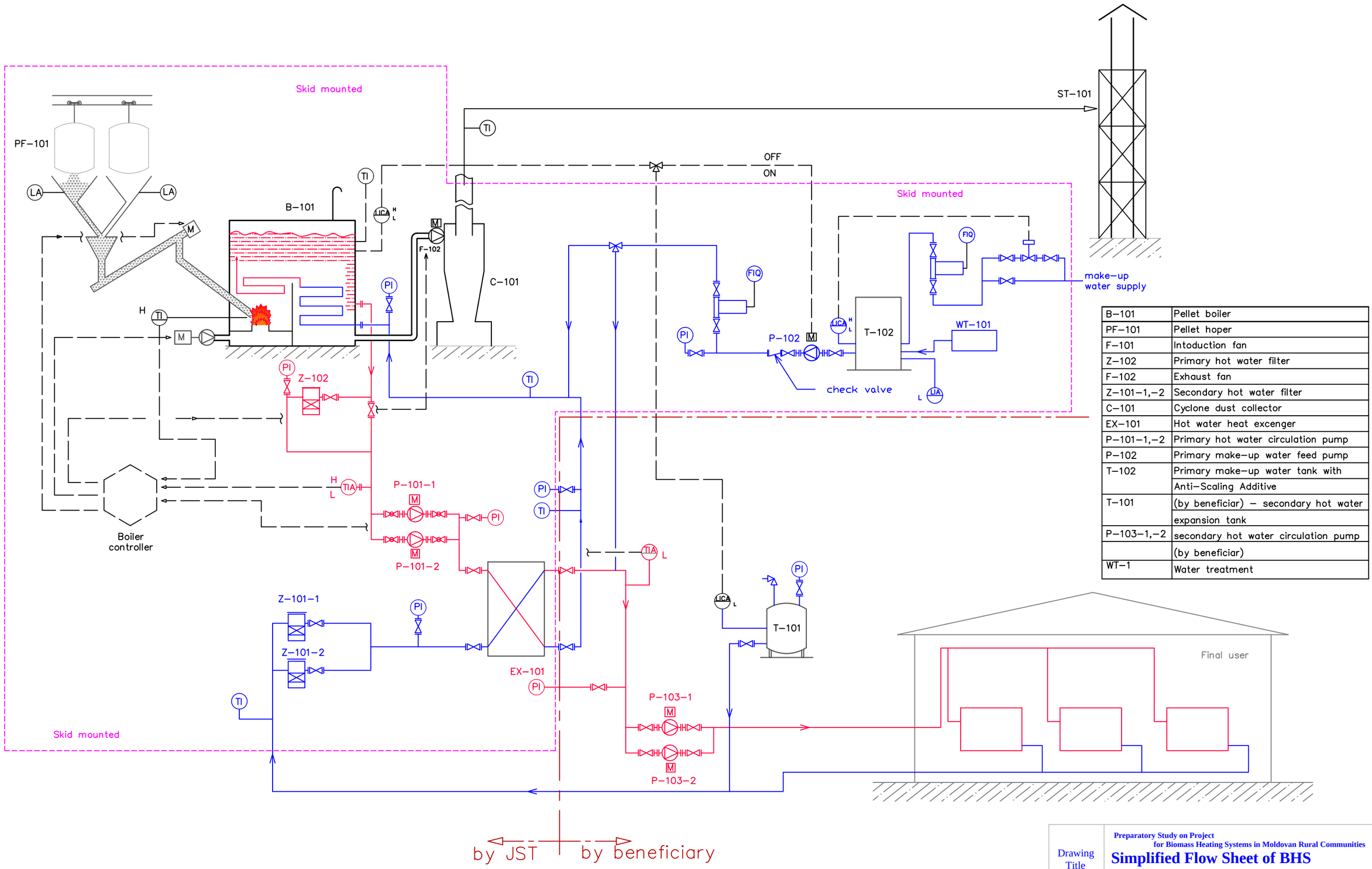
6. Other Relevant Data

6.1 Outline Design Drawings of Pellet Boilers and Plot Plan Drawings



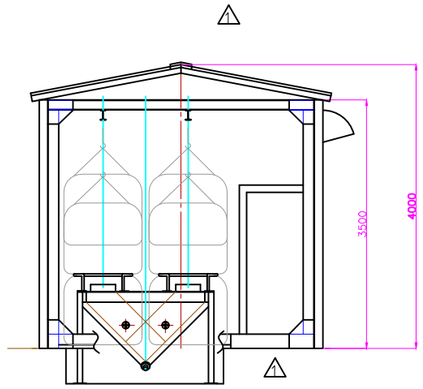
B–101	Pellet boiler
PF–101	Pellet hoper
F–101	Intoduction fan
Z–102	Primary hot water filter
F–102	Exhaust fan
Z–101–1,–2	Secondary hot water filter
C–101	Cyclone dust collector
EX–101	Hot water heat excenger
P–101–1,–2	Primary hot water circulation pump
P–102	Primary make–up water feed pump
T–102	Primary make–up water tank with Anti–Scaling Additive
T–101	(by beneficiar) – secondary hot water expansion tank
P–103–1,–2	secondary hot water circulation pump (by beneficiar)
WT–1	Water treatment

Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities

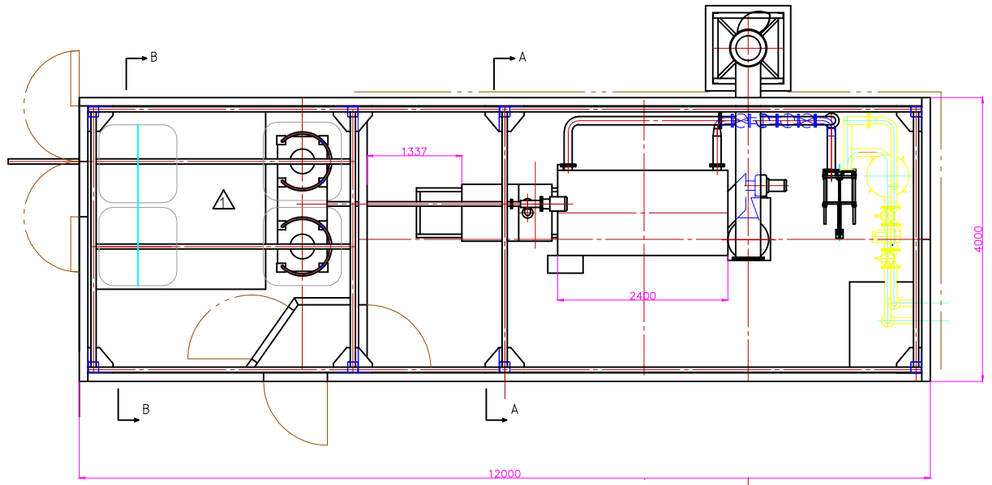
Drawing Title: **Simplified Flow Sheet of BHS**

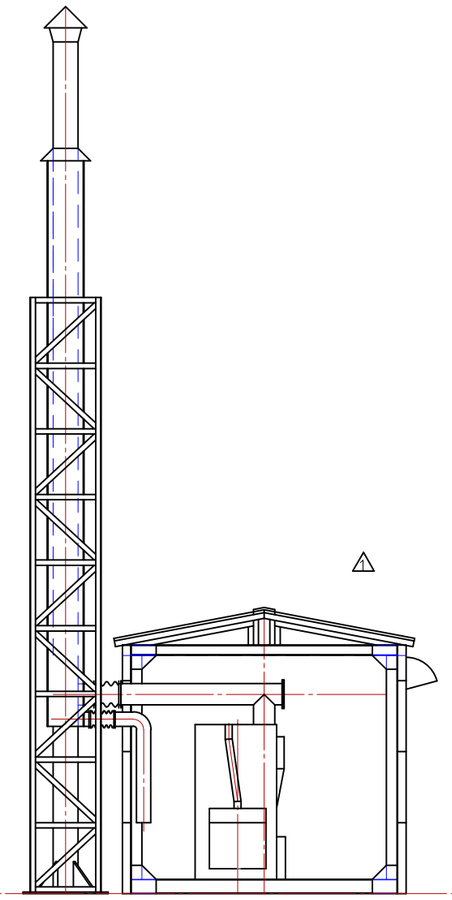
Drawing No.: **JST - FD - 005 - 001**

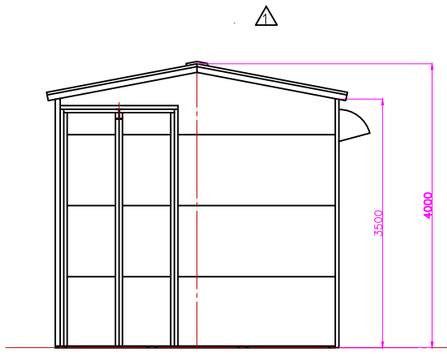
By Denda



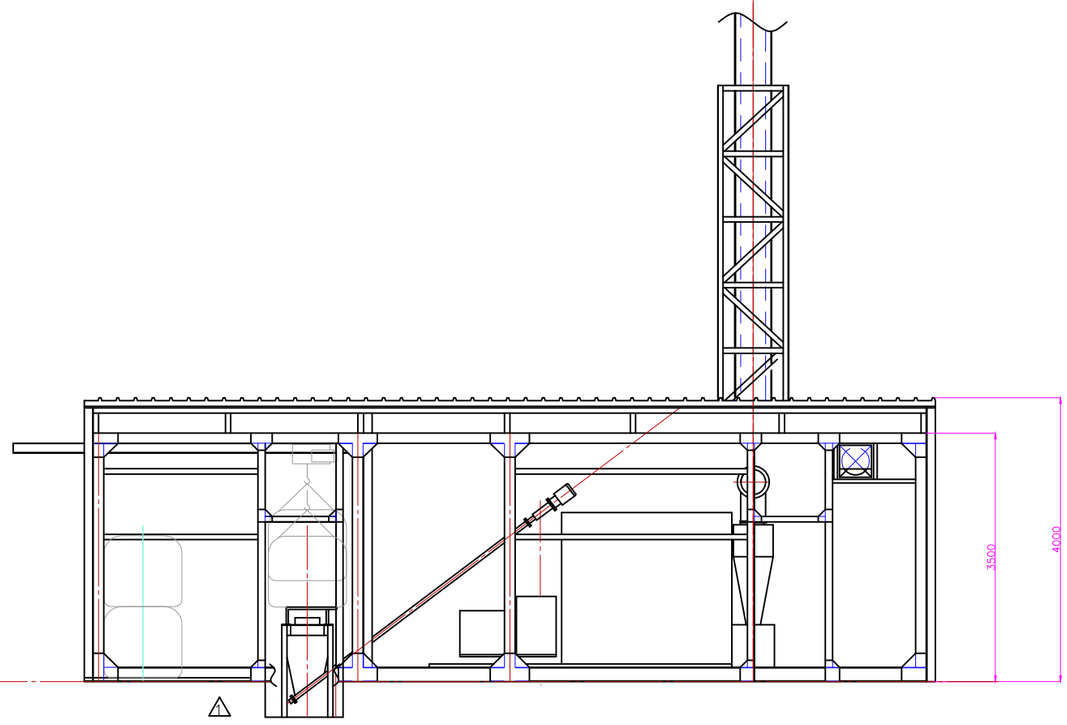
Cross section B-B







Cross section A-A



580kw(500,000kcal/h) Heat generator (NE)

1 11,Dec,2012 Fuel strage room flower dig down
Roof sharp change to gable

No.	Equipment	Tag No.	Quantity	Materials	Remarks
1					

Date,Month,Year	Design	Approval	Drawing Method	Scale
11,Aug,2012	Yamano.K	Yamano.K	JIS 3rd	Non

Drawing Title	**Single Biomass Heat Generator Layout for 580kw** **Module A Type**
Drawing No.	**JST-LY- 005-580-A**

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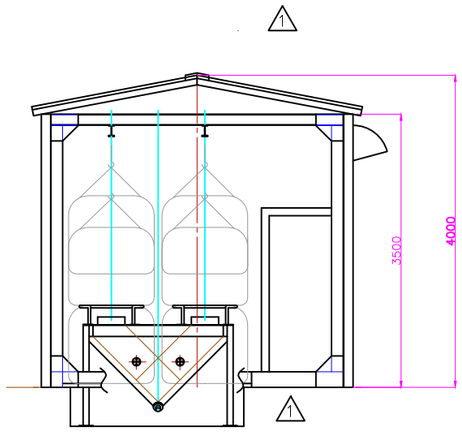
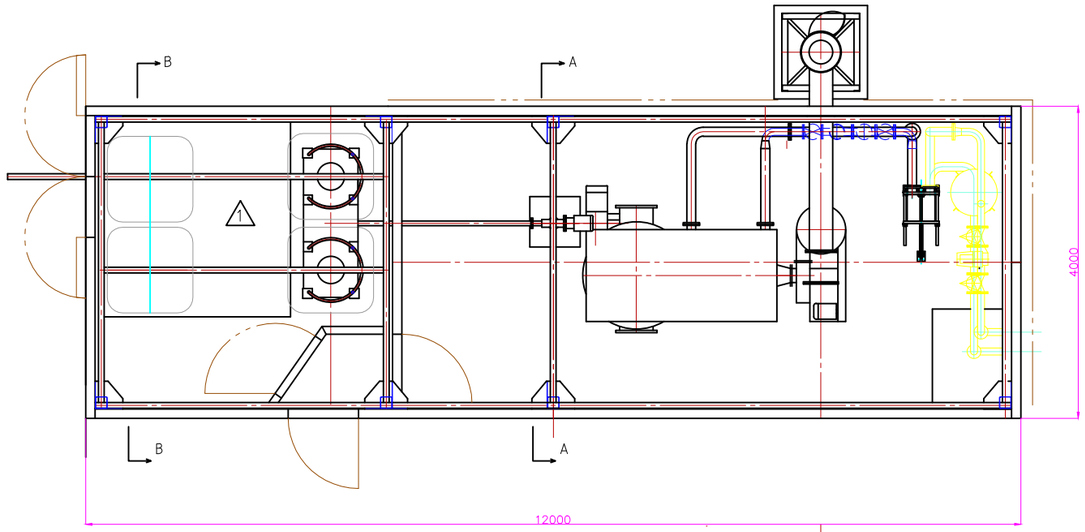
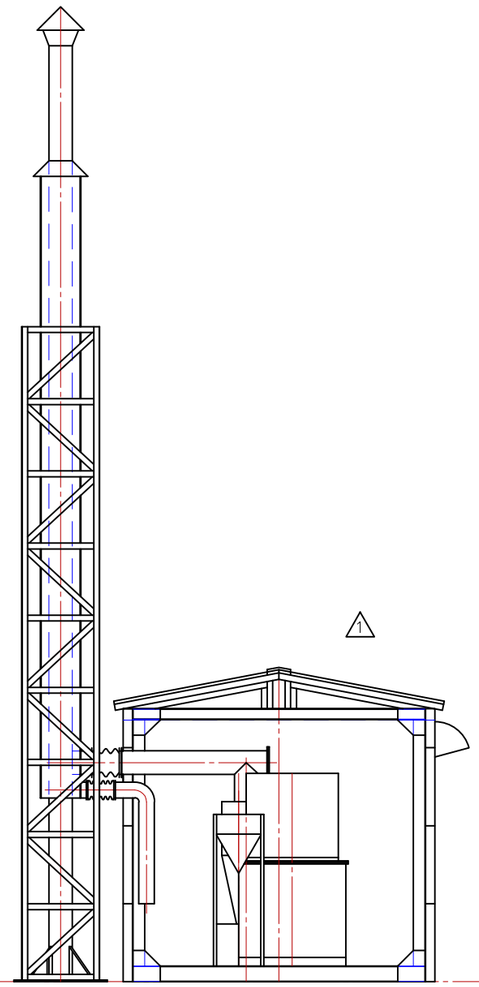
Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities

