hǔĭ5ƑƇƯllƐ hǔďŖƑƇlllƐ hǔllŖďƊŽllƐ lƑďƑƇlƨllƐ lƑǐƍƑƬƗ5Ǘ hǔllNjƇ hƨƐƥƍ
5ƐƥyllƐ Ĭƺ hǔĭƨƊŽƪllƐ hǔ5ƑƯllƑƇ üƊŽyƗ ĬƗllƐ

** ƷƇƥ!ƒ ǇǑƥ!ƒ ƥƶƪ ǇƶƊ * ŎƞĂnjƥ ƩljĂŏ Ɣ!Ƈƺ ƨĂƙƗƥ!ƒ
ƗŏƗŏljƇƗŏď!ƒ Ɨƪƥljnj!ƒ Ɗƪƥ
ƾƒƧƶ!ƒ - ýƬĂď!ƒ ƗƶďƇƞ

: ƫ ƍƗƊŽllƐ

ýŏƞƬùƙ! Ɨŏƪùď!ƒ ƗƥƇƱ!ƇƵ ýďƶƙ Ŏƙ!ƒ Ɨŏ!ƨljď!ƒ ƗŏƪďƬ!ƒ ƘƇljƇƤƪ! ĭƥƇƬƙƥƒ ýŏƍƙĂ ƗƪƒƧƥ ƇƒƧƞ Ĭ!ƍ Ɨƍƙ!ƒ ƻƥnjŏ
ƗùƥƇƱ!ƒ ƧƥƇƬùď! Ɨƭ5ƤljďƐƒ ƧƇƶƪŬƒ Ǉď ƊƺƧ!ƒ ĬƐƵ ƨƭƇƍ!ƒ ƘƥĂ!ƒ Ŏ5 ƘƇƶďƞď!ƒ ljŖNj ƊƒƥƤƙƪƒ ƖƧƗ5 ýƵƙ ĬƐƵ ǇƱƒĂď!ƒ
. Ɨŏƥŏllƙ!ƒ
Ɨ!ĂnjƪƐ ll!ŖĂ ŎƞĂnjƥ ýƵƥ Ǉď ƟƧƙƖď!ƒ ŎƥƇƱ!ƒ ǇƨƇƤ!ƒ ýďƞď!ƒ ƥƇďƙƵƇƵ ĭƥƇƬƙƥŬƒ Ă ĭƧƒƧƍ!ƒ ýŏƍƙ!ƒ ƇƒƧƞ Ɗƙ ƥƗ5
.Ŏllŏll!ƒ ĭƧƒƧƍ!ƒ ƥƗ5!ƒ ƗŏƍƇj Ǉď ƞƬĂƬƤ ƨƇƙďď!ƒ ĭƧƒƧƍ!ƒ ljƇƒƥƊĂ NƶŏljƬƙ
ýƇùƞď Ŏ5 ƞŏĂljƪ Ɨ5ĂƧƬď!ƒ ƗƥƇƱ!ƒ Ɨ5ll! %58 Ü %35 Ü % 56 Ü %49 ƥĂƥƍƵ ƧƵĂŏ ƊƇƯljƪ Ǉƒ ƝƑƇljƪ ƘljŏƵ ƥƥĂ
ƧƇƶùƪƊ Ŏù5 ƊƤƭùƙ ƗƵƪlj ƥƇďƙƶƇƵĂ Ŏ!ƒĂƙ!ƒ ĬƐƵ ƗƵƱƧ!ƒĂ ƖƧƬƵ!ƒĂ ƥƒƥƺƵĂ ýƬĂď!ƒ ǇƥďƇƒĂƞƊ Ŏ5 Ɨŏ!ƨljď!ƒ ljƇŏď!ƒ ǇǑƤƪƙ
. Ɨljƪ 20 ljƧƒƥƊď ŎllŏƺƬƙ ƧďƶĂƥď ĬllƶĂ %20 ƇNjƧƒƥƊď ƇƵƨnjƗ!ƒ

Preliminary Investigation of the Economics of the Stratified Integrated Collector – Storage Domestic Hot Water System in Iraq

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Abstract:

This research aims at investigating the economics of domestic solar hot water systems in order to promote the use of such systems in Iraq in spite of the low prices of the natural energy sources. The integrated collector storage system, suggested by Kahwaji, is adopted in this study due to its simplicity and good thermal performance especially with respect to nighttime heat loss.

Thermal and economics analysis indicated that the system can provide savings of 49 %, 56 %, 35 % and 58 % in the domestic hot water energy expenditure in the environment of the cities of Mosul, Baghdad, Basrah and Ratba respectively when 20 % inflation rate for the price of electricity and a system life time of 20 years are used.

* Assistant Professor ƍYƑƨƊ ƤƑƗƨƇ *
** Assistant Lecturer ƍYƑƨƊ Ƨƥƍƍ **

قبل في 2005/2/6 **أستلم في 2004/9/5**

-1

[illegible]

-2

[illegible]

-1 [illegible]

-2 [illegible]

-3 [illegible]

-4 [illegible]

-5 [illegible]

-3

[illegible]

1-3 . [illegible] : (A split Collection Storage Unit)

[illegible]

Dþùhdž LJǫ . ǑƪǒFS ǑǁƽƪĂ ǐĂǁƵ ydžĞȠ ƔĂhǉdžh ƱhkSk Ġdžǂ ƚǒ!ĂƱ ƔǒhĞǉD Ğnjh ƘhĂk þǒþĞƤD Ǐǁ Ƶ ǐĂkơkĂ þĂƪD ĈǗƱh

. [3,4,5,6,7] ýƨǉdžǁ! ǑƪǒFS!f LJfƨƤ!f LJdž ǁƱĂD ǑƪdžT!f ydžȠdž!f ǎĂkƪdž LJĂǂǒĂ ǑƶǒhƱ!f ýdžơ!f Ǐǁ Ƶ þdžkƶǒ ĞnjǁdžƵ LJĂǉĞǂ SnjT! % 21.5 LJǒh ƘơĂfSk Ü LJþSǕf Ǒ5 ǇƽǉdžǁfĂ YĂǉ!f fȐnj! ƚǒSnjT!f yǒdžȠk!f ǇĈƽǂ LJD Ǐǁ Ƶ ƚĂơh!f Ƙ!þ

þp LJĞƤƪ!f LJD Ǐǁ Ƶ ƚĂơh!f Ƙ!þ Ġdžǂ . % 41.8 Ŋ! ǎĂƮǃ!f ƚǒdžĂǒ!f ǇĈƽǂ!f ƘƺǁhĂ ǑǉĞĂ!f LJǒSTk SnjT! % 35.6 Ǐ!ǫ ýĂǕf

