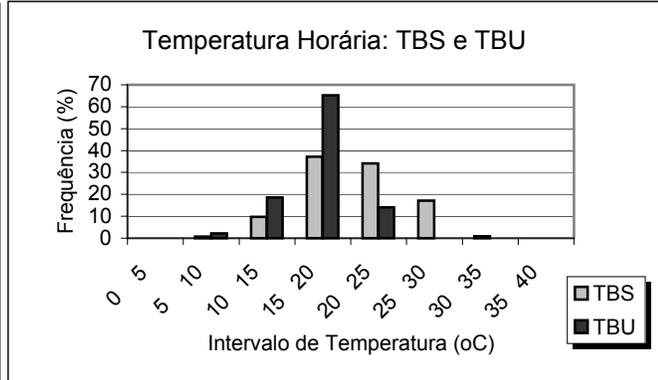
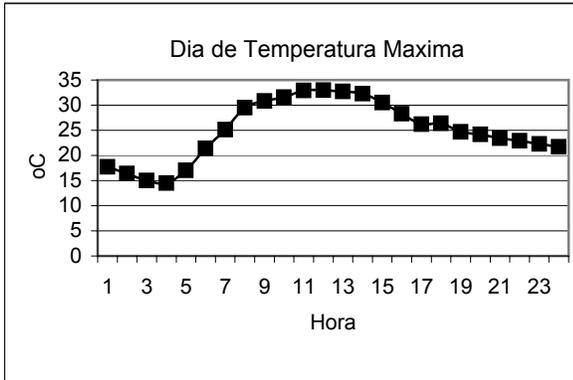
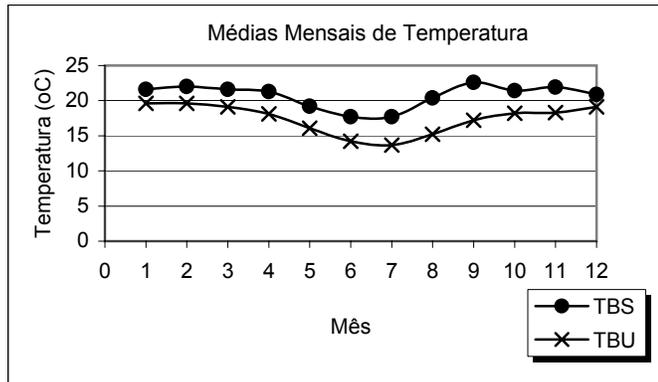
| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |
| I diurna**>0 | OK |

*Das 21 h às 4 h

**Das 8 h às 17 h

| Tmax | |
|------|-----|
| Mês | Dia |
| 9 | 22 |

| I max | |
|-------|-----|
| Mês | Dia |
| 10 | 18 |



Resumo do Arquivo Climático

Cidade: Vitória
 Ano: 1962

| Média dos dados horários | | | | | | | |
|--------------------------|------|------|---------|-----|----------------------|----------------------|-------------|
| | tbs | tbu | pressão | neb | rad global | rad direta | veloc.do ar |
| | (oC) | (oC) | (kPa) | | (Wh/m ²) | (Wh/m ²) | (m/s) |
| Máxima | 35.6 | 28.8 | 102.7 | 10 | 1237 | 1059 | 15 |
| Média | 23.2 | 21.1 | 101.5 | 6.0 | 211.4 | 148.9 | 4.3 |
| Mínima | 11.2 | 10.8 | 100.2 | 0 | 0 | 0 | 0 |

| | |
|--------------|----|
| TBS>TBU | OK |
| I noturna*=0 | OK |
| I diurna**>0 | OK |

*Das 21 h às 4 h

**Das 8 h às 17 h

| Tmax | |
|------|-----|
| Mês | Dia |
| 1 | 3 |

| I max | |
|-------|-----|
| Mês | Dia |
| 12 | 3 |