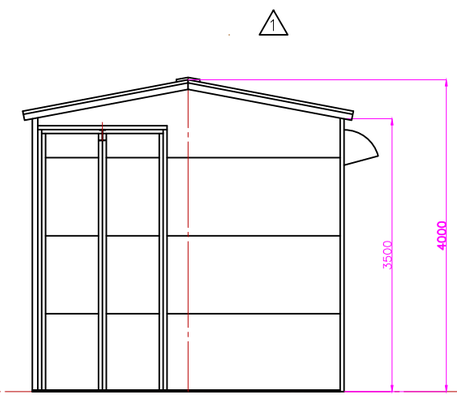
6.1-3



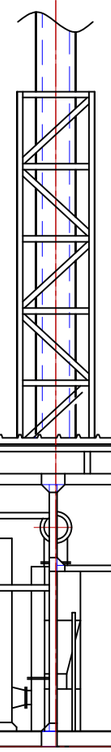
Cross section B-B

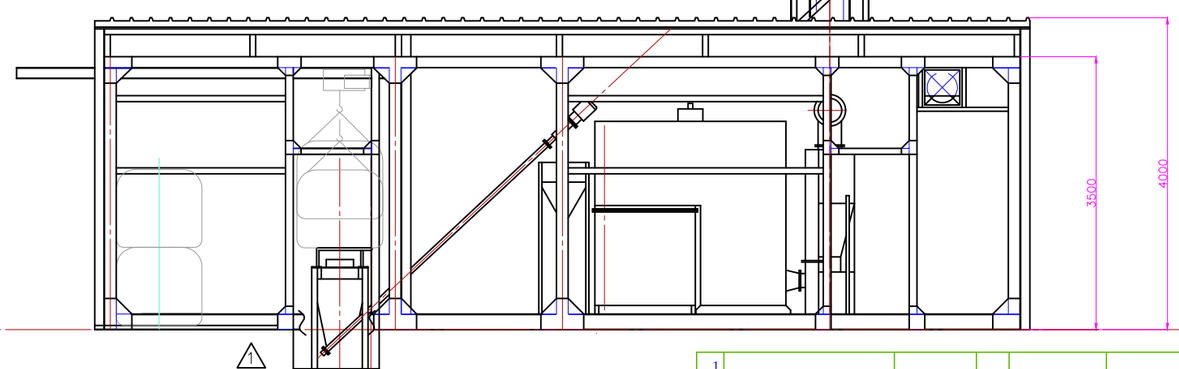






Cross section A-A





407kw(350,000kcal/h) Heat generator (NB)
348kw(300,000kcal/h) Heat generator (NB)

1 11,Dec, 2012 Fuel strage room dig down
Roof sharp change to gable

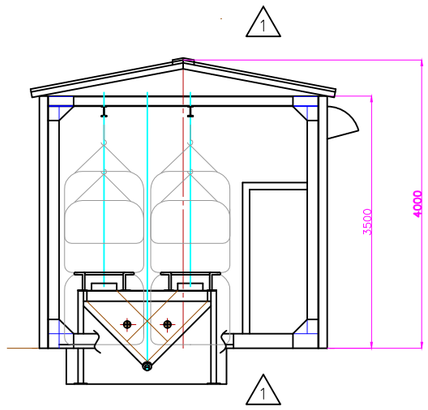
No.	Equipment	Tag No.	Quantity	Materials	Remarks
1					

Date,Month,Year	Design	Approval	Drawing Method	Scale
13,Aug,2012	Yamano.K	Yamano.K	JIS 3rd	Non

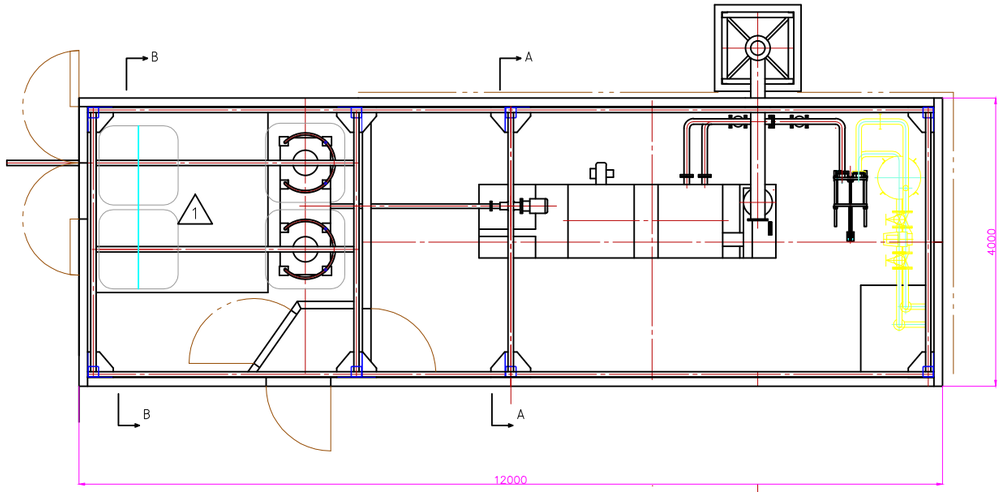
Drawing Title	**Single Biomass Heat Generator Layout for 407kw & 348kw** Modulae B Type
Drawing No.	**JST-LY- 005-407, 348-B**

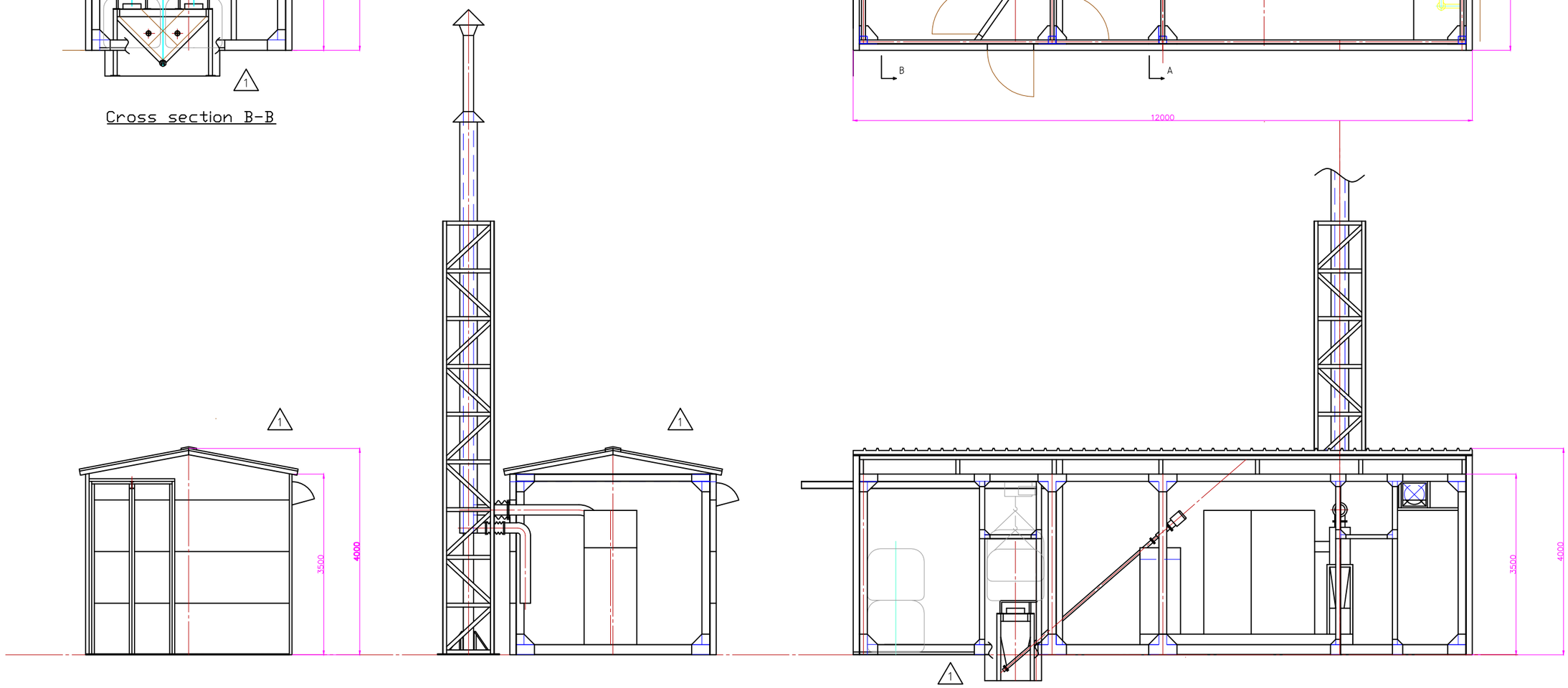
Mitsui Consultants Co.,Ltd

Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities



Cross section B-B





Cross section A-A

232kw(200,000kcal/h) Heat generator (AS)

No.	Equipment	Tag No.	Quantity	Materials	Remarks
1					

Date,Month,Year	Design	Approval	Drawing Method	Scale
13,Aug,2012	Yamano.K	Yamano.K	JIS 3rd	Non

Drawing Title	**Single Biomass Heat Generator Layout for 232kw** **Module C Type**
Drawing No.	**JST-LY- 005-232-C**

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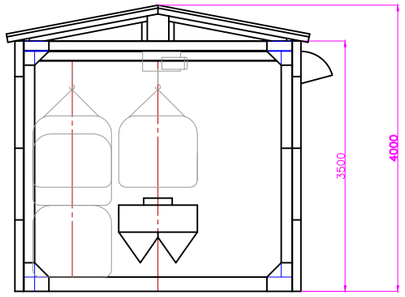
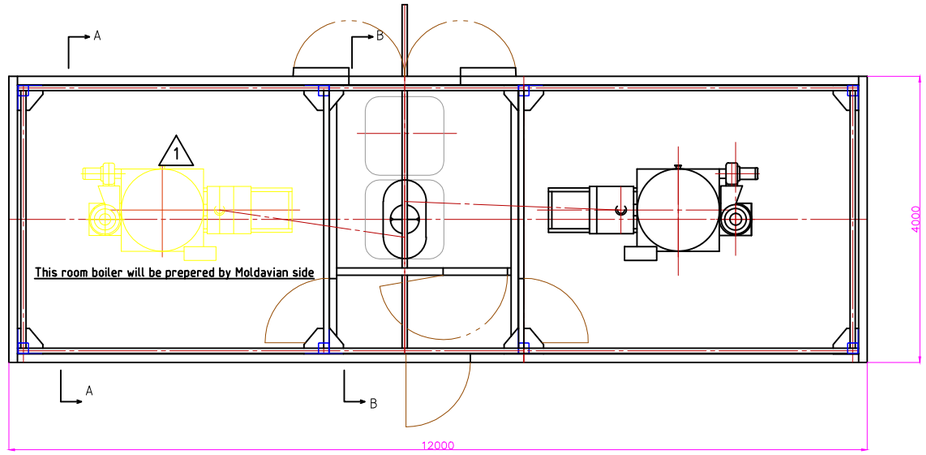
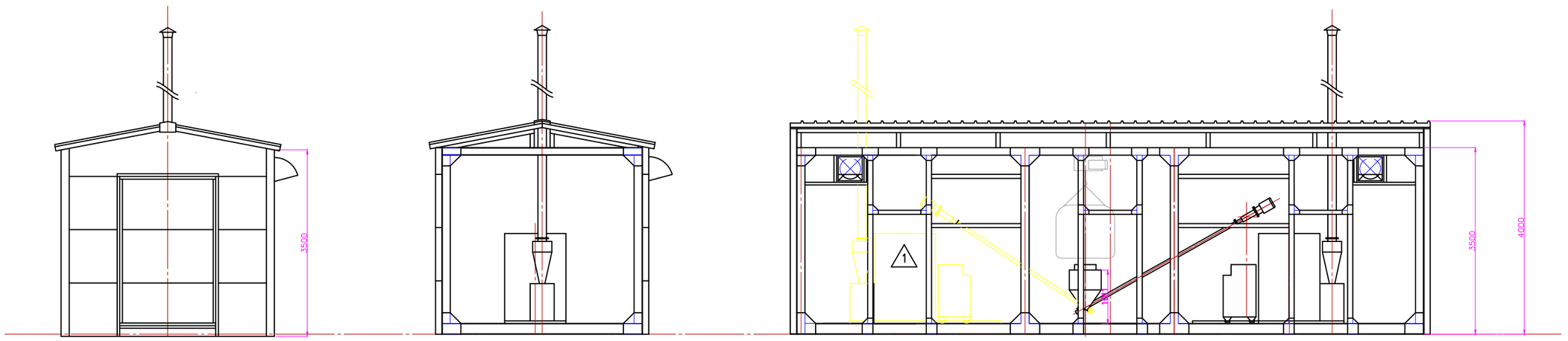
Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities

1 11,Dec,2012 Fuel strage room dig down
Roof sharp change to gable



Cross section B-B





Cross section A-A

116kw(100,000kcal/h) Heat generator(NE)

1 11,Dec,2012 Boiler is reduced from twin to single

No.	Equipment	Tag No.	Quantity	Materials	Remarks
1					

Date,Month,Year	Design	Approval	Drawing Method	Scale
1,Dec,2012	Yamano.K	Yamano.K	JIS 3rd	Non

Drawing Title	**Biomass Heat Generator Layout for 116kw** Module TW Type
Drawing No.	**JST-LY- 005-116-TW**

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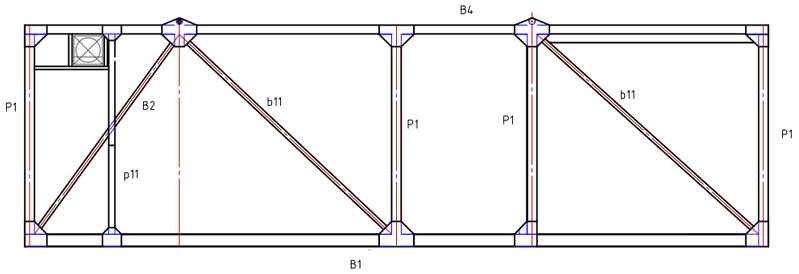
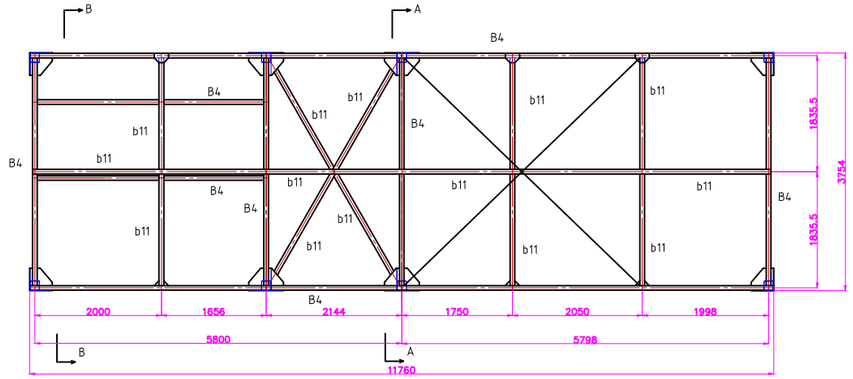
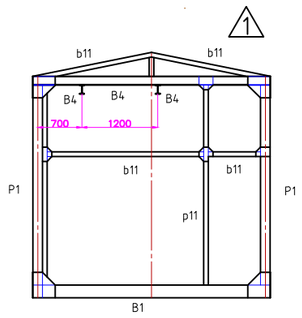
Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities



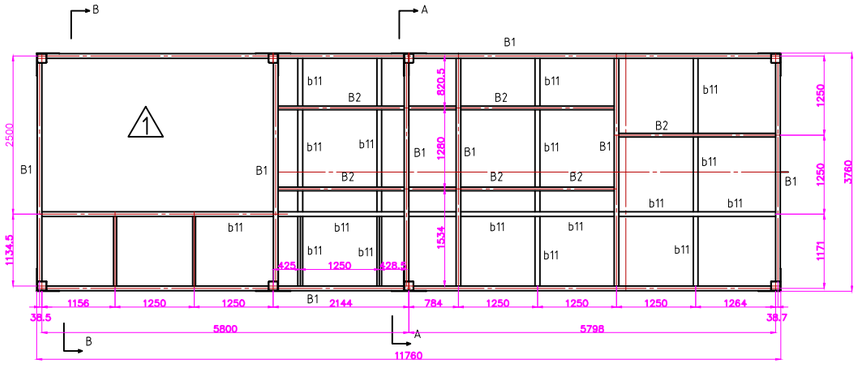
Backyard view Skeleton (NE)



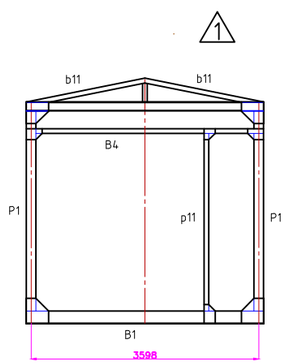
Roof Skeleton (NE)