Ġdžǂ ǇþþƶkdžƚǒƶǒǉƮk ƘĞǒǁdžƵ Ǐ!ǫ ǛĞkơǒ ƘĞǉĞƤƪ!f LJdž YĂǉ!f fȐnj LJǂ! . [2] ýƨĞǉdžǁ! ǑdžǒdžƮk!f ýdžơ!f LJdž % 46 ǏkơǑhǁǒ

LJùdž YĂùǉ!f fȐnj ƠƯĂǒ (1) ýǂT!fĂ . ƨĞnjnj!f ƔƮǉ ĈĞǉĂD ǁǁnjkƪdž!f ǎþ! LJĂǂǒ LJĞƤƪ!f fȐnj yǒdžȠk LJD ǐD ƚFƨȠdž ŊǉfSǀ5 LJD

. ƘĞǉĞƤƪ!f

2-3 . ƨǉƽƪ ǉFƠǁƨ ǏƨǊ ǎŊƚƟǐ ĂǂY ƔƟŊj ǊȐƠǁ ǋǁƾǊƿǉ :(Combined Collector Storage Unit)

ƚơǒ5ùƮ yǒǉƮùkǊkùǒ YĂùǉ!f fȐùNj Ǒ5 LJD ƚǒơ þơfĂ ĽĈ Ǒ5 ƚpĞƱ!f LJfƨƤĂ yǒdžȠkh ƘĞƶdžȠdž!f LJdž YĂǉ!f fȐNj ǊĂǀǒ

ƽùƽǕf LJùƵ ƚǒĂfƨh ydžȠdž!f ƚ!Ğdžǫ þǉƵ ĈĞdžǁ! ƚǒƯSƶ!f yƽþ!f ǇĂpĂ ƱƺƯ!f ýdžơkk Ǒǂ LJfƨƤ!f ǇþĞdž YĂǉ Σƽǉ LJdž fĞƮkdžǕf

LJdž ƚǒdžǂhĂ % 40.7 þĂþơh ƘĞƶdžȠdž!f LJdž YĂǉ!f fȐNj ǇĈƽǂ ƩǁhkĂ Matt Black Emulsion LJǂfþ þĂƪD ĈǗƱh ǏǁƱkĂ

. ²Ǌ / ýĂȠĞùǂǒdž 20.5 Ǒ!fĂơ ƚƱpĞƪ!f ƚǒƪdžT!f ƚpĞƱ!f ƘǉĞǂ ĠdžǉǒhǊĂǒ!Ğh . ²Ǌ / ýĂȠĞǂǒdž 8.34 ĞNjSfþǀdž ƚǉĂƨƤdž!f ƚpĞƱ!f

. [8] ǊĂǒ!Ğh

LJfþùǀ5Ă ǇĈĞkùTĂ ǆƽǒƮ LJfƨƤ!f ýǒdž ƚǒĂfƨ SǒǒƺkǏ!ǫ ƚȠĞơ!f ƚdžǙǉǕf LJdž YĂǉ!f fȐNj ǊfþƤkƪf ŊȠfĂk Ǒk!f ýǂĞTdž!f LJdž

ǊfþƤkƪD þpĂ ƘĞƶdžȠdž!f LJdž YĂǉ!f fȐNj Ǐ!ǫ þǒǀƶk LJdž ŊǒƽƯǒ Ġdž ydž Ǒǁǒǁ!f ýƨƶ!f ǊfþƤkƪf Ǐ!ǫ ĂƵþǒ Ġdždž ǕǒǑ! LJfƨƤ!f LJdž ǇSfSơ!f

.(2)ýǂT!Ğh ƠƯĂdž ĂŊjĂ Ʊǀ5 ǇSƮh!f ƚǉǒþdž ĈfĂȠǕ YĂǉ!f fȐNj

3-3 . ǁǁƨǉƽƪ ǉǉFƠǁƨ ǏƽFĞǕǁǁƨ :(Stratified Integrated Collector Storage Unit)

[9] ǑȠĂùnjp ƚùơĞh!f ýhp LJdž ƟSkǀdž!fĂ (3) ǊpS ýǂT!f Ǒ5 ŊǁǒƮĞƽk ƠƯĂdž!fĂ ƚǉƨĞƤ!f yǒdžȠk!f ƚdžǙǉD þơD ĂŊjĂ

(LJƨùƤ!f ǇþơĂ) LJƨĞƤ!f ĈƨȠ!f LJD ƚǒơ LJĞƤƪ!f fȐNj yǒǉƮk ǇSǂ5 Ǒ5 ƚƱĞƪh!f Ǐǁ Ƶ ýǕþkƪǕf LJǂdžǒ ýǂT!f ƚǙơǗdž LJdžĂ

ƚùǒǁơdž!f ƽfĂƪǕf Ǒ5 ǇS5fĂkdž!f LJĂǁƺdž!f þǒþơ!f ǇþĞdž LJdž ƟfĂ!D LJdž ƚƵĂǉƮdž LJƨƤ!f ǇþơĂ LJǫ Ü fĞƮkdžǕf ƚơǒ5Ʈ! ƚ!ƮǗdž

. fĞƮkdžǕf ƚơǒ5Ʈ ýǀdžǒ 2Ăƪ ǐȐ!f ΣdžT!f ƚƶTǕ ŊnjfĂdž!fĂ ǐĂǁƶ!f ƠƱƪ!f fþƵ ƔǉfĂȠ!f ƚ5Ğǂ LJdž ƚ!ĂƨƶdžĂ

ƘĞùhǀǫ Ğùnj!ǔƤ LJdž Ǌk ýƮĂdž!f ƚƶdžĞȠ ƚǒǂǒǉĞǂǒdž!f ƚƪþǉnj!f Ǌƪp Ǒ5 YĂǉ!f fȐNj Ǐǁ Ƶ ƚǒSǀkƤdž ƘĞƪfSþ ǇþƵ ƘdžǀkþpĂ

ƚùǒơ Ü ýĞƶ5!f LJƨĞƤ!f YĞƱǀ!f LJǁƵ yǒdžȠk!f ƠƱƪ ƯƽƤǉf ƔhƪhƚǒǁǒǁƢ!f ƚǒSfSơ!f ƘĞƵĞǒƯ!f ƚdžǒp Ưƽ5Ƥ Ǒ5 ydžȠdž!f ƚǒ!Ğƶ5 ƘƺǁhĂ