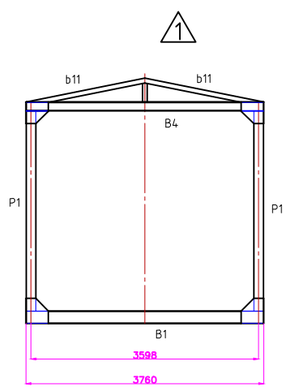
Cross section B-B

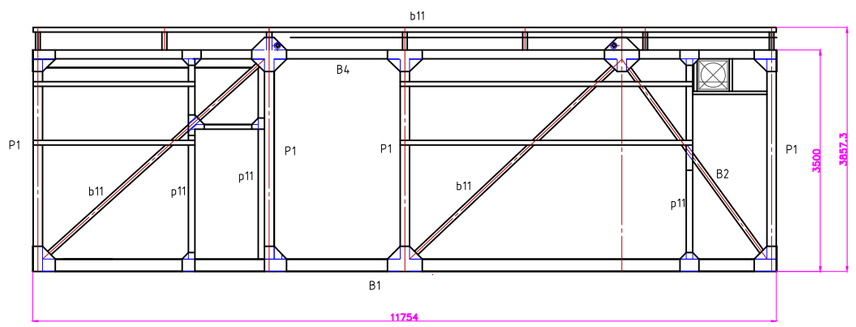


Platform skeleton (NE)



Cross section A-A





580kw(500,000kcal/h) Heat generator (NE)

Fram work skeleton elements list					
9					
8					
7	p11	Angle	75*75*6	Carbon steel	
6	b11	Angle	75*75*6	Carbon steel	
5	P1	Square pipe	150*150*6	Carbon steel	
4	B4	I beam	140*73*4.9	Carbon steel	
3	B3	C channel	100*47* 6	Carbon steel	
2	B2	Channel	140*58*6	Carbon steel	
1	B1	Channel	200*75*9	Carbon steel	
No.	Beem,Piller code	Cross section	Size(H*W*t)	Materials	Remarks

Date,Month,Year	Design	Approval	Drawing Method	Scale
14,Aug,2012	Yamano.K	Yamano.K	JIS 3rd	Non

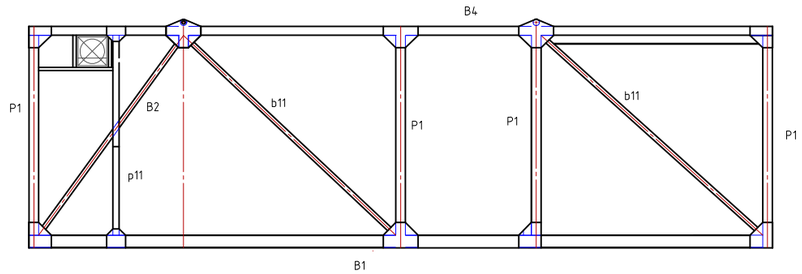
Preparatory Study on Project
for Biomass Heating Systems in Moldovan Rural Communities

Drawing Title: **BHS Single Module framing plan for 580kw**
Module A Type

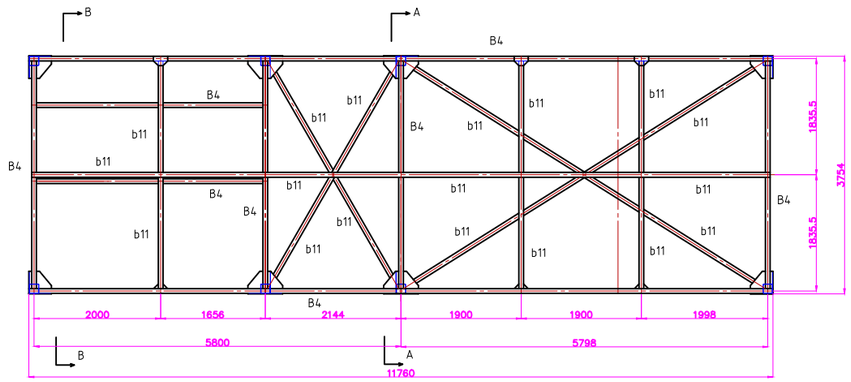
Drawing No.: **JST-MD-005-580-A**

Mitsui Consaltants Co.,Ltd

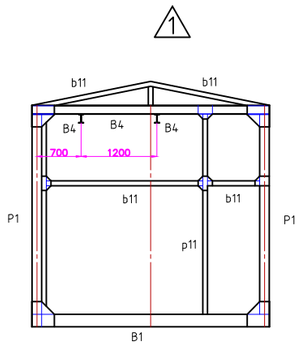
1 11,Dec,2012 Fuel strage room dig down
Roof sharp change to gable



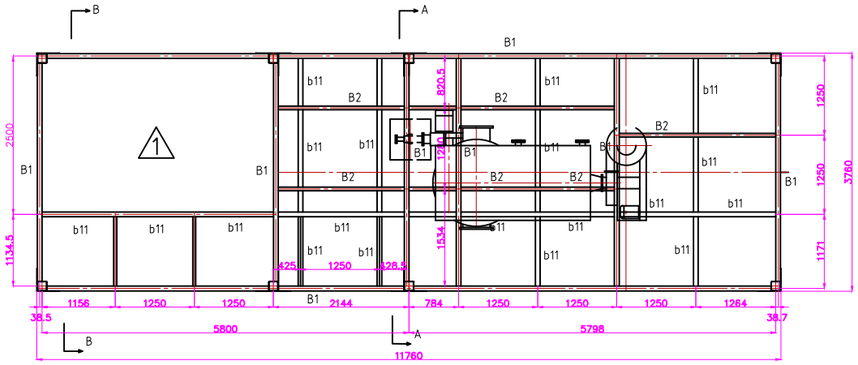
Backyard view Skeleton (KN)



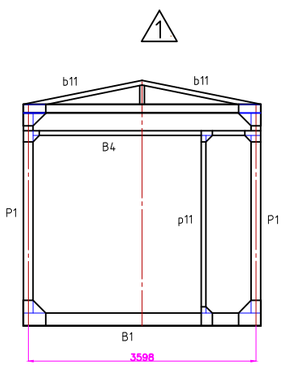
Roof Skeleton (KN)

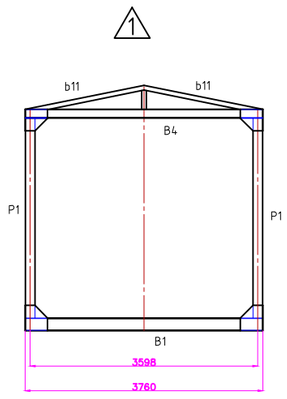


Cross section B-B

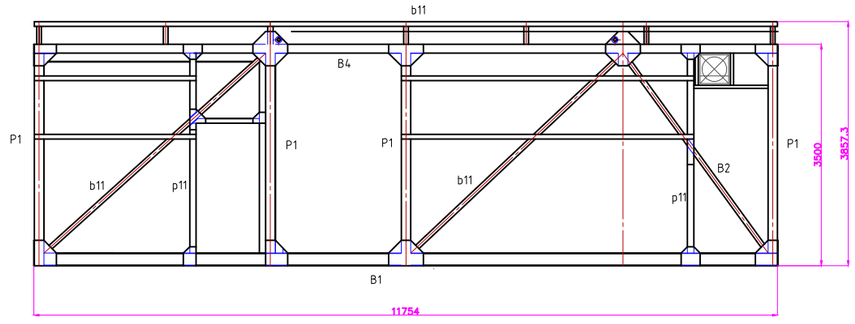


Platform skeleton (KN)





Cross section A-A



407kw(350,000kcal/h) Heat generator (KN)

348kw(300,000kcal/h) Heat generator (NE)

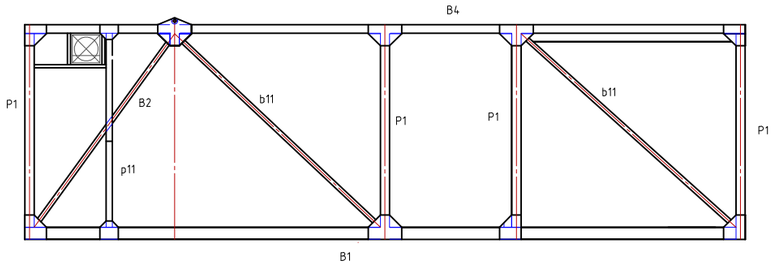
Fram work skeleton elements list					
9					
8					
7	p11	Angle	75*75*6	Carbon steel	
6	b11	Angle	75*75*6	Carbon steel	
5	P1	Square pipe	150*150*6	Carbon steel	
4	B4	I beam	140*73*4.9	Carbon steel	
3	B3	C channel	100*47* 6	Carbon steel	
2	B2	Channel	140*58*6	Carbon steel	
1	B1	Channel	200*75*9	Carbon steel	
No.	Beem,Piller code	Cross section	Size(H*W*t)	Materials	Remarks

Date,Month,Year	Design	Approval	Drawing Method	Scale
14,Aug,2012	Yamano.K	Yamano.K	JIS 3rd	Non

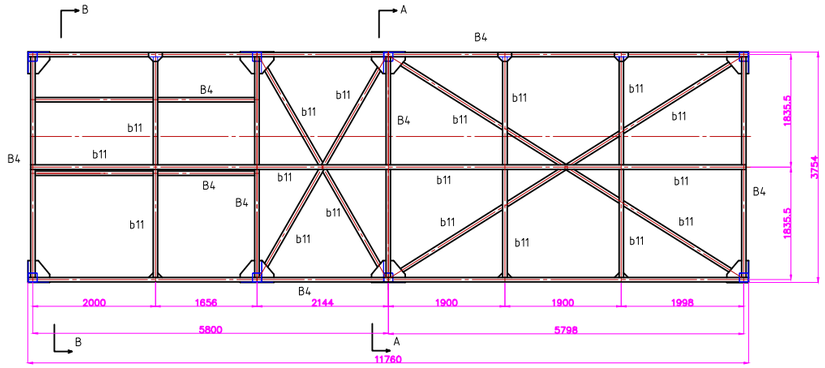
Drawing Title	Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities **BHS Single Module framing plan for 407kw 348kw Module B Type**
Drawing No.	**JST-MD-005-407. 348-B**

Mitsui Consaltants Co.,Ltd

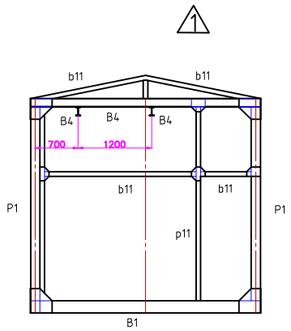
1 11,Dec,2012 Fuel strage room dig down
Roof sharp change to gable



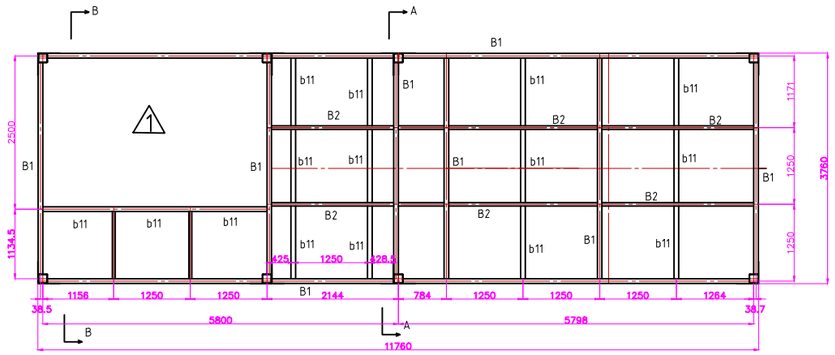
Backyard view Skeleton (AS)



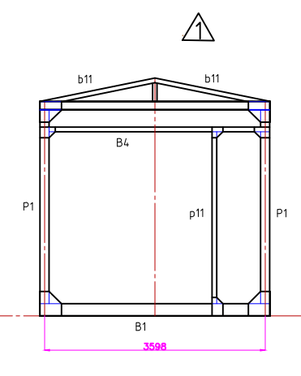
Roof Skeleton (AS)

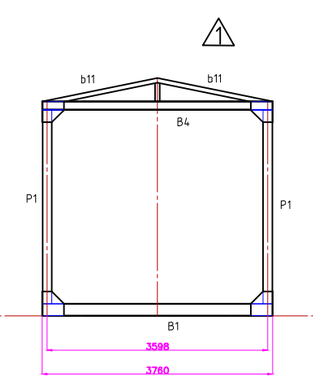


Cross section B-B

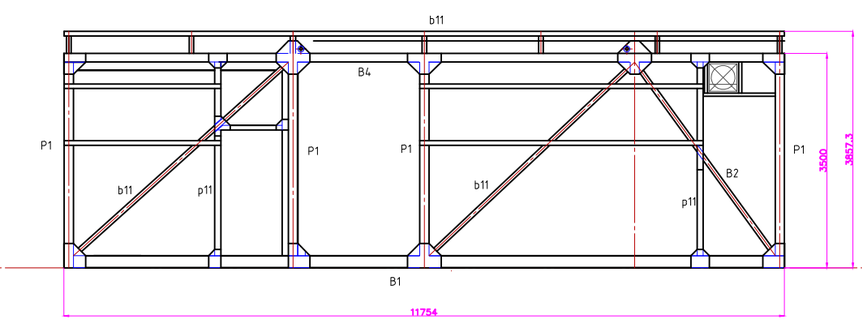


Platform skeleton (AS)





Cross section A-A



232kw(200,000kcal/h) Heat generator (AS)

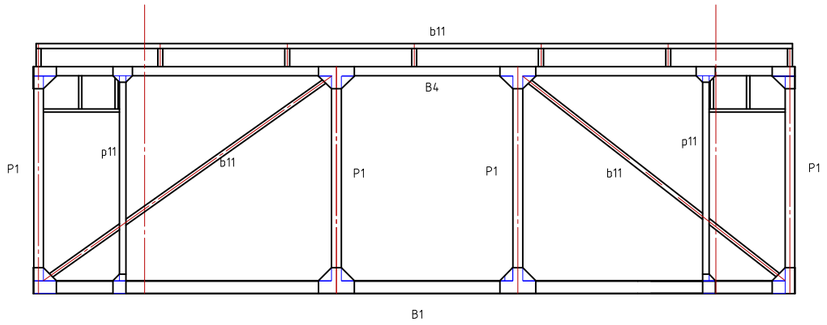
Fram work skeleton elements list					
9					
8					
7	p11	Angle	75*75*6	Carbon steel	
6	b11	Angle	75*75*6	Carbon steel	
5	P1	Square pipe	150*150* 6	Carbon steel	
4	B4	I beam	140*73*4.9	Carbon steel	
3	B3	Channel	100*47*6	Carbon steel	
2	B2	Channel	140*58*6	Carbon steel	
1	B1	Channel	200*75*9	Carbon steel	
No.	Beem,Piller code	Cross section	Size(H*W*t)	Materials	Remarks

Date,Month,Year	Design	Approval	Drawing Method	Scale
31,May,2012	Yamano.K	Yamano.K	JIS 3rd	Non

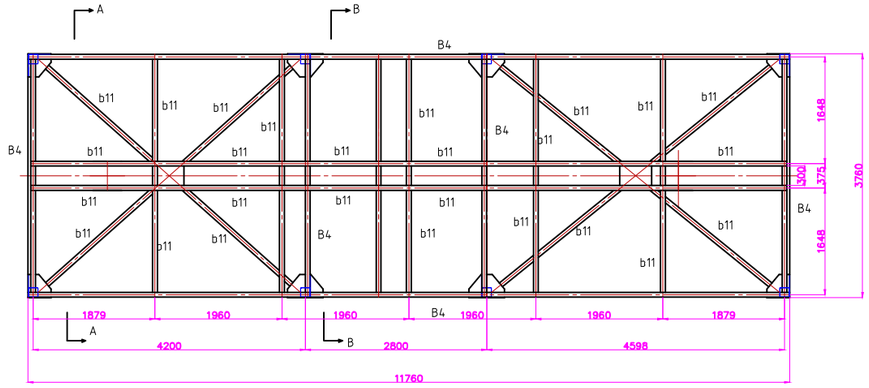
Drawing Title	**Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities** **BHS Single Module framing plan for 232kw** **Module C Type**
Drawing No.	**JST-MD-005-232-C**

Mitsui Consaltants Co.,Ltd

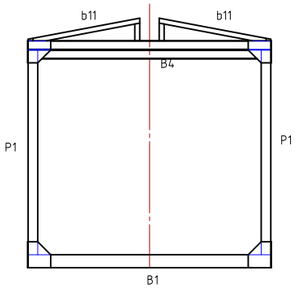
1 11,Dec, 2012 Fuel strage room dig down
Roof sharp change to gable



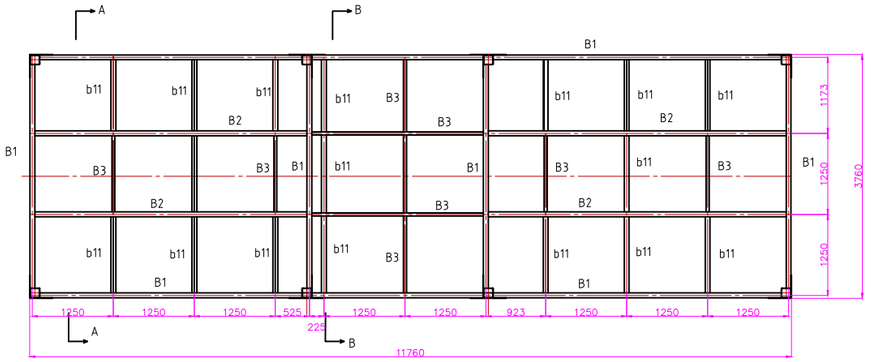
Backyard view Skeleton (NE)



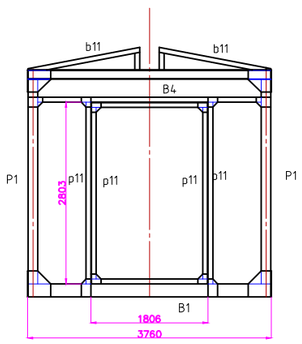
Roof Skeleton (NE)

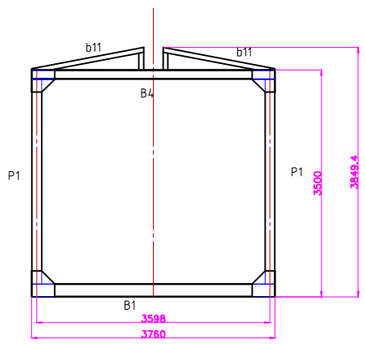


Cross section B-B

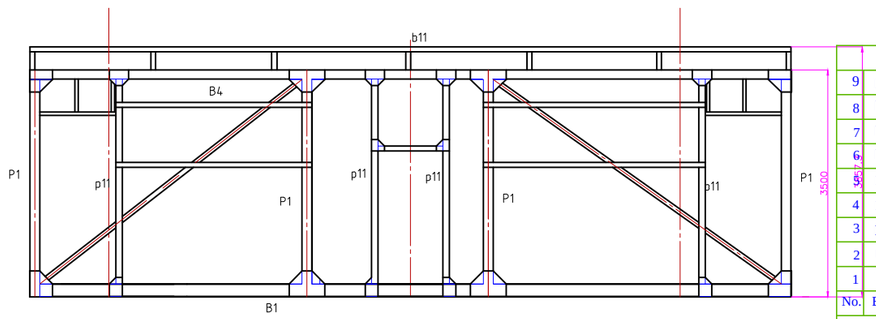


Platform skeleton (NE)





Cross section A-A



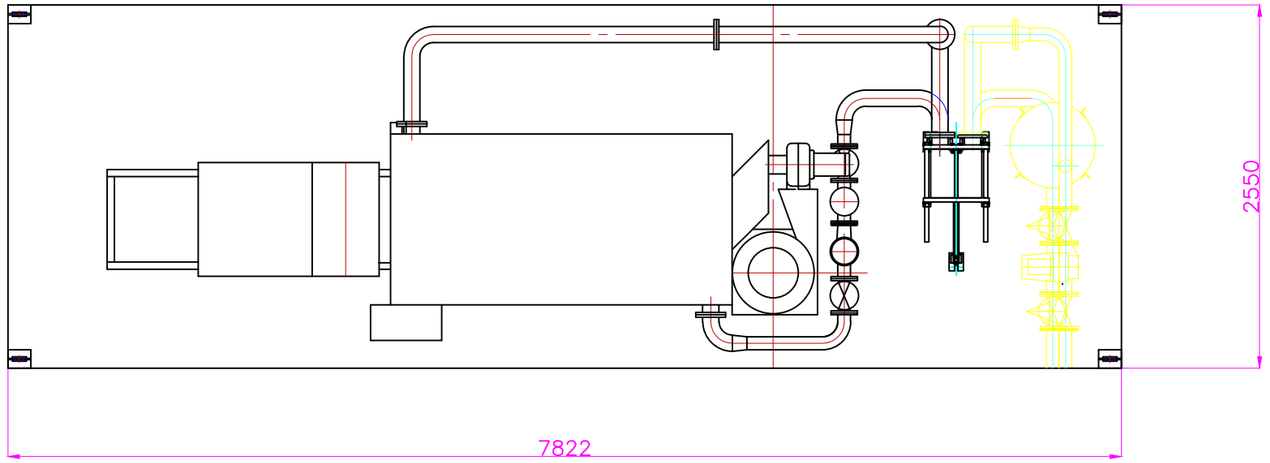
116kw+116kw(200,000kcal/h) Heat generator(NE)

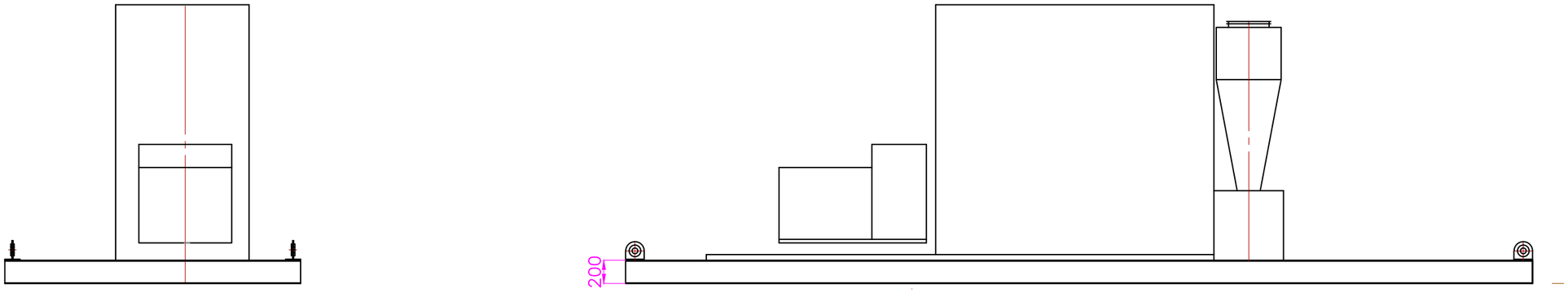
Fram work skeleton elements list					
9	p11				
8	b21				
7	b12	Angle	75*75*6	Carbon steel	
6	b11	Angle	75*75*6	Carbon steel	
5	P1	Square pipe	150*150* 6	Carbon steel	
4	B4	I beam	140*73*4.9	Carbon steel	
3	B3	Channel	100*47*6	Carbon steel	
2	B2	Channel	140*58*6	Carbon steel	
1	B1	Channel	200*75*9	Carbon steel	
No.	Beem,Piller code	Cross section	Size(H*W*t)	Materials	Remarks

Date,Month,Year	Design	Approval	Drawing Method	Scale
15,Aug,2012	Yamano.K	Yamano.K	JIS 3rd	Non

Drawing Title	Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities **BHS Twin Module framing plan for 116kw** Module TW Type
Drawing No.	**JST-MD-005-116-TW**

Mitsui Consaltants Co.,Ltd





580kw(500,000kcal/h) Heat generator (NE)

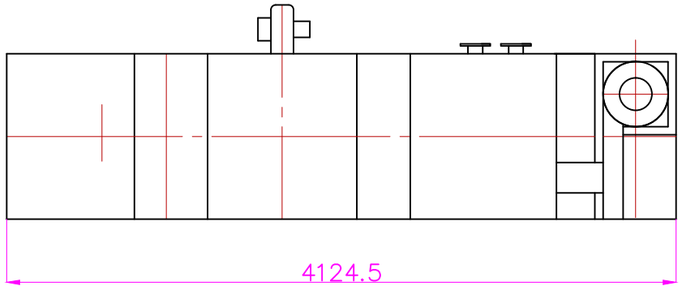
No.	Equipment	Tag No.	Quantity	Materials	Remarks
1					

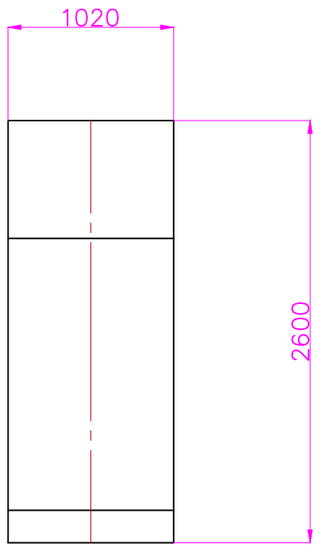
Date,Month,Year	Design	Approval	Drawing Method	Scale
15,Aug,2012	Yamano.K	Yamano.K	JIS 3rd	Non

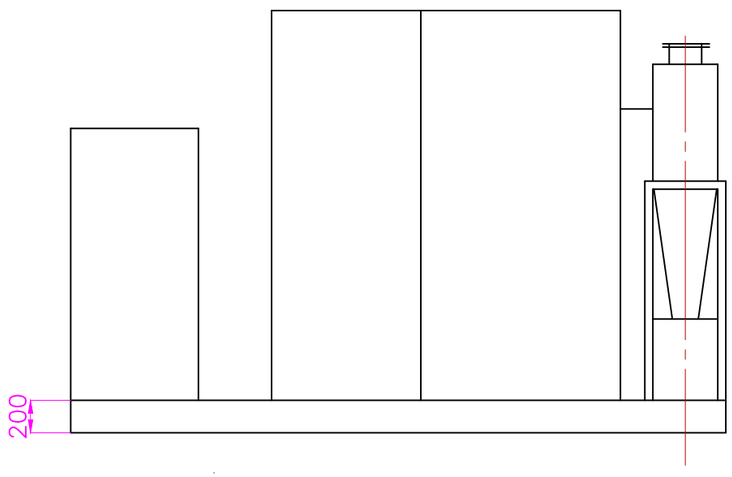
Drawing Title	**Single Biomass Heat Generator Skid for 580kw** **Module A Type**
Drawing No.	**JST-SK- 005-580-A**

Mitsui Consultants Co.,Ltd

Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities







232kw(200,000kcal/h) Heat generator Sklid

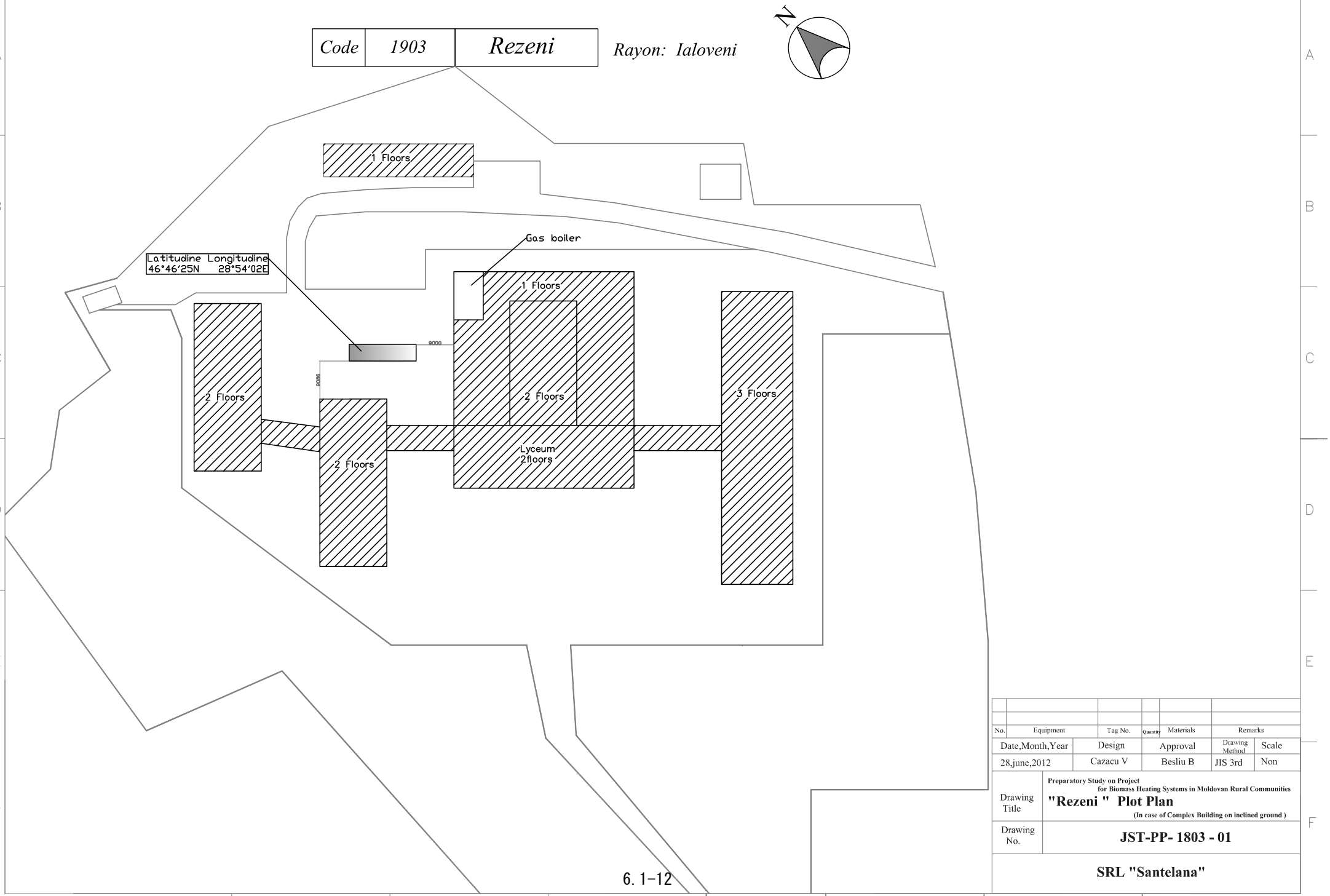
No.	Equipment	Tag No.	Quantity	Materials	Remarks
1					

Date,Month,Year	Design	Approval	Drawing Method	Scale
15,Aug,2012	Yamano.K	Yamano.K	JIS 3rd	Non

Drawing Title	**Single Biomass Heat Generator Skid for 232kw** **Skid C Type**
Drawing No.	**JST-SK- 005-232-C**

Mitsui Consultants Co.,Ltd

Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year	Design		Approval	Drawing Method	Scale
28,june,2012	Cazacu V		Besliu B	JIS 3rd	Non