LJùdž ǊĞùǙǉǁ! LJƨĞƤ!f ydžȠdžǁ! Ğnjǉdž 0.26 þĂþơh ǑpĞhƱ!f LJƨĞƤ!f ǊĞǙǉǁ! Ǒǁƽ5!f LJfƨƤ!f LJdž Ǒǁǒǁ!f ǐSfSơ!f YĞǒƯ!f ƚdžǒp Ƙƺǁh

. [10] ǑǉĞĂ!f YĂǉ!f

LJùǂdžǒ Ğùdžǂ Ă Ğnjƶǒǉƽùk Ǒ5 þǒǀƶk!f Ǐ!ǫ ǛĞkơkǕĂ ǆǒǁơdž ǇS5Ăkdž ƘĞƶdžȠdž!f ǉȐNj ýǂdž yǒǉƮk þfĂdž LJD ƠơǗdž!f LJdžĂ

ǕùƮD ǑùNj LJĞƤƪ!Ğh ƚƮĞƤ!f Ĉǁdž!f ƚdžǂ SĞhkƵf LJƵ ǕƯ5 Ĉǁdž!f ǊfþƤkƪf Ǒ5 ƔǁƱ!fĂ ƚȠĞơ!f ǊfǕk ƚƽǁkƤdž ǊĞȠơh Ğnjƶǒǉƶk

.Ŋǒǒ5 Ĉǁdž!f SǒĂþk! Ĉǁdž ƘĞƤƯdž Ǐ!ǫ ǛĞkơǒ Ǖ ŊǉD Ġdžǂ ýƨǉdžǁ! ǑǁƮǕf LJfƨƤ!f ǊȠơ Ǐ!ǫ ƚ5ĞƯdž

þþƺh LJþdž Ǒù5 ƘǁǂdžkƽfSƶ!f LJdž ǇþþƶkdžƽƱĞǉdž Ǒ5 ƘĞǉĞƤƪ!f LJdž YĂǉ!f fȐNj ĈfþD ĈĞƮǀƪĞh ǑȠĂnjp ƚơĞh!f ǊĞp þǀ!

Ǒù!ƨǉdž!f ǊfþƤkƪǕf ĈĞùùdž SùǒƽĂk ƚǒǉĞǂdžǫ Ǐǁ Ƶ ǋùFĞǉ!f Ƙ!þ þpĂ ƚǒSƮĞǉ!fĂ ƚhƱS!f Ü ǁĂǂS Ü ǇSƮh!f Ü ýƮĂdž!f Ü

ǏǉþD LJǒþơǂ Ǒ!fĂk!f Ǐǁ Ƶ ǇSƮh!fĂ ƚhƱS!f Ǒùkǉǒþdž Ǒ5 Ǌ° 38Ü 25 LJǒh ƘơĂfSk ǑdžĂǒ!f ǊfþƤkƪǕ! ƚǒ5Ğǂ ƚǒSfSơ ƘĞƨSh

0.2 ǉSfþùǀdž fĠdž ƠƱƪ ƚơĞƪdž Ǐ!ǫ ǊȠơ ƚhƪǉ þǉƵ Ǌ° 38.65ƽfSƶ!f ǊĂdžƶ! ǐĂǉƪ!f ýþƶdž!f Ʃǁh Ġdžǒ5 ƽfSƶ!f LJþdž! ǏǁƵDĂ

ýþùƶdžh LJƤĞƪù!f ĈĞùdž SǒǒĂk ǑpĞhƱ!f LJƨĞƤ!f ydžȠdž!f LJĞǂdžƽh LJD Ǐǁ Ƶ ǁǁȐǂ ŊùȠFĞǉ Ƙ!þĂ . 0.25 ĞNjSfþǀdž ƔơƪƚhƪǉĂ

Sk! 150) fĠdž!f ƠƱƪ! þơfĂ yƺSdž Skdž ƚơĞƪdž yþfĂhĂ LJǒƮƤT! Ĉdž!f þǒĂƨk! ǊfþƤkƪǒ Ġdžþǉƶ ƽfSƶ!f ǊĂdžƵ Ǒ5 Ǌ° 31.5

(ǆǒdžĂǒ Ĉdž

DžÄùdžZ Õ5 % (60 - 35)LJÄ+k5 ljŭZD lSfSơ!f KĠηSþ! lSUĠljdž!f lþTSdž!f ÄD lS5Ädž!f Ħpć0!f Ħh]Lj f Pě Ġdžõ5 ĠdžD
) Nù! lSÁĠùηdž!f Ħùõh2z!f ýÁþ!fÄ Ħ5Ġ+ sfSz!f LJþdž Õ5 NdžfþPk]f LJ+džõ YÄlj!f fRNj LJD Uơŭlj Ħõơ . [11] CĞkT!f ý]5
. (LJfSěq Ü LJĠJh! Ü LJþSŰf Ü GõSÄ]

: ăσFTĦ5Úξ üĭ+ΘĦ‖ξ -4

ýNj Ü YÄSTdž!f fRηj! ĭþć]kpŰf þÄþSdž!f Ħ5Szdž! ĭþć]kpf ýöl̈ơk LJdž ÕZĠlj] YÄSTdž ÄD Õηökfskl]f 2þNj ĭŰ þhŮ
Ġùdž+ Þ ĺlhĠ] ĠnjöllZ ljÄLjdž!f sõhƠk!f Ħõć]ξ ÄD 2þnj!f ĭþdk KĠdžÄUljdž yõlj]k LJĠ+džÚĠh ýNjÄ Þ GnjĺηD LJdž ΕTlD Õk!f Ħõć]ξ!f s]σk
ýþùzdž) SĠdžÄkùl]Ůf 2ÄSU Ħl]fSþ yõz. Gnjksõ0Ä ĭþdk! ĠNjCfsηD S5ÄkÄ KĠdžÄUljdž!f ljRNj ýλdž! Ħõzöl]k!f Ħsl̈+!f Yĝ]σ Yηŏ
.(LJdžs!f yõz ‖ŭnjk]Ůf