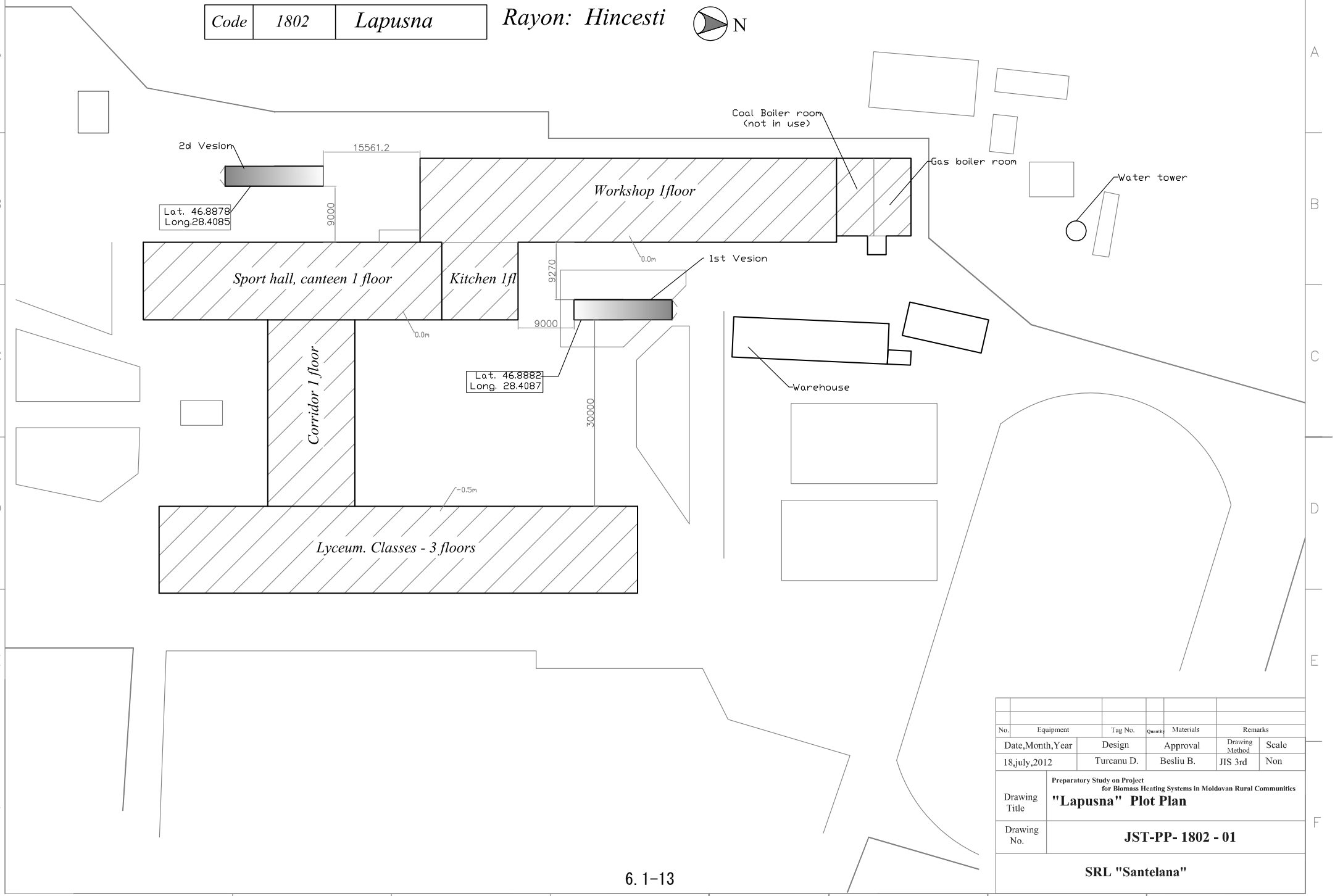
Drawing Title	Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities **"Rezeni " Plot Plan** (In case of Complex Building on inclined ground)
Drawing No.	**JST-PP- 1803 - 01**

SRL "Santelana"

Code	1802	Lapusna

Rayon: Hincesti

N



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method: JIS 3rd; Scale: Non
18,july,2012		Turcanu D.		Besliu B.	

Preparatory Study on Project
for Biomass Heating Systems in Moldovan Rural Communities

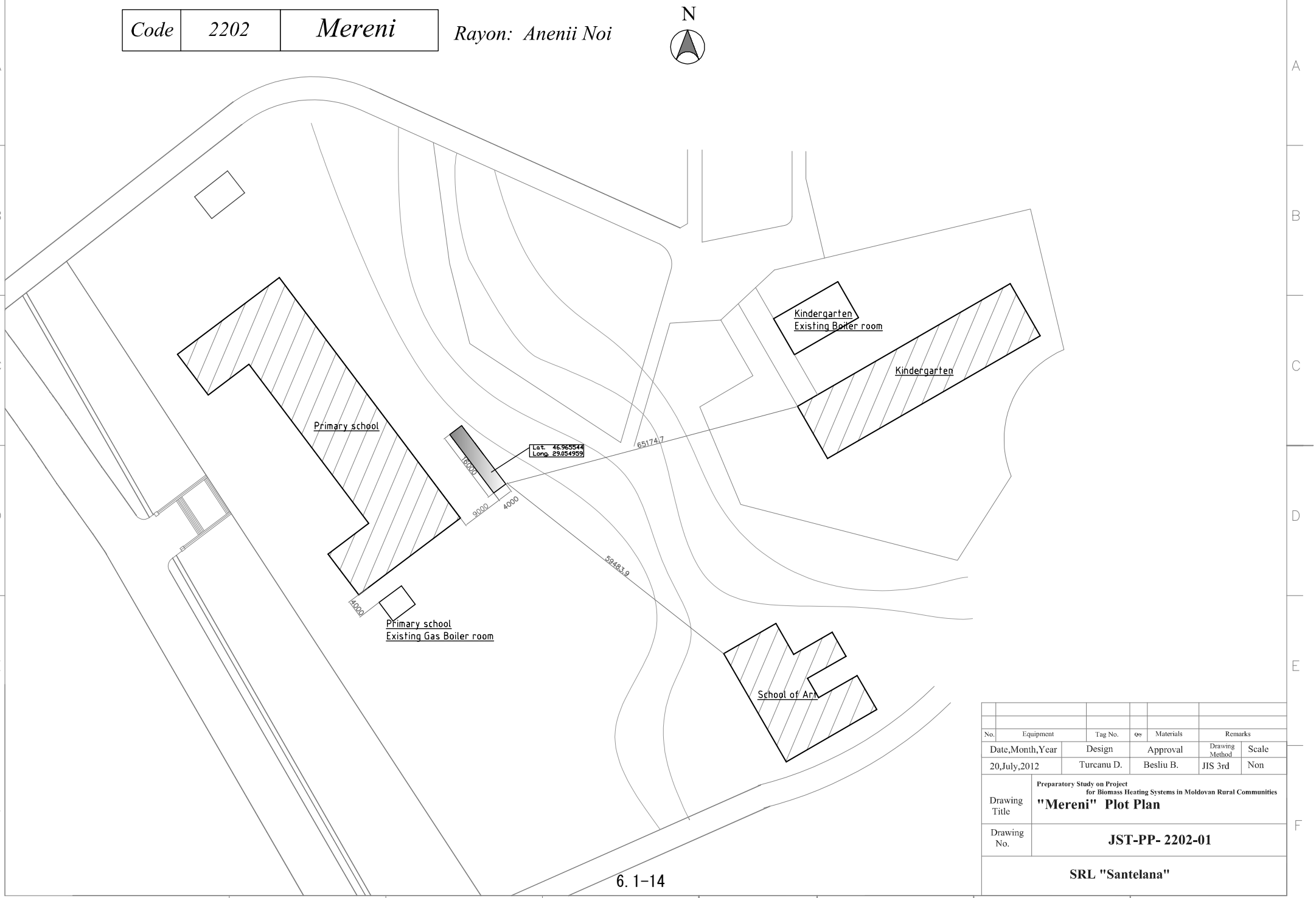
Drawing Title: **"Lapusna" Plot Plan**

Drawing No.: **JST-PP- 1802 - 01**

SRL "Santelana"

Code	2202	Mereni

Rayon: Anenii Noi



No.	Equipment	Tag No.	Qty	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method: JIS 3rd; Scale: Non
20,July,2012		Turcanu D.		Besliu B.	

Preparatory Study on Project
for Biomass Heating Systems in Moldovan Rural Communities

Drawing Title: **"Mereni" Plot Plan**

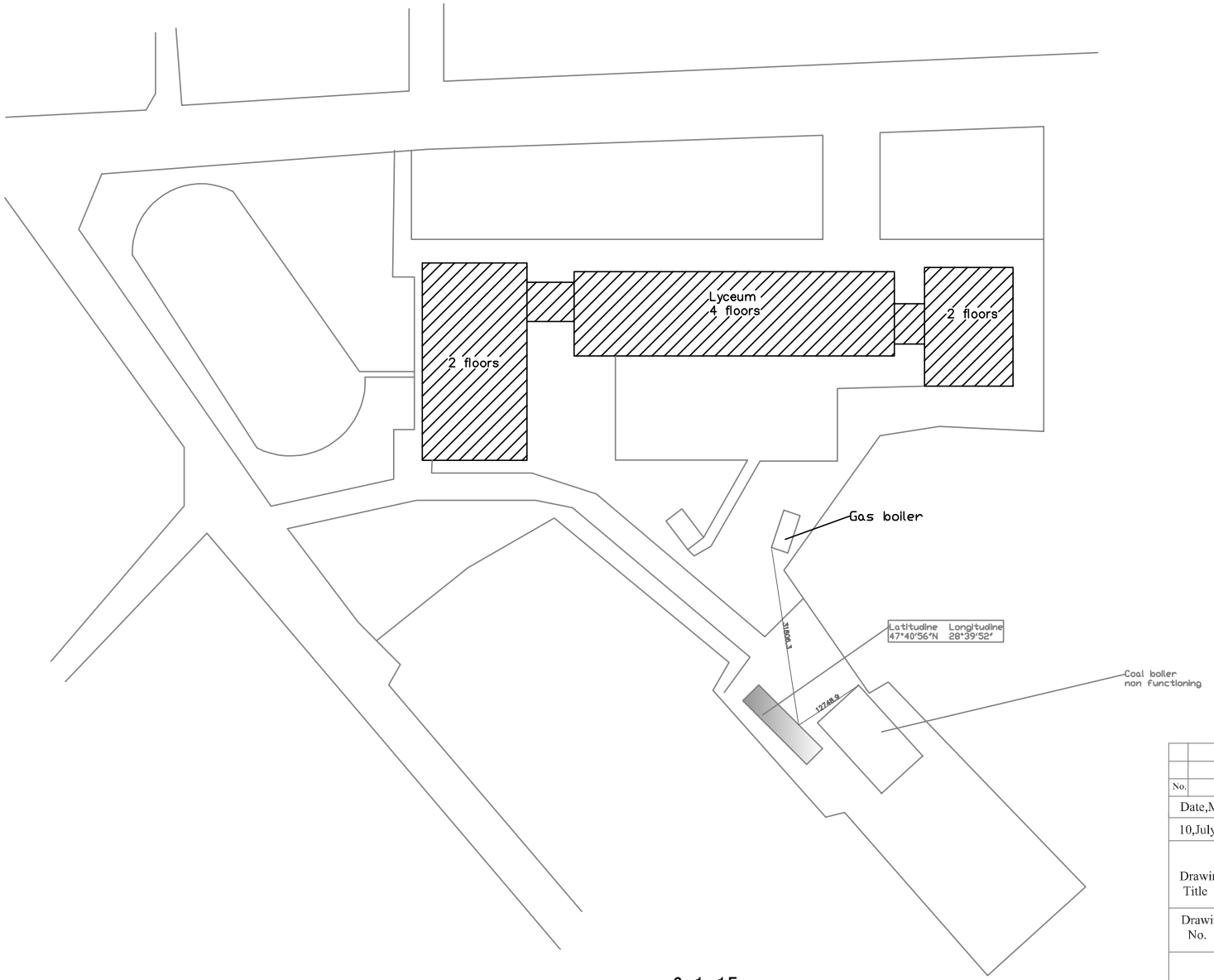
Drawing No.: **JST-PP- 2202-01**

SRL "Santelana"

6. 1-14

Code	3201	Ignatei

Rayon: Rezina



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method: JIS 3rd; Scale: Non
10,July,2012		Cazacu V		Besliu B	

Preparatory Study on Project
for Biomass Heating Systems in Moldovan Rural Communities

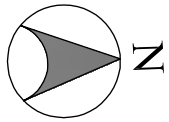
Drawing Title: **"Ignatei " Plot Plan**
(In case of Complex Building on inclined ground)

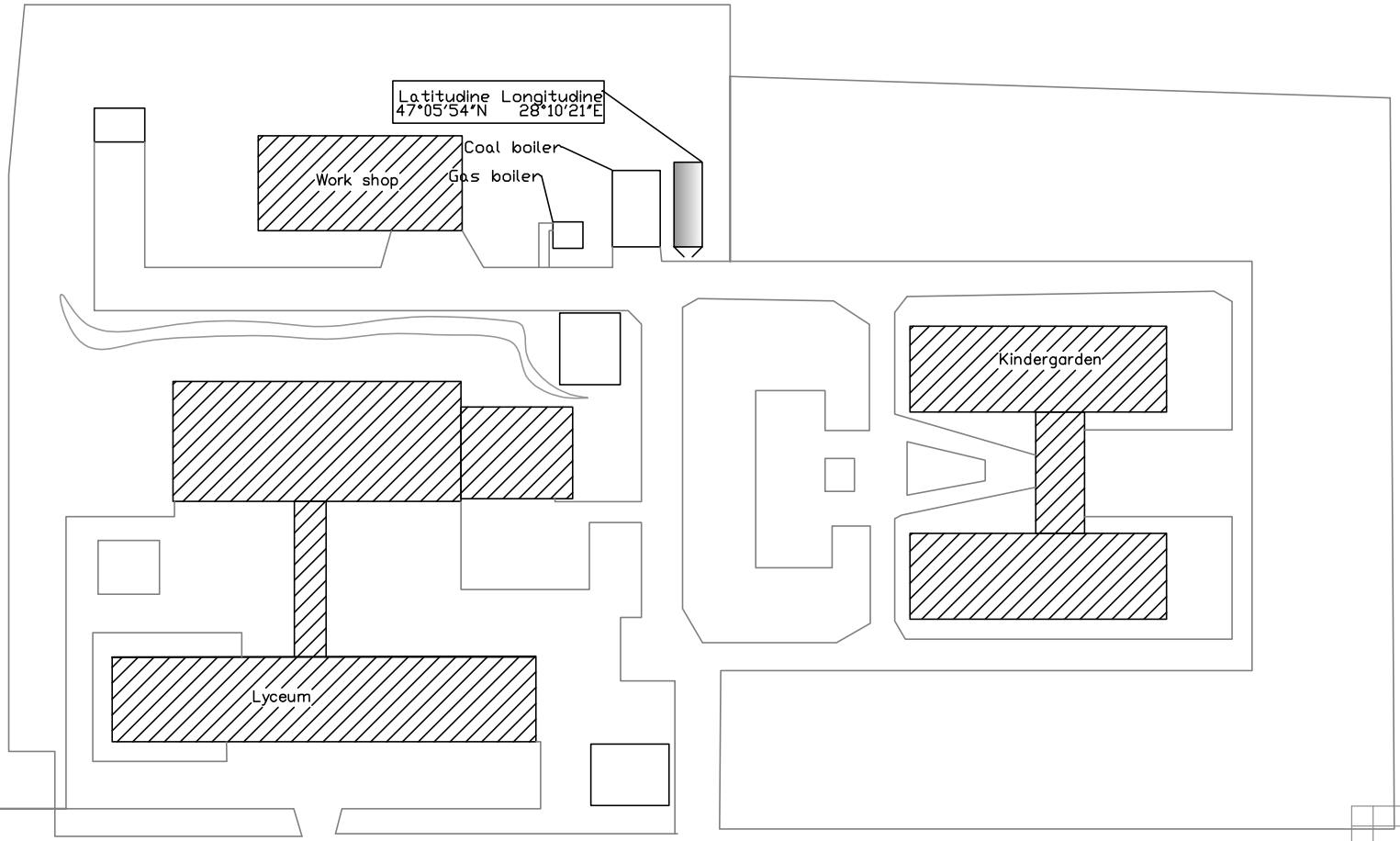
Drawing No.: **JST-PP- 3201 - 01**

SRL "Santelana"

Code	7203	Varzaresti

Rayon: Nisporeni





No.	Equipment	Tag No.	Quantity	Materials	Remarks

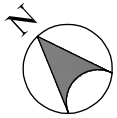
Date,Month,Year	Design	Approval	Drawing Method	Scale
31,July,2012	Cazacu V	Besliu B	JIS 3rd	Non