[12] (F-chart Microcomputer version 5.6) ÕhÄùl]Ġơ NdžĠljSh ĭþć]kpŰf ýöl̈ơk!f Õ5 DžþPk]f
) ýλdž lSλdž!f ăSPŰf ýdžfÄz!f Ĭ!ọ Ħ5ĠưÚĠh Ħõ'PĠljdž!f KĠõƠzdž!f KfSõλdk ŖP0 ĬlïZ lSþ!!f N0!Ä lSÄƠkdž!f KĠh]Ġơ!f ĬlïZ ýdžzŏ
þÄþSùdž LJùdž Õ]džT!f DžĠUlj!f Ħõ!Ġz5 þõþơk Õ!Ġk!GhÄ (NkõƠ5k Õ5 ĦdžþPk]dž!f WĠηs!f KĠlhƠ þþZÄ Nljŭõdž Ħη6þÄ DžĠUlj!f yþÄdž
DžĠùUlj!f Cfzùη0 Ħ5Ġ+ Ħl]fSþ NdžĠljSh!f fRNj Õ5 Džkõ Ġdž+ (ĦõdžÄõ ÄD ĦõSnjT LJÄ+k þp) Ħlj]!f Cfzη0 ÄD DžĠZ ýŭP ĦõƠ5k Ħh]ljÄ
. Ħõzpf Ä Ħõl̈džZ Ħ!Ġơ! s5fÄdž!fÄ YÄl̈ƠSdž!f WRÅdžlj!f Ư fS5f LJ+džõ Nlj ĭD Ħõfszη NdžfSh ΣĠ]D ĬlïZ Õ]džT!f
Ü Ħùl̈dž5Ġz!f ĭþùöŰf Ü Ħõ!ÄŰf þfÄdž!f Ħsl̈+) ĦdžÄUljdž!f ljRnj! Ħõzöljk!f Ħsl̈+!f ΣĠ]D ĬlïZ Põljdž Ħsl̈+!f Yĝ]σ LJĠ+ ‖!R!
ĦdžÄUljdž!f ljzηjηk ĠdžÄ.þơfÄ!f DžÄõ!Gh CĞdž!f LJdž þSs!f N+l̈njk]ỏ GdžÄ ĦdžÄUljdž!f Dηơ ĬlïZ þdžkzõ fRNjÄ (Y]ljfÄ Ħ]õ0]!f KfCfSηg
. Õ!s]dž!f DžfþPk]ŭ! DžFŭdž LJÄ+õ LJD þhŰ (CĞdž!f lSfSơ Ħη6þ)
Ħ ùõơ Ġùnjljdž H+l̈njk]dž!f Ħpć0!f ýöl̈lk ĬlïZ ýdžzkÄ Ħõþöl̈lk!f KfþơÄ!! lþZĠ]dž ÕNj KfþơÄ!f ljRNj ýλdž LJD þĠdžkZf Yηõ
þù15 ‖!R! ýŭzk]f LJÄfþhÄ Ědžõ 6fnjk Ħ]dž0T!f Ħpć0!f LJD ĠljShkZf Gdž fRg Ħpć0!f KĠõ5]0 LJdž ýöl̈lk!f Õ5 lS0Ghdž lSÄ0h Dmj]k
. ĦZĠ] . 0fÄ Äl̈õ+!Gh lSþ!dž Ħpć0 LJdž KĠdžÄUljdž!f ljRNj ljƧ5Äk Gdž Yĝ]σ Dfk
) ÕùNj Ħùõpf6Z LJfþdž yh2D Ħl]fSþ!f KlïdžT þ15 Ħsl̈kPdž!f sfSz!f Cf0ηD Õ5 ýdžzk ĦdžÄUljdž!f LJD 0ƧT sõlσk ýηD LJdžÄ
KĠùU5Ġơdž yùödžη ýdž0õ! O]dž!f CfSηg LJdžư]j Õ+!Ä Gnj! Hõ'PĠljdž!f 2ÄSU!f 2ŭkPŮ (IhƠƧ!f Ü lS0h!f Ü þfþzh Ü ý0Ädž!f
Ħsl̈+!f Yĝ]σ Õ5 ljĠljþD KĠljĠõh!f þĠdžkZf Dfk þpÄ . sfSz!f

-1	lþơfÄ!f ĦdžÄUljdž!f Dηơ
-2	þƧsl̈! ÕdžÄõ!f ‖ŭnjk]Ůf ýfþzdž
-3	Cĝdž!f sěnjηk lSfSơ Ħη6þ
-4	CĞhƧnj+!f LJdž ĭþĠõkZŰf ýs]ljdž!f ‖ŭnjk]f ýfþzdž
-5	Ħdžþ Pk]dž!f KĠdžÄUljdž!f þþZ
-6	Ħdžþ Pk]dž!f WĠηs!f KĠlhƠ þþZ
-7	Ħ0Ġdž!f ĦlhƠ!f LJŭõdž Ħη6þ

2k! 500
2k! 75
Dž° 50
Õõ2nj0 lþơÄ 3000 - 2000
2
1
° 45

-: ljĠljþD Gnjsõlj0]kÄ 2Ġljõþ 2!D ĦFĠdž (100000) lþơfÄ!f ĦdžÄUljdžl̈! Hõ!ÄŰf Ħõzölj0]k!f Ħsl̈+!f KĠhĠ]ơ Kĝ0h þpÄ
CĞdž!f KĠljfs?P Õ5 DžþPk]dž!fÄ 2Dž 7 LJÄl̈ξdž Oõs0]0 -1
Džl̈dž 4 ‖dž]h WĠηs -2
. ĭ2fSơ!f ýszl̈! Õηĝηs 2Ä0 -3
.Y0]lj!f Ư fS2ξŰ lþZĠ]dž yƠpÄ Yõh0Ġljd LJdž Ħõ5Ġưǫ KĠlơl̈dž -4
ýdžz!f 2Äηd -5

ŁƶƅƧƊ ǈǋǆ ǈǍǂǆ ŁǁƑƵ ýƨǉǆ! ŁõƥƓƮƙƿǕƒ ŀƪƒƧþ!ƒ ƘőƧƞƊ ƥƿǍ Ü ǉƥƑƓƪ!ƒ ƽǍƪ!ƒ ƧƓƶƪƊ ŎǸ ǉƥǆƙƶǆ!ƒ ƧƓƶƪǕƒ ǈƊ ǇǆǁƵ ƧǇǉöƥ ƻ!Ɗ ǈǍƶƅƪǍ ŀƪǆƤ 75000 ƩǁƅǆƵ ƻŏƛƊ ƥƿǍ ǈƤƑƪ!ƒ ǇǆǆƵ!ƒ ǈǆǆ Ƨƙ! 300 ƧõƼǍƙ! ŁõƪǆƮ ýõǆƞƙ ǈǓƙƥƠǍƅ ƥǍƨ ƒ ƓƤƮƊ . ýƨǉǆǆ!ƒ Ŏ5 ƖƧǆ ýǍǕ ŁǆǍƱǉǆǆ!ƒ ƔƮǉ ƻõ!ƓǂƙǂŁ