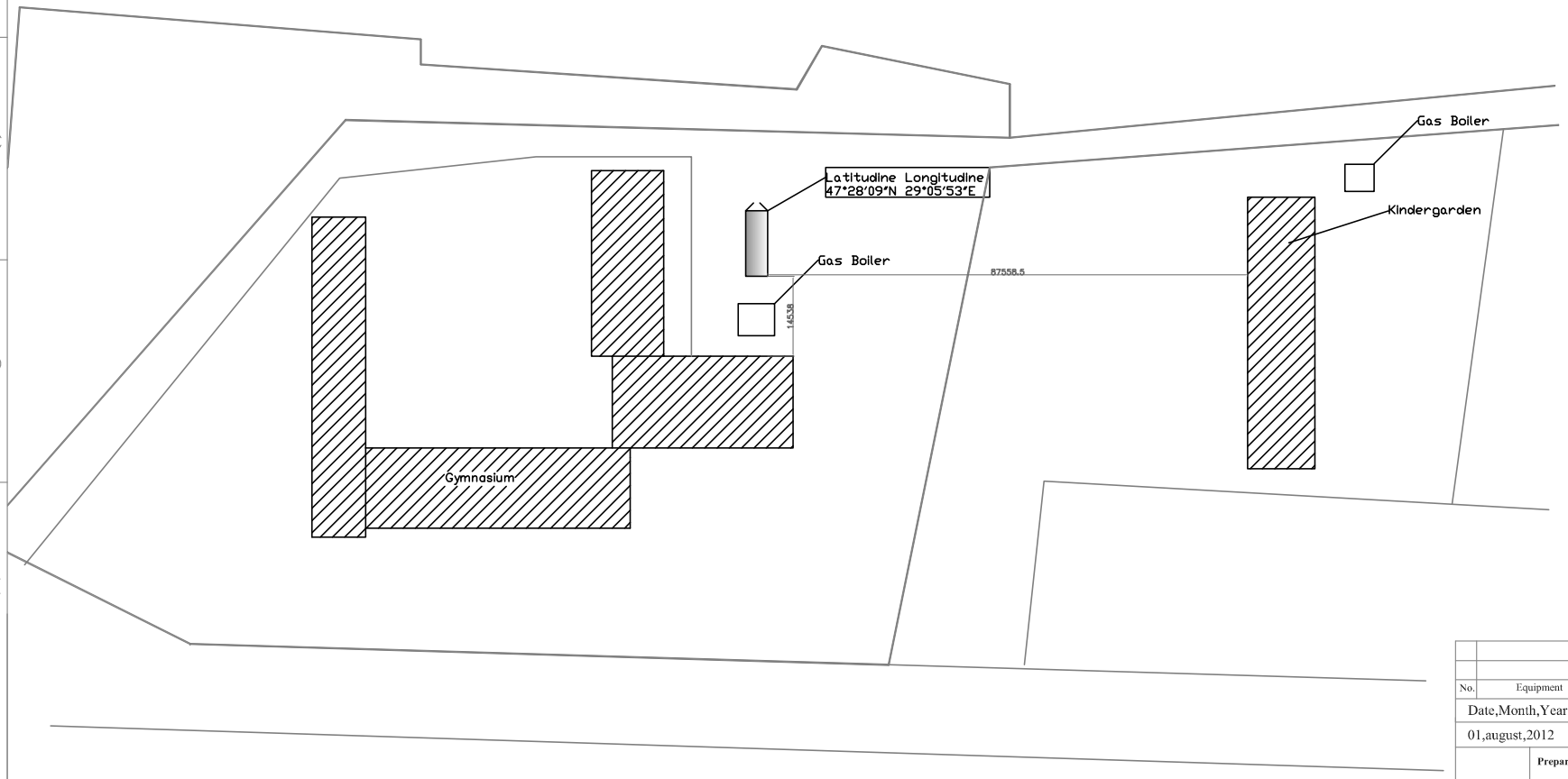
Drawing Title	Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities **"Varzaresti " Plot Plan** (In case of Complex Building on inclined ground)
Drawing No.	**JST-PP- 7203 - 01**

SRL "Santelana"

Code	1706	Jora de Mijloc

Rayon: Orhei





No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method: JIS 3rd / Scale: Non
01,august,2012		Cazacu V		Besliu B	

Drawing Title: Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities

"Jora de Mijloc " Plot Plan

(In case of Complex Building on inclined ground)

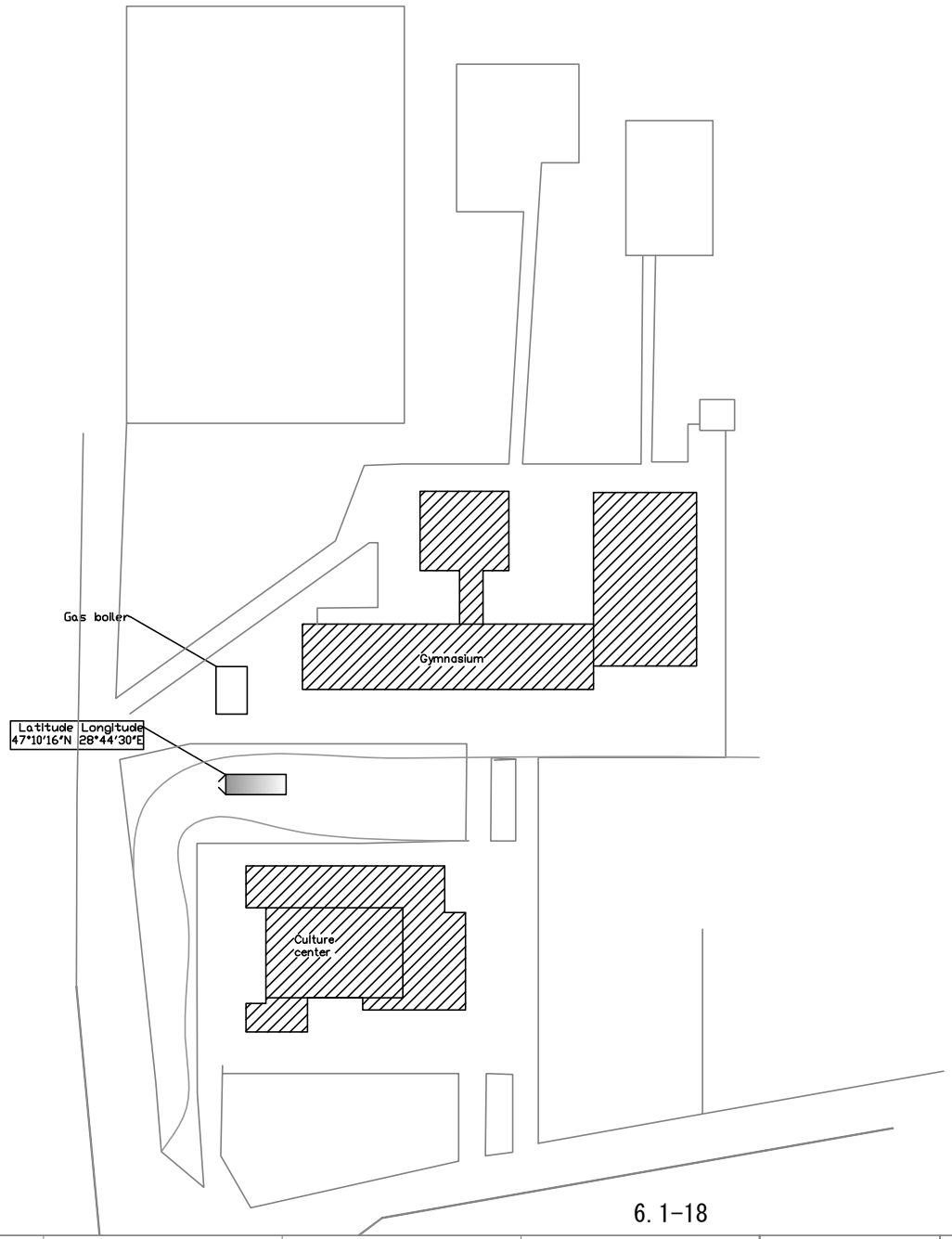
Drawing No.: **JST-PP- 1706 - 01**

SRL "Santelana"

6. 1-17

Code	7702	Micauti

Rayon: Straseni



6. 1-18

No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method / Scale
01,august,2012		Cazacu V		Besliu B	JIS 3rd / Non

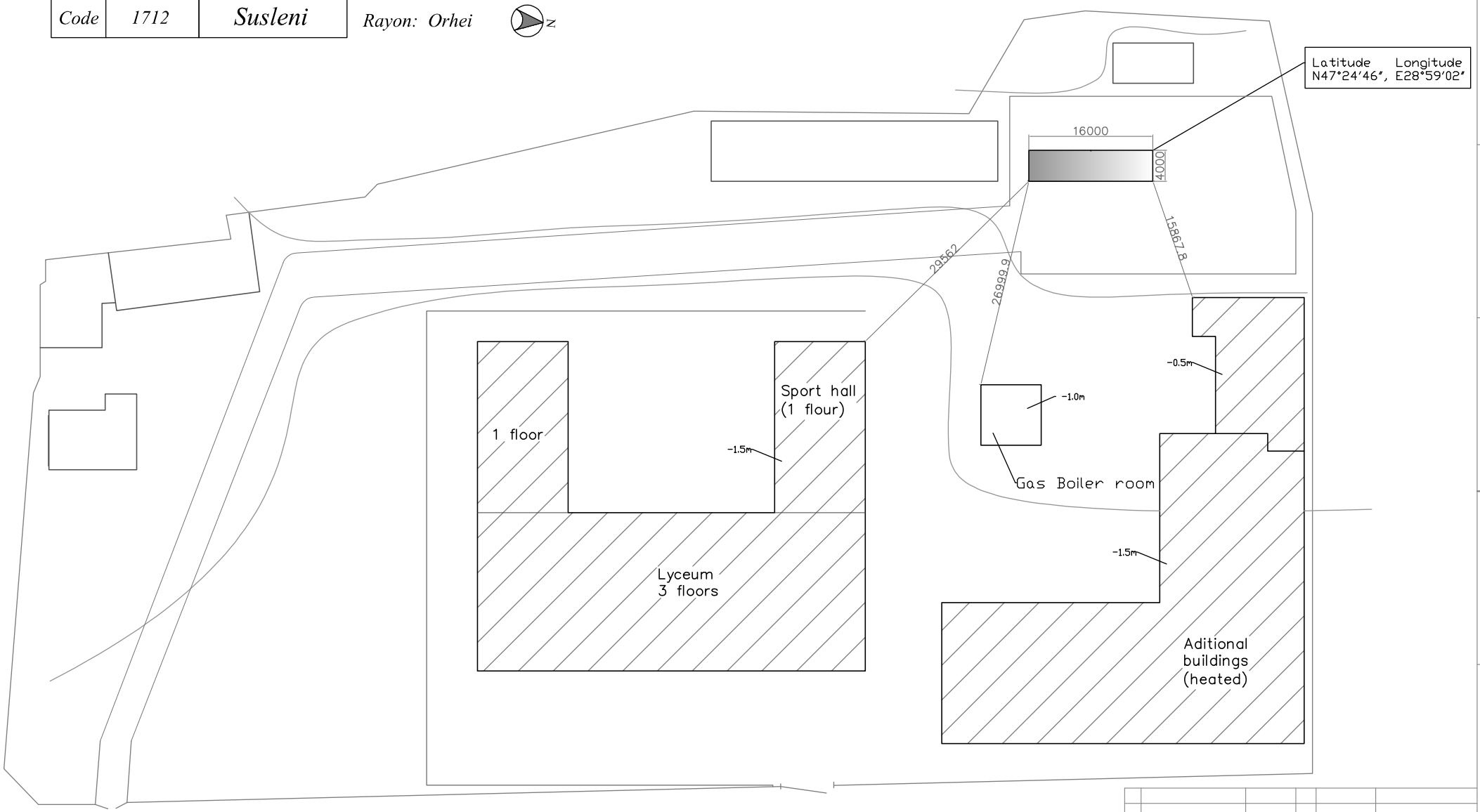
Drawing Title: Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities
"Micauti " Plot Plan
(In case of Complex Building on inclined ground)

Drawing No.: **JST-PP- 7702 - 01**

SRL "Santelana"

Code	1712	Susleni

Rayon: Orhei



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method / Scale
27,june,2012		Turcanu D.		Besliu B.	JIS 3rd / Non

Preparatory Study on Project
for Biomass Heating Systems in Moldovan Rural Communities

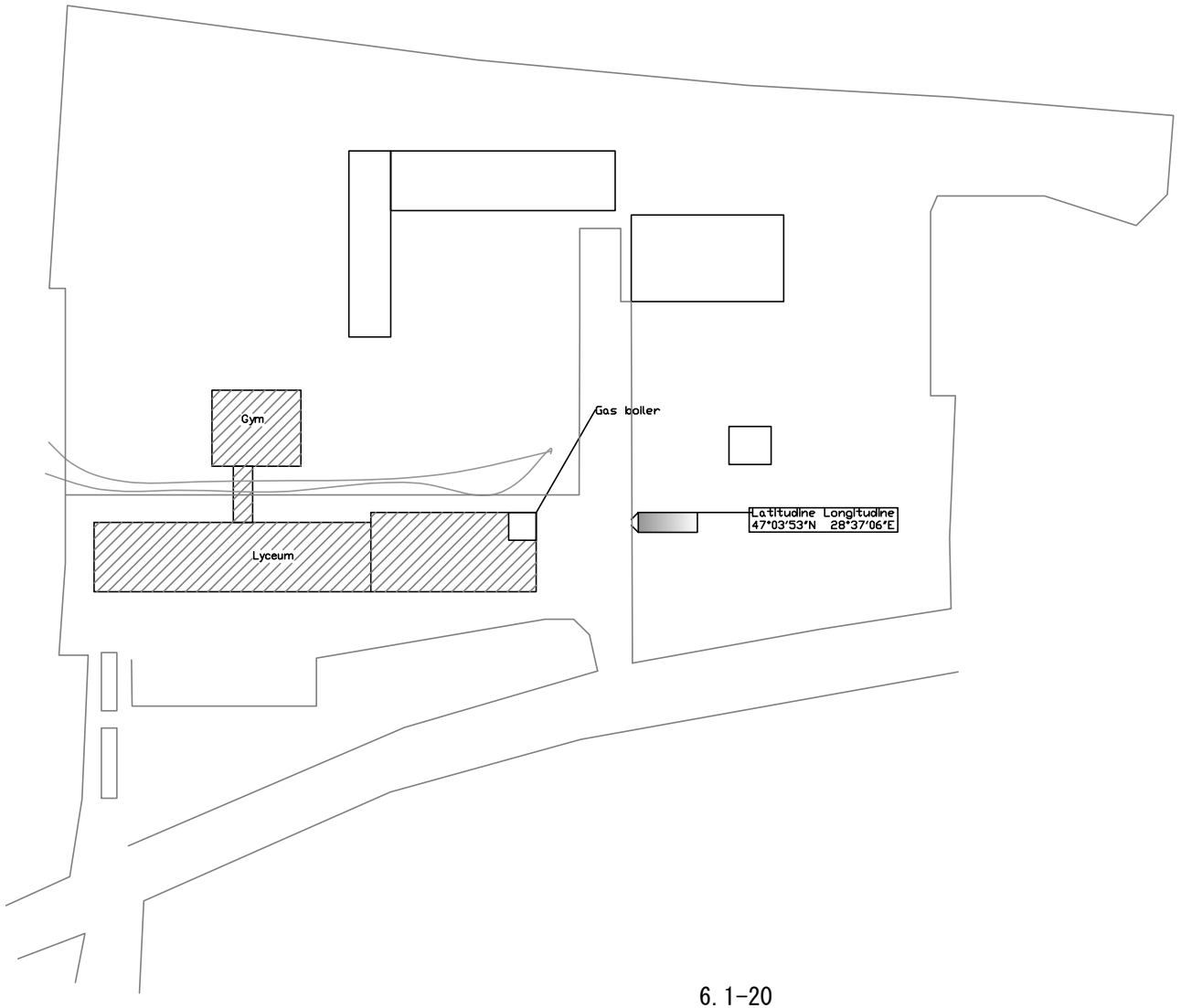
Drawing Title: **"Susleni " Plot Plan**
(In case of Complex Building on inclined ground)

Drawing No.: **JST-PP- 1712 - 01**

SRL "Santelana"

Code	7703	Scoreni

Rayon: Straseni



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method / Scale
13,august,2012		Cazacu V		Besliu B	JIS 3rd / Non