Łùõ!ƓƠ!ƒ ŀƪƒƧþ!ƒ Ŏ5 (1) ǄƥƧ ýǍƥƞ!ƒ Ŏ5 ŁƙƅǆǆƵ!ƒ ƘƒƧõƺƙǆƵ!ƒ ƘƥǆƙƵƒ ýǍǀƶǆ ǏƥƓƮƙƿƒ ýõǁƠƙ Ǐ!ǫ ýǍƮǍ!ƒ ƲƧƺ!Ǎ . ƾƒƧƵ!ƒ ǄǍǆƵ! ŁõƤǉǆǆ!ƒ ƘǕƓƠ!ƒ ýõǆƙ ƻƥǌƅ ŁƅƱƧ!ƒǍ ƖƧƮƅ!ƒǍ ƥƒƥƺƅǍ ýƮǍǆǆ!ƒ ŎǸ ǈƥǆ ŁƶƅƧǕ ƘǀƅƱ Ŏƙ!ƒǍ

(1) ǄƥƧ ýǍƥƞ!ƒ

	ǚǏøøøƮƒƻŁǁǁ	ǉ
ƧǇǉöƥ ƻ!Ɗ 100000	ǉƥƠƒǍ!ƒ ǉƥƠǍ!ƒ Ƨƶƪ	-1
ƧǇǉöƥ ƻ!Ɗ 200000	ŁǁǆƓǂ!ƒ ŁǆǍƱǉǆǆ!ƒ Ƨƶƪ	-2
ƧǇǉöƥ ƻ!Ɗ 75000	Łõ!ǍǕƒ Ɣõƪǉƙ!ƒ Łƽǁǂ	-3
ƧǇǉöƥ 1.650	ǇõƧǌƮ ǉƥƠǍ 3000-2000 ƩƓƪƊ ǏǁƵ ƇƅƧǌǂ!ƒ ǉƥƠǍ Ƨƶƪ ýƥƶǆ	-4
% 50 Ü40 Ü30 Ü20	ƇƅƧǌǂ!ƒ Ƨƶƪ! ŁõǍǉƪ!ƒ ǉƥƓõƨ!ƒ	-5
% 5	ƥƑƓƪ!ƒ ǉƥƑƓƽ!ƒ Ƨƶƪ	-6
Łǉƪ 20	ŁǆǍƱǉǆǁ! ŎƲƒƧƙƽǕƒ ƧǆƵ!ƒ	-7
ǇƥǀǇ	Łƽǁǂ!ƒ ýƽƥ ŁõƽõǂŁ	-8
ŎǁƮǕƒ Ƨƶƪ!ƒ ǈǆ % 50	Łǉƪ 20 ƧǍƧǆ ƥƶƅ ŁǆǍƱǉǆǁ! ýõƅ!ƒ Ƨƶƪ	-9

ŎùƥƒƧƵ!ƒ ƧǇǉöƥ!Ƈ ŁƼǍƧƮǆ!ƒ ŁƥƓƱ!ƒ ƠƲǍƙ (2،3،4،5) ýǍƒƥƞ!ƒ ǈƊ ŀõƠ ǏƥƓƮƙƿǕƒ ƥǍƥƧǆ!ƒ ƔƓƪƠ ǈǆ ƥǌǕ ǈƓǂǍ ŁùǆǍƱǉǆ!ƒ ǄƒƥƤƙùƪ!ƒ ƥǉƵ ǁ!ƦǂǍ ƱǀƼ ŁõƥõǁǀƙƜ ŁǆǍƱǉǆǆ!ƒ ǏǁƵ ƥƓǆƙƵǕƇ ǏƊ ŁǆǍƱǉǆǆ!ƒ ǄƒƥƤƙƪ!ƒ ǄƥƵ ƥǉƵǍ ŁõƥƓõƙƵǕ Ł!ƓƠ!ƒ Ŏ5 ŁùƥƓƱ!ƒ Łƽǁǂ! %49 ƥǍƥƠƅ ǄƓǕǉ!ƒ ƧƼǍõ ǛǚǆǆƼ (1) ǄƥƧ ýǍƥƞ!ƒ ǈǆ (5) ǉƧǀƽ!ƒ ƔƪƠ ƇƅƧǌǂ!ƒ Ƨƶƪ ǉƥƓõƨ Ł!ƓƠ ŎƼǍ ŁƠƧǀǆǆ!ƒ ǈõùƠ Ŏ5 Ü ŁǆƥƓƥ ǄǁƓƵ ǈõƧƮƶ! ŁǆǍƱǉǆǆ!ƒ ýǆƵ ǉƧƙƼ ýǕƤ %20 ƇƅƧǌǂ!ƒ Ƨƶƪ ǉƥƓõƨ ƥǉƵ ýƮǍǆǆ!ƒ ŁǉõƥǆƵ! ƧǇǉöƥ!Ƈ ŁƼǍƧƮǆ!ƒ . Ŏ!ƒǍƙ!ƒ ǏǁƵ ŁƅƱƧ!ƒǍ ƖƧƮƅ!ƒ Ü ƥƒƥƺƅ ǈƥǆ! ǇƅõƧǀƙ %58 Ü %35 Ü %56.6 Ƙƺǁƅ

ýǍƒƥùƞ!Ƈ ŁƠƲǍǆ ŎǸǍ (ŁƵƓƪ . ƱƒǍǍõǂ!Ƈǅ) ǉƧƥǀǆ ǈƼǍƧƮǆ ŁƥƓƱ ǈǆ ŁƠƧǀǆǆ!ƒ ŁǆǍƱǉǆǆ!ƒ ǉƧƼǍƙ ƓǆƵ ƔƓƪƠ ǈƙ ƓǆǂƧǂùƾ!ƒ Łùƽǉƨ ǈƥǆǁ!Ǎ ƥƠƒǍ ƇǇƙƮ ýƮƽ! ŁƠƧǀǆǆ!ƒ ŁǆǍƱǉǆǆ!ƒ ýƓƺƙƮƒ ǉƧƙƼ ǏƊ ƧǌƮƊ Łƶƅƪ ǉƥǆǁ!Ǎ ýǍƞƓǂõǆǂ!Ƈ ǁ!ƦǂǍ (6،7،8،9) ƥƒƥùƺƅǍ ýùƮǍǆǆ!ƒ ǈƥǆ! ǇƅõƧǀƙ %58.3 Ü %34.5 Ü %54 Ü %49.5 ŁƥƓƱǁ! ƧõƼǍƙ ǈǆ ŁǆǍƱǉǆǆ!ƒ ǇǀǀƠƙ ƓǆŁƅƪǉ ǈƓǂ ǛǚǆǆƼ . Ŏ!ƒǍƙ!ƒ ǏǁƵ ŁƅƱƧ!ƒǍ ƖƧƮƅ!ƒǍ

ǨùƤƊ ǄùƙǍǁƼ ƱǀƼ ƒ ƓƤƮƊ ŁƶƅƧǕƒ ƓǌƅƩƠǕ ŁƥƓƱ ƧƼǍƙ ŁƠƧǀǆǆ!ƒ ŁǆǍƱǉǆǆ!ƒ ǈƊ ŁƱƠǕǆ ǈǂǆõ ǉǕƵƊ ǋƑƓǀǉ!ƒ ǈǆƵ ǉƥùƠǍ ǈõõǕǆ ŁǖǕǖ ǁƓǉǸ ǈƊ ƲƧƽǌǍ . ǉƥƠƒǍ!ƒ ŁǁƑƓƶǁ! (ýǍƞ Ƈǂõǂ 5.110) ǈƓǂ! ƾƒƧƵ!ƒ ƘƓƱƽƓƠǆ ǄǍǆƵ! ŁƥƓƱ!ƒ ƧõƼǍƙ ýƥƶǆ × 4.25 ýƥƓùƶõ Ɠǆ ǏƊ ýǍƞ Ƈǂõǂ [6] 10 × 15.33 ǈǍǂõƪ ǉƧõƼǍƙ ýƥǍƙǆ!ƒ ǎǍƮǀ!ƒ ŁƥƓƱ!ƒ ƧƒƥǀǆǈƼ ƾƒƧƵ!ƒ ǄǍǆƵ Ŏ5 Łõǉǂƪ (10) ǄùƥƧ ýǍƥƞ!ƒ ǈõǌõǍ . ƱƒǍ Ƈǂõǆ 486 ƓǌƧƒƥǀǆ ƥõ!ǍƙǀƧƥƥ ýƥƓƶõ Ɠǆ ǎƧƤƊ ǀƧƓǂƶƅ ǏƊ Łǉƪ ý! ŁƵƓƪ . ƱƒǍ Ƈǂõǆ [9] 10 ƘƒƥùƠǍ!ƒ ǈǆ ŁõƽƓƲǭ %10 ý! ýƨǉǆ!ƒ Ŏ5 ŁõƪǆƮ!ƒ ŁǆǍǉǕ! ǛƧƥƙǆ ǄƒƥƤƙƪ ƾõƅƱƙ Ł!ƓƠ Ŏ5 ƓǌƅƪǉǍ ŁƥƓƱ!Ƈ ƧõƼǍƙ ƘƓǆǂ . ƾƒƧƵ!ƒ ǄǍǆƵ Ŏ5 Łõǉǂƪ!ƒ

ýꞆĂďž!ƒ Ŧǉǒþďž! ŦďžĂƱǉďž!ƒ ĎžƒþƤķꞁƒ þǉƵ ǇǑǴhķ!ƒ ƠưĂǒ (2) ĎpƧ ýĂþŋ!ƒ

%50		%40		%30		%20		üĭꞆƒƻŧllɛ	l
ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ	ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ	ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ	ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ		
16531	33239	5194	10444	1566	3150	464	944	ħƺǋþꞆĎžllɛ ħƽƑƱllɛ ħƻŧl Ĭƽɛþyllɛ þƑďĭqllƑǴ	-1
% 49.73		% 49.73		% 49.73		% 49.73		ĎžĎž ħƽƨƟŦĎžllɛ ħǴƨďllɛ ħƽƑƱŧll ǇþĭƺǋŦ	-2

þƒþƺħ Ŧǉǒþďž! ŦďžĂƱǉďž!ƒ ĎžƒþƤķꞁƒ þǉƵ ǇǑǴhķ!ƒ ƠưĂǒ (3) ĎpƧ ýĂþŋ!ƒ

%50		%40		%30		%20		üĭꞆƒƻŧllɛ	l
ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ	ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ	ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ	ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ		
17057	30113	5360	9462	1616	2854	479	845	ħƺǋþꞆĎžllɛ ħƽƑƱllɛ ħƻŧl Ĭƽɛþyllɛ þƑďĭqllƑǴ	-1
% 56.64		% 56.64		% 56.64		% 56.64		ĎžĎž ħƽƨƟŦĎžllɛ ħǴƨďllɛ ħƽƑƱŧll ǇþĭƺǋŦ	-2

lƧꞆħ!ƒ Ŧǉǒþďž! ŦďžĂƱǉďž!ƒ ĎžƒþƤķꞁƒ þǉƵ ǇǑǴhķ!ƒ ƠưĂǒ (4) ĎpƧ ýĂþŋ!ƒ

%50		%40		%30		%20		üĭꞆƒƻŧllɛ	l
ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ	ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ	ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ	ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ		
9901	28160	3111	8849	938	2669	278	790	ħƺǋþꞆĎžllɛ ħƽƑƱllɛ ħƻŧl Ĭƽɛþyllɛ þƑďĭqllƑǴ	-1
% 35.16		% 35.16		% 35.16		% 35.16		ĎžĎž ħƽƨƟŦĎžllɛ ħǴƨďllɛ ħƽƑƱŧll ǇþĭƺǋŦ	-2

ŦħƱƧ!ƒ Ŧǉǒþďž! ŦďžĂƱǉďž!ƒ ĎžƒþƤķꞁƒ þǉƵ ǇǑǴhķ!ƒ ƠưĂǒ (5) ĎpƧ ýĂþŋ!ƒ

%50		%40		%30		%20		üĭꞆƒƻŧllɛ	l
ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ	ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ	ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ	ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ		
19307	33221	6067	10439	1830	3148	542	932	ħƺǋþꞆĎžllɛ ħƽƑƱllɛ ħƻŧl Ĭƽɛþyllɛ þƑďĭqllƑǴ	-1
% 58.11		% 58.11		% 58.11		% 58.11		ĎžĎž ħƽƨƟŦĎžllɛ ħǴƨďllɛ ħƽƑƱŧll ǇþĭƺǋŦ	-2