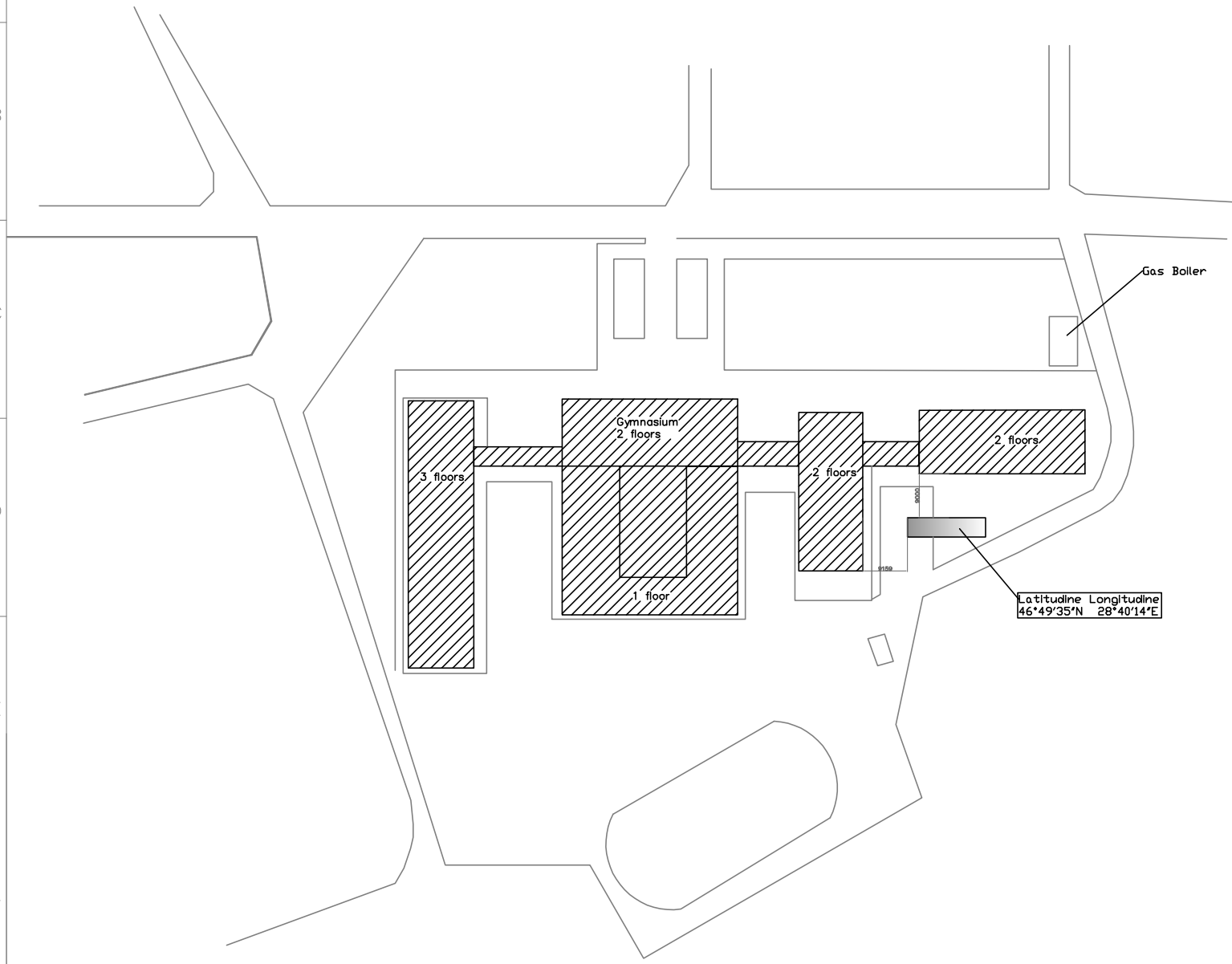
Drawing Title: Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities
"Scoreni " Plot Plan
(In case of Complex Building on inclined ground)

Drawing No.: **JST-PP-7703 - 01**

SRL "Santelana"

Code	1803	Buteni

Rayon: Hincesti



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method / Scale
28,june,2012		Cazacu V		Besliu B	JIS 3rd / Non

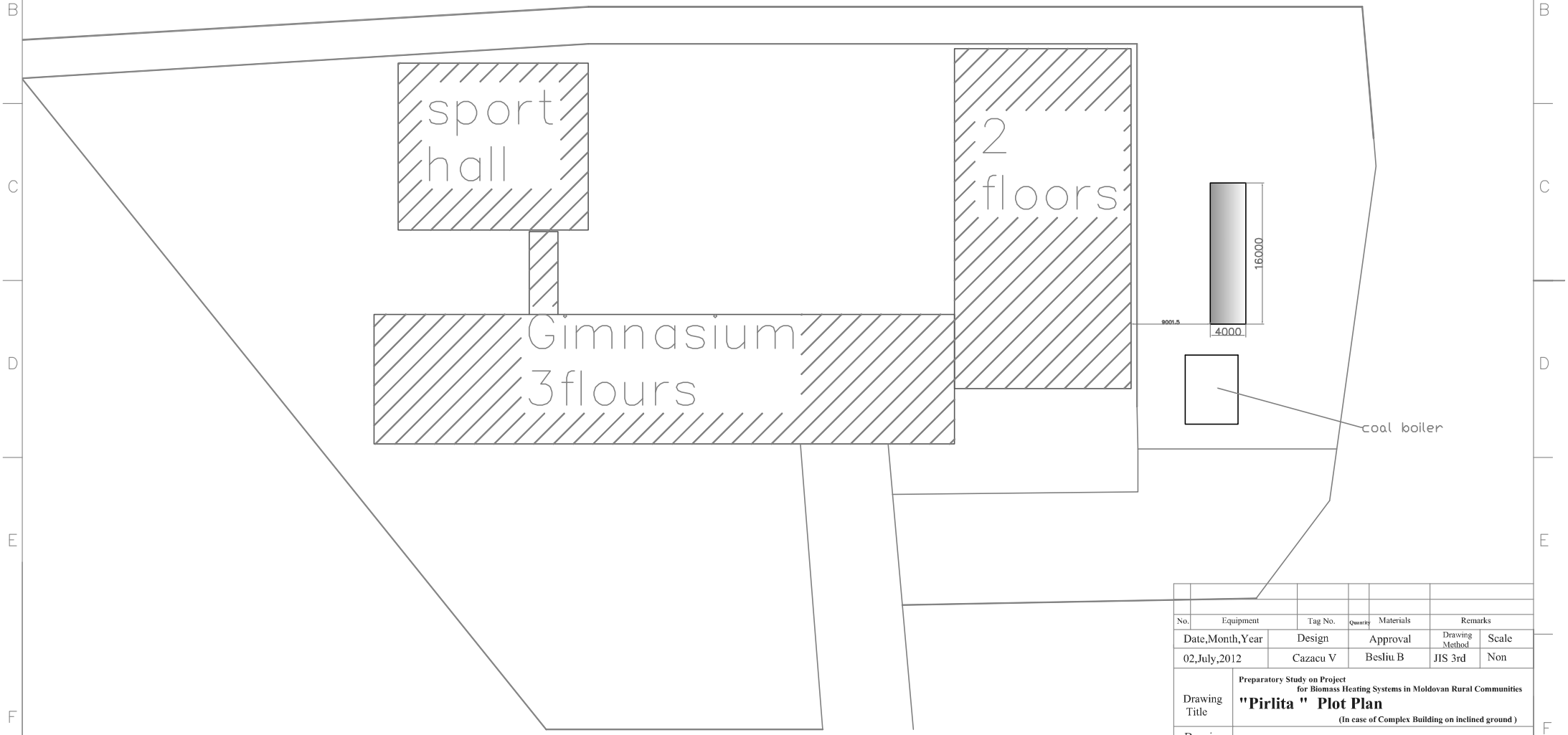
Drawing Title: Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities
"Buteni " Plot Plan
(In case of Complex Building on inclined ground)

Drawing No.: **JST-PP- 1803 - 01**

SRL "Santelana"

Code	2104	Pirlita

Rayon: Ungheni



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method: JIS 3rd / Scale: Non
02,July,2012		Cazacu V		Besliu B	

Preparatory Study on Project
for Biomass Heating Systems in Moldovan Rural Communities

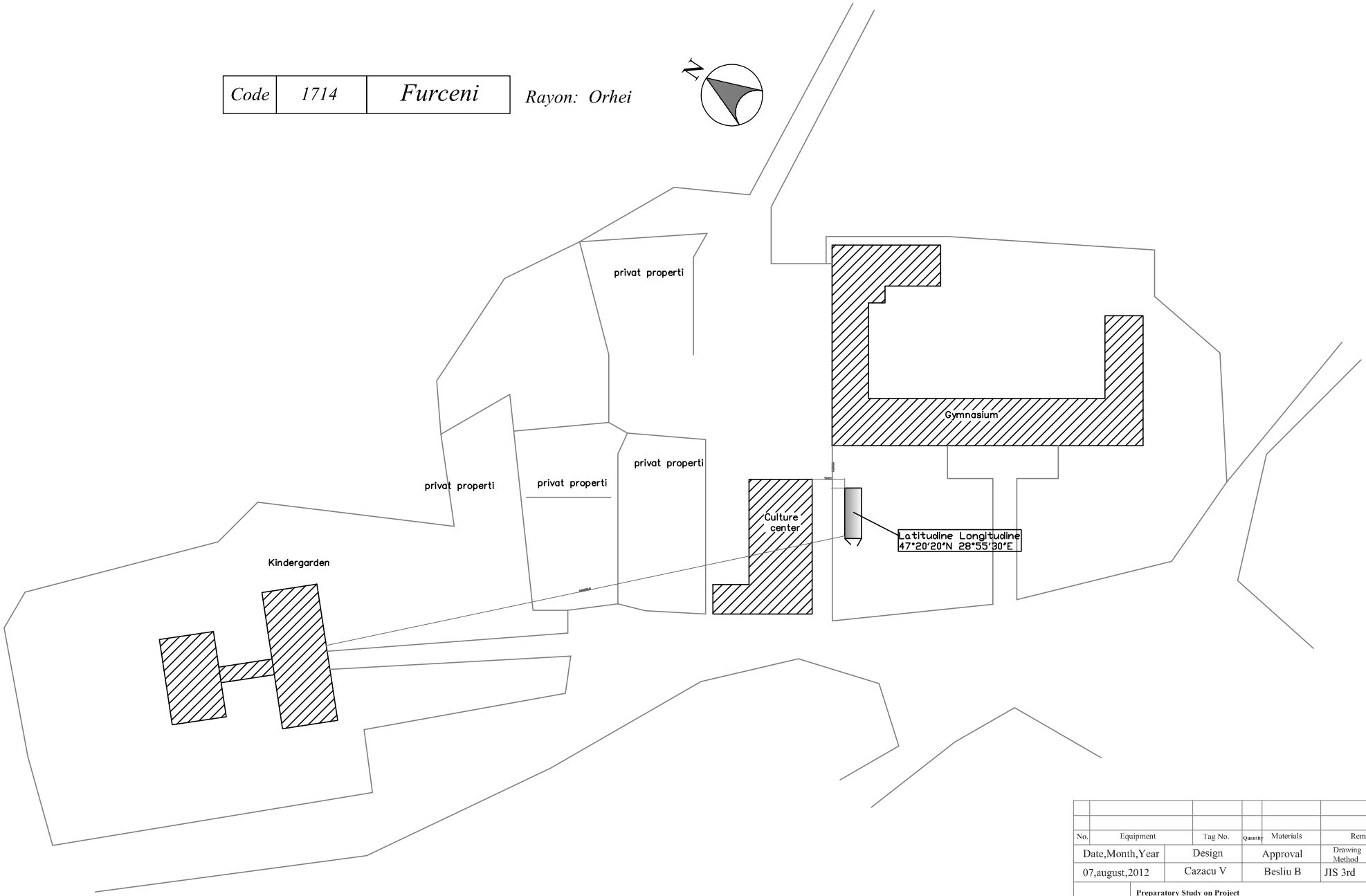
Drawing Title: **"Pirlita " Plot Plan**
(In case of Complex Building on inclined ground)

Drawing No.: **JST-PP- 2104 - 01**

SRL "Santelana"

Code	1714	Furceni

Rayon: Orhei



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method / Scale
07,august,2012		Cazacu V		Besliu B	JIS 3rd / Non

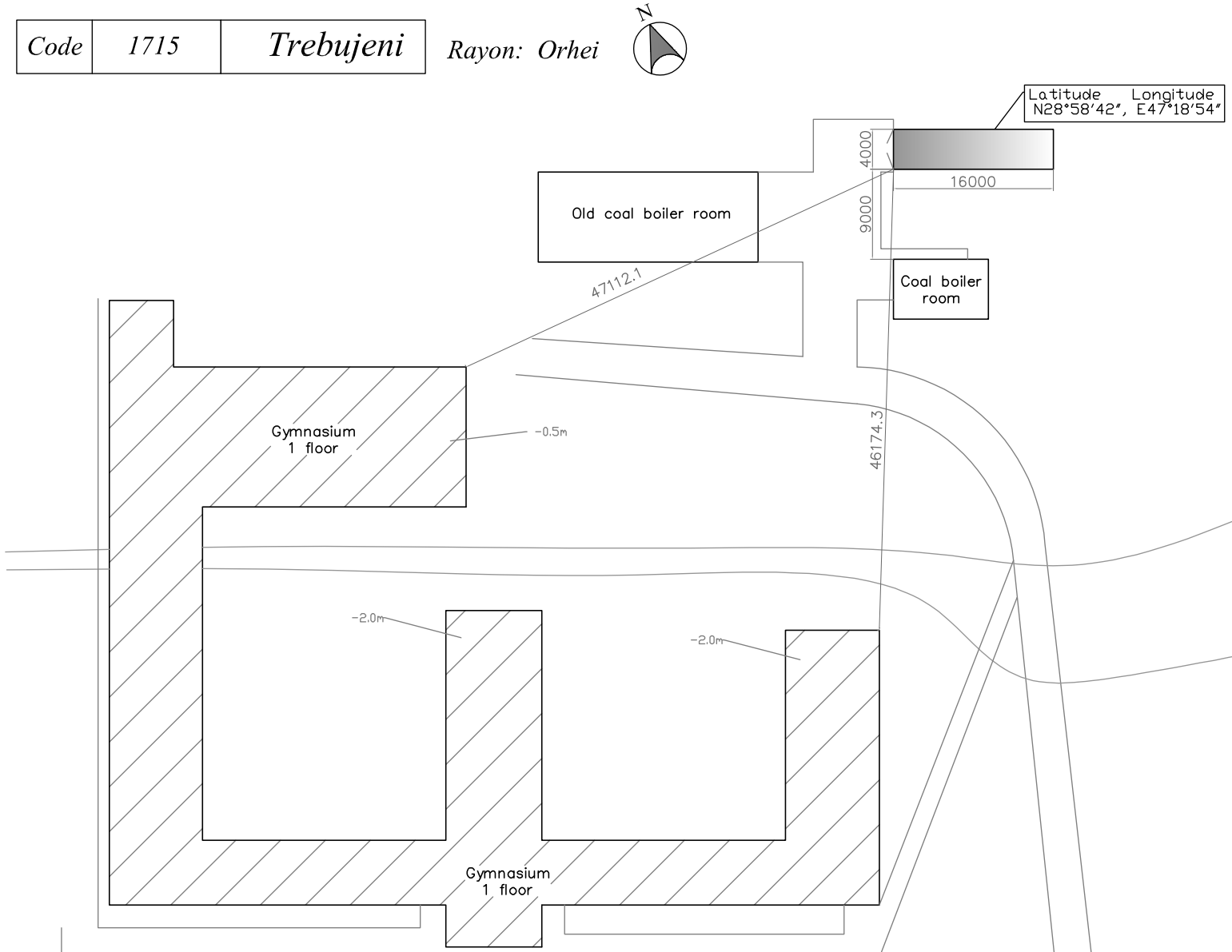
Drawing Title: Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities
"Furceni" Plot Plan
(In case of Complex Building on inclined ground)

Drawing No.: **JST-PP- 1714 - 01**

SRL "Santelana"

Code	1715	Trebujeni

Rayon: Orhei



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method: JIS 3rd; Scale: Non
2,july,2012		Turcanu D.		Besliu B.	