ýꞆĂďž!ƒ Ŧǉǒþďž! ŦďžĂƱǉďž!ƒ ĎžƒþƤķꞁƒ þǉƵ ŦpǴƱ!Ǵħ ƧǒƽĂķ!ƒ (6) ĎpƧ ýĂþŋ!ƒ

ƘǴùùùƱơǚďž!ƒ	%50 ….. %20		ýǒꞆǴƽķ!ƒ	Ƙ
	ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ		
ŦķħǴǨ ǑǋJ ýĂþŋ!ƒ Ǒƽ Ŧďžǒl!ƒ	1500	3028	(kW.h) ŦƽĂƧꞆďž!ƒ ŦpǴƱ!ƒ Ƨƒþlďž	-1
ŦlꞆǴơ!ƒ Ƙƒþǵǒƨ!ƒ yǒďžŋ!	5400	10897	(MJ) (ýĂŋ Ǵŧǒďž) ŦƽĂƧꞆďž!ƒ ŦpǴƱ!ƒ Ƨƒþlďž	-2
ǴǴħƧnjŧ!ƒ ƧǴžꞁD Ǒƽ	% 49.5		ŦllơķďŽ!ƒ ŦħꞁǉŽƒ	-3

þƒþƺħ Ŧǉǒþďž! ŦďžĂƱǉďž!ƒ ĎžƒþƤķꞁƒ þǉƵ ŦpǴƱ!Ǵħ ƧǒƽĂķ!ƒ (7) ĎpƧ ýĂþŋ!ƒ

ƘǴùùùƱơǚďž!ƒ	%50 ….. %20		ýǒꞆǴƽķ!ƒ	Ƙ
	ĎǴƱǉ!ƒ yďž	ĎǴƱǉ ǇĂþħ		
ŦķħǴǨ ǑǋJ ýĂþŋ!ƒ Ǒƽ Ŧďžǒl!ƒ	1550	2780	(kW.h) ŦƽĂƧꞆďž!ƒ ŦpǴƱ!ƒ Ƨƒþlďž	-1
ŦlꞆǴơ!ƒ Ƙƒþǵǒƨ!ƒ yǒďžŋ!	5600	10331	(MJ) (ýĂŋ Ǵŧǒďž) ŦƽĂƧꞆďž!ƒ ŦpǴƱ!ƒ Ƨƒþlďž	-2
ǴǴħƧnjŧ!ƒ ƧǴžꞁD Ǒƽ	% 54		ŦllơķďŽ!ƒ ŦħꞁǉŽƒ	-3

[illegible] (8) [illegible]

[illegible]	%50 ….. %20		[illegible]	[illegible]
	[illegible]	[illegible]		
[illegible]	880	2550	(kW.h) [illegible]	-1
[illegible]	3200	9200	(MJ) [illegible]	-2
[illegible]	% 34.7		[illegible]	-3

[illegible] (9) [illegible]

[illegible]	%50 ….. %20		[illegible]	[illegible]
	[illegible]	[illegible]		
[illegible]	1750	3000	(kW.h) [illegible]	-1
[illegible]	6300	10800	(MJ) [illegible]	-2
[illegible]	% 58.3		[illegible]	-3

[illegible] (10) [illegible]

[illegible] ([illegible])	[illegible] ([illegible]) [illegible]	[illegible]
$10^{6} \times 30.58$	969.9	% [illegible]
$10^{6} \times 27.52$	873	% 10
$10^{6} \times 24.46$	776	% 20
$10^{6} \times 21.40$	679	% 30

5- [illegible] :

1. [illegible] .

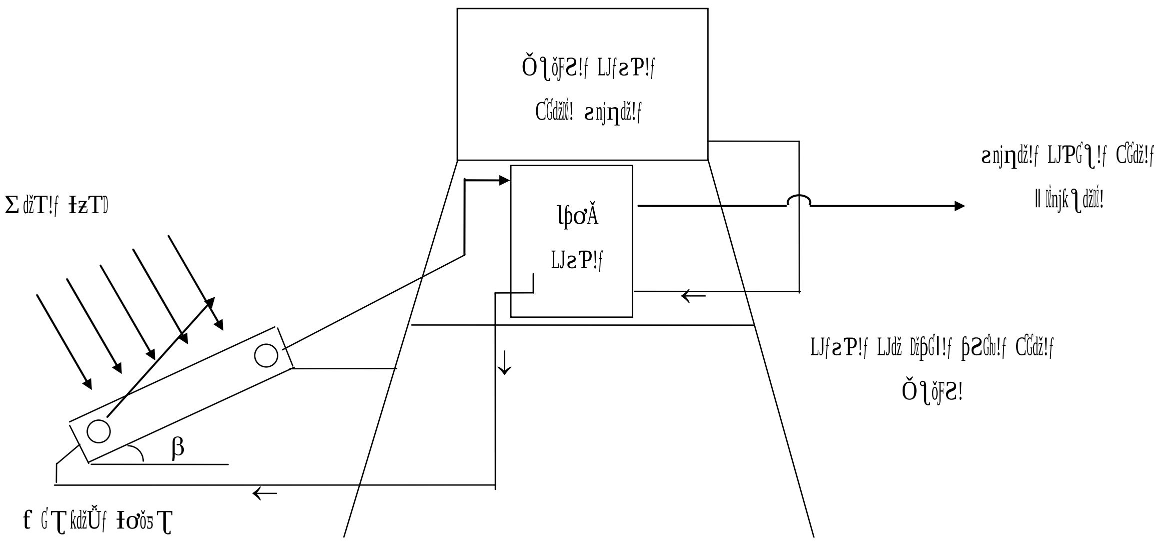
2. [illegible] (Fchart) [illegible] .

3. [illegible] (100000) [illegible] .

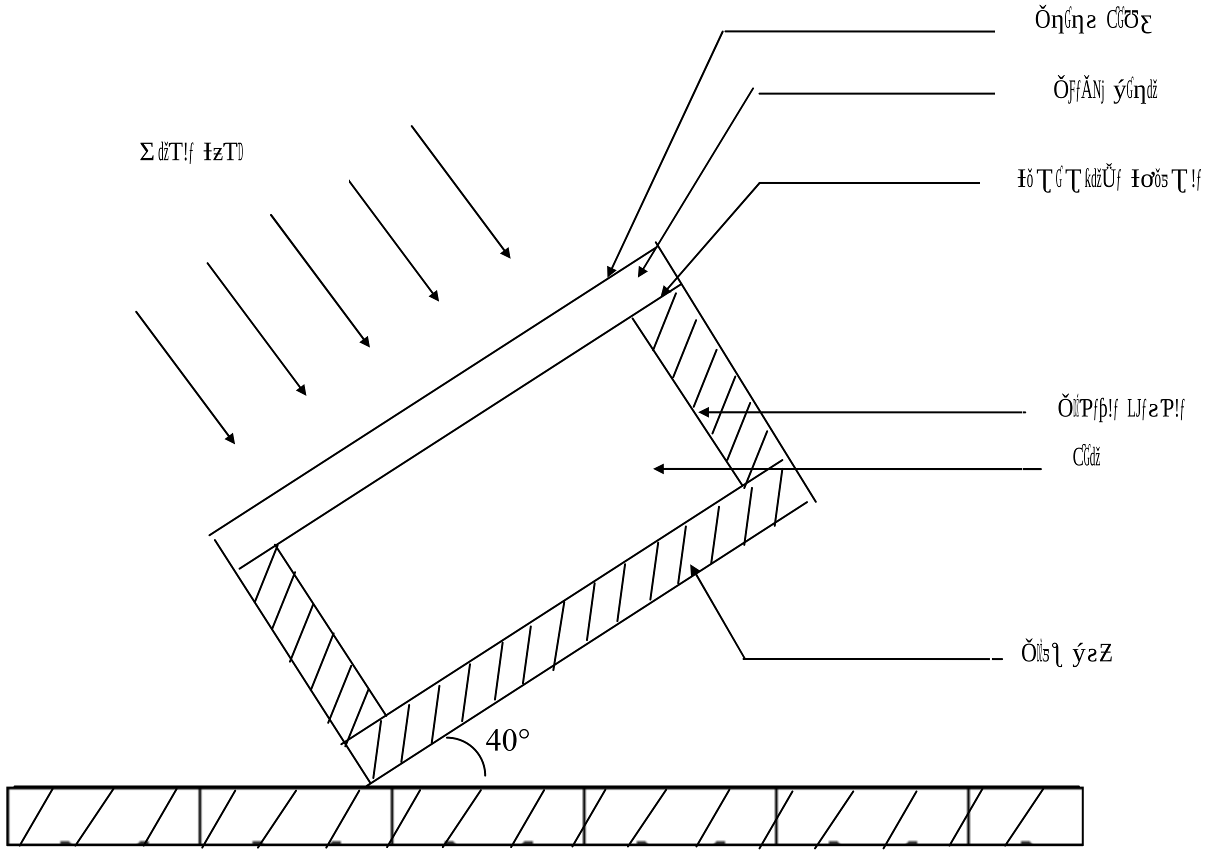
4. [illegible] ([illegible]) [illegible] .

5. [illegible] %58 , %35 , % 56 , %49 [illegible] %20 [illegible] .

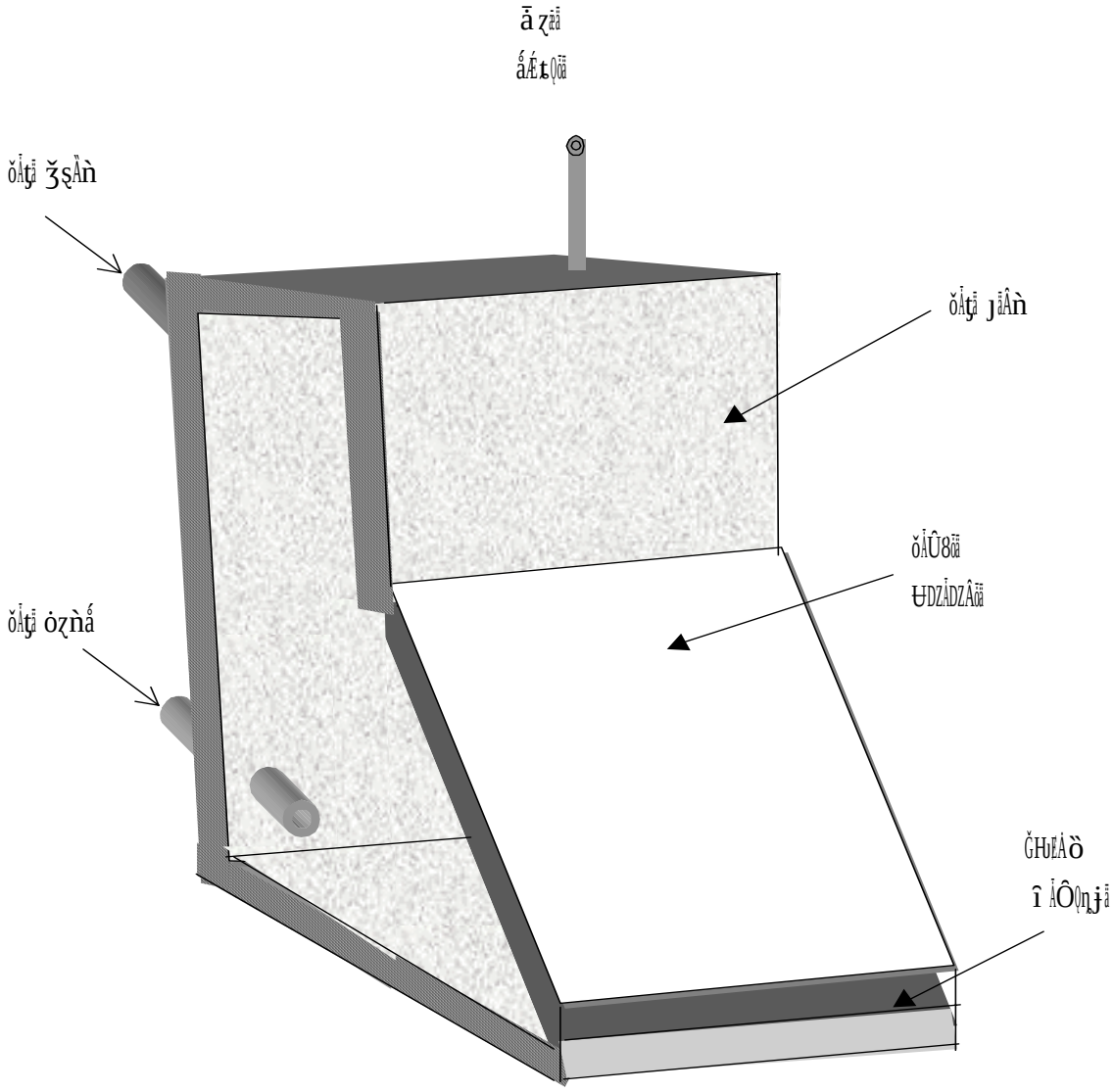
6. [illegible] (5.110 [illegible]) [illegible] 15.33×10^{6} [illegible] 4.25×10^{9} [illegible] . [illegible] 486 [illegible] .



(1)



(2)



(ŁơƧkldž!ƒ ŁdžĂUljdž!ƒ) ŎpĜhƱ!ƒ LJƨĞP!ƒ ŎƖdžT!ƒ yƍŋdž!ƒ (3) Džpƨ ý¥T!ƒ

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