Preparatory Study on Project
for Biomass Heating Systems in Moldovan Rural Communities

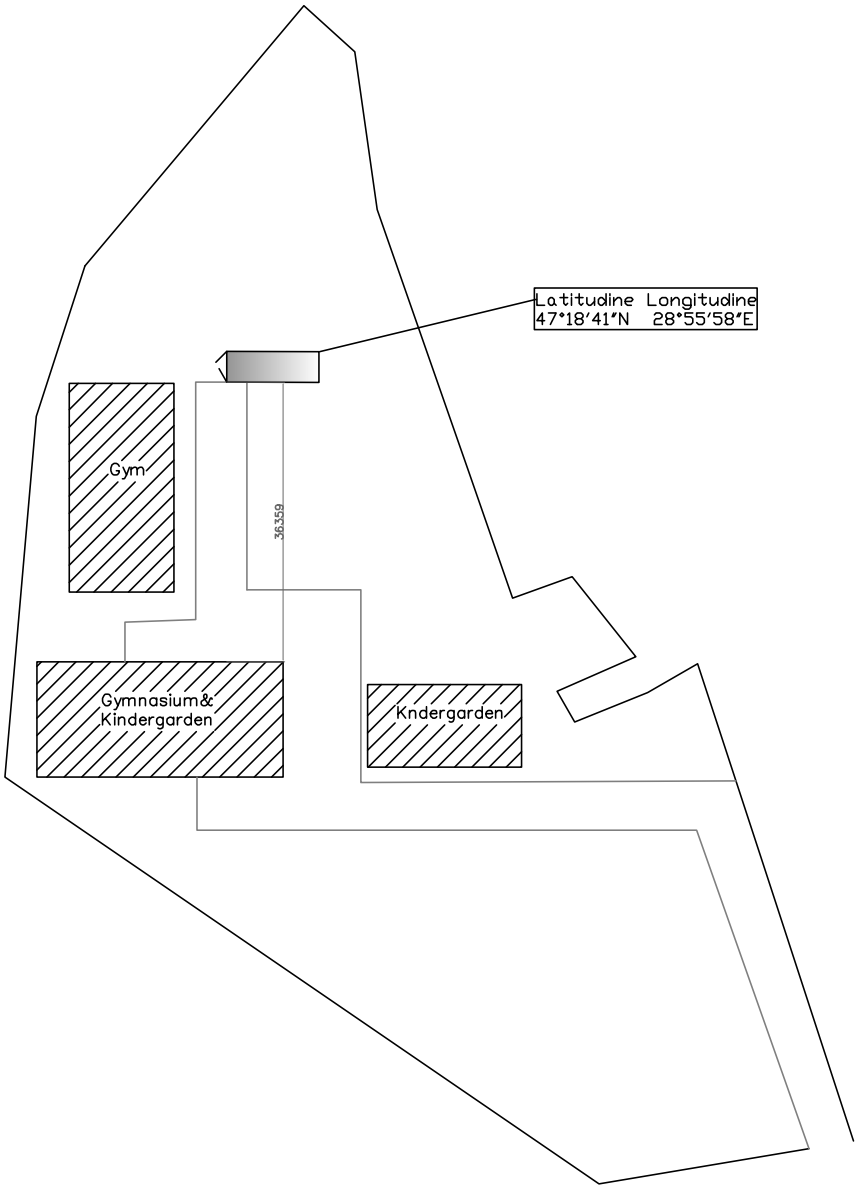
Drawing Title: **"Trebujeni " Plot Plan**

Drawing No.: **JST-PP- 1715 - 01**

SRL "Santelana"

Code	1702	Branesti

Rayon: Orhei



6. 1-25

No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method: Scale
07,august,2012		Cazacu V		Besliu B	JIS 3rd: Non

Drawing Title: Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities
"Branesti " Plot Plan
(In case of Complex Building on inclined ground)

Drawing No.: **JST-PP- 1702 - 01**

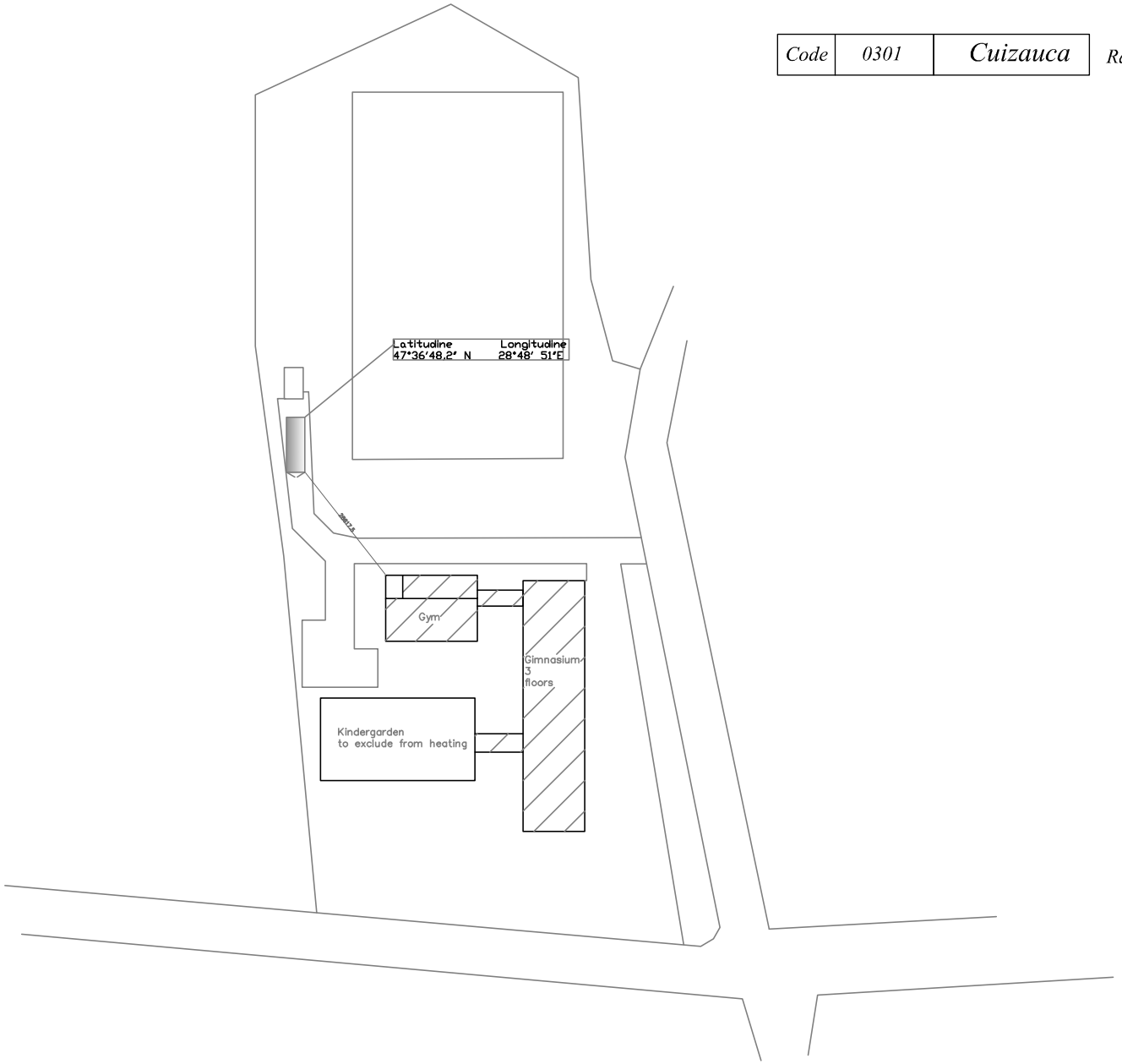
SRL "Santelana"

Code	8002	Cricova

Rayon: mun. Chisinau

No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method: Scale
23, aug, 2012		Turcanu D.		Besliu B.	JIS 3rd: Non
Drawing Title	Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities "Cricova" Plot Plan				
Drawing No.	JST-PP- 8002 - 01				
SRL "Santelana"					

Code	0301	Cuizauca	Rayon: Rezina



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method: JIS 3rd / Scale: Non
14,august,2012		Cazacu V		Besliu B	

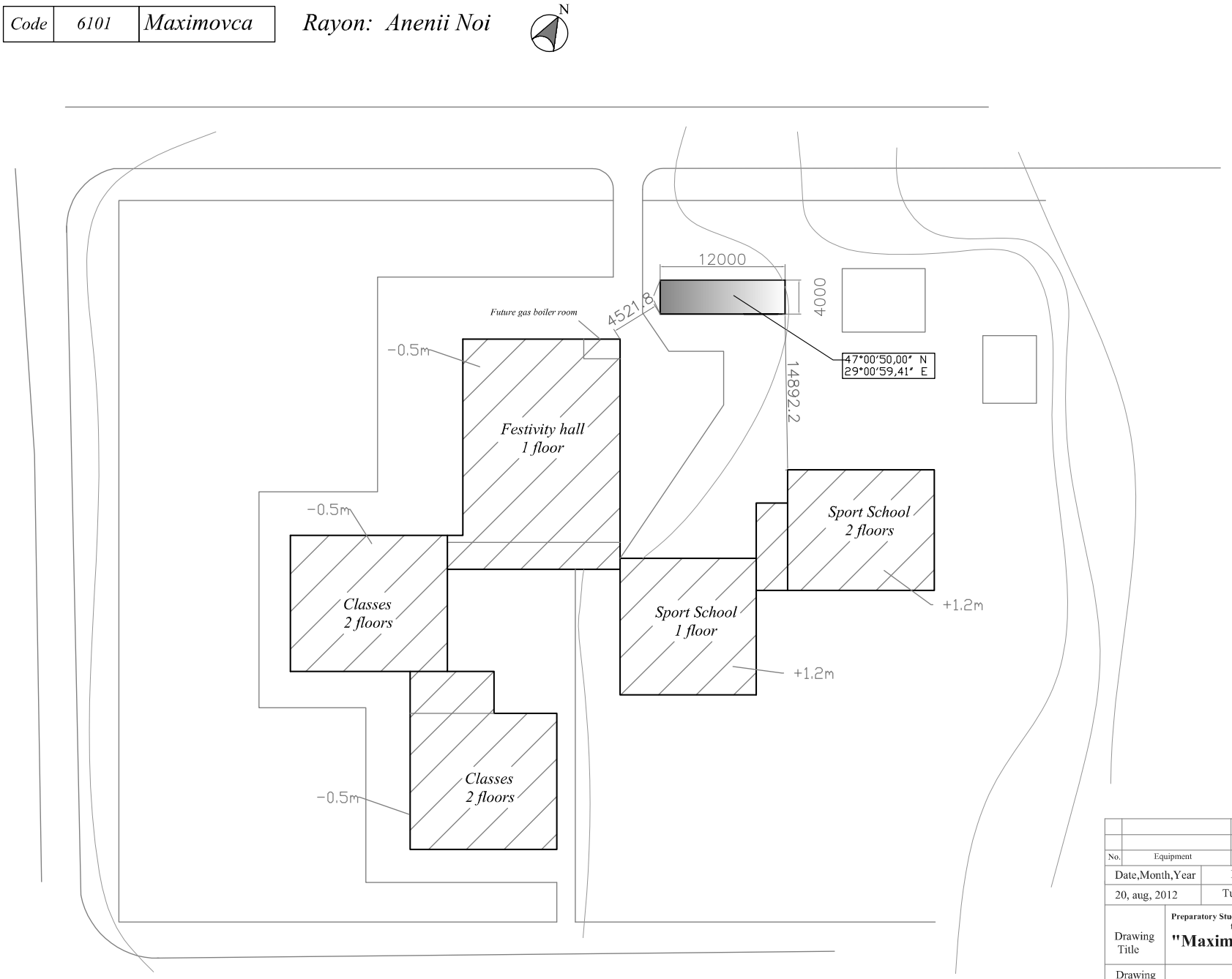
Drawing Title: Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities
"Cuizauca " Plot Plan
(In case of Complex Building on inclined ground)

Drawing No.: **JST-PP- 0301 - 01**

SRL "Santelana"

Code	6101	Maximovca

Rayon: Anenii Noi



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method / Scale
20, aug, 2012		Turcanu D.		Besliu B.	JIS 3rd / Non

Preparatory Study on Project
for Biomass Heating Systems in Moldovan Rural Communities

Drawing Title: **"Maximovca" Plot Plan**

Drawing No.: **JST-PP- 6101 - 01**

SRL "Santelana"

Code	8004	Bubuieci

Rayon: mun. Chisinau

No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method: JIS 3rd; Scale: Non
23, aug, 2012		Turcanu D.		Besliu B.	

Preparatory Study on Project
for Biomass Heating Systems in Moldovan Rural Communities

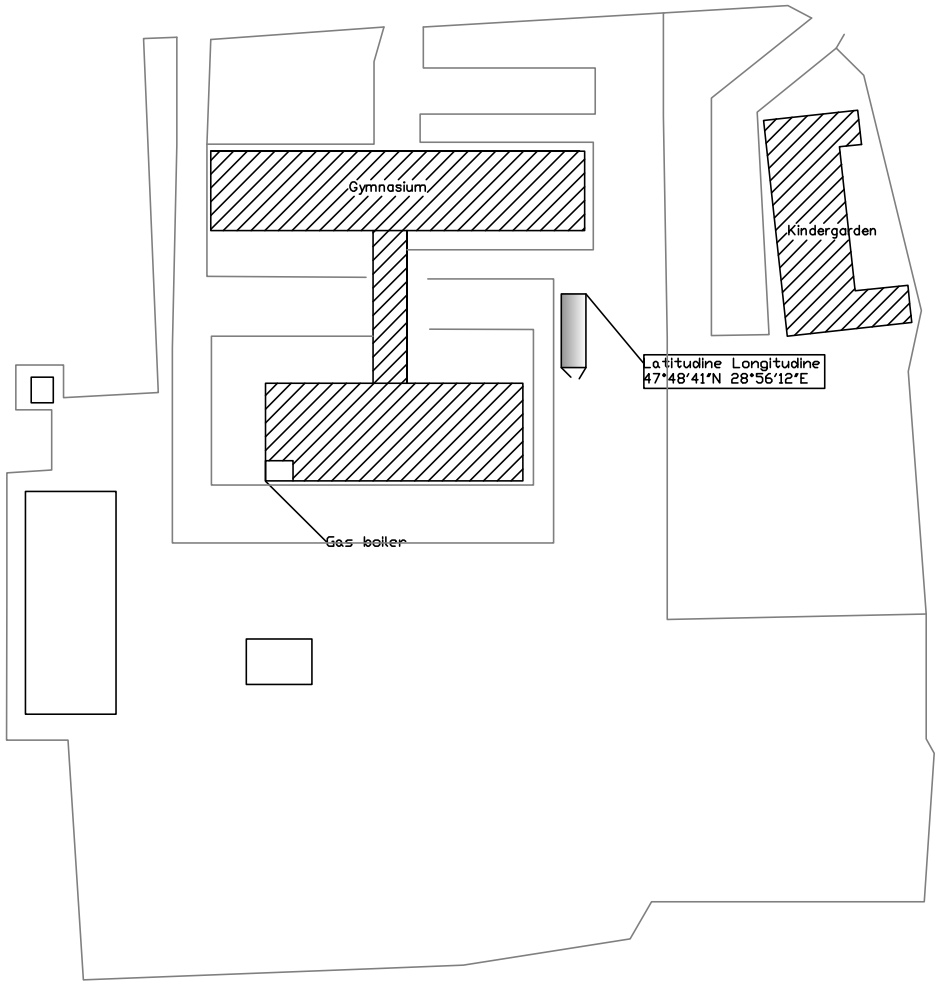
Drawing Title: **"Bubuieci" Plot Plan**

Drawing No.: **JST-PP- 8004 - 01**

SRL "Santelana"

Code	7501	Mateuti

Rayon: Rezina



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method: JIS 3rd; Scale: Non
14,august,2012		Cazacu V		Besliu B	

Drawing Title: Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities
"Mateuti " Plot Plan
(In case of Complex Building on inclined ground)

Drawing No.: **JST-PP- 7501 - 01**

SRL "Santelana"

Code	6402	Tibirica

Rayon: Calarasi

No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method: JIS 3rd; Scale: Non
23, aug, 2012		Turcanu D.		Besliu B.	

Preparatory Study on Project
for Biomass Heating Systems in Moldovan Rural Communities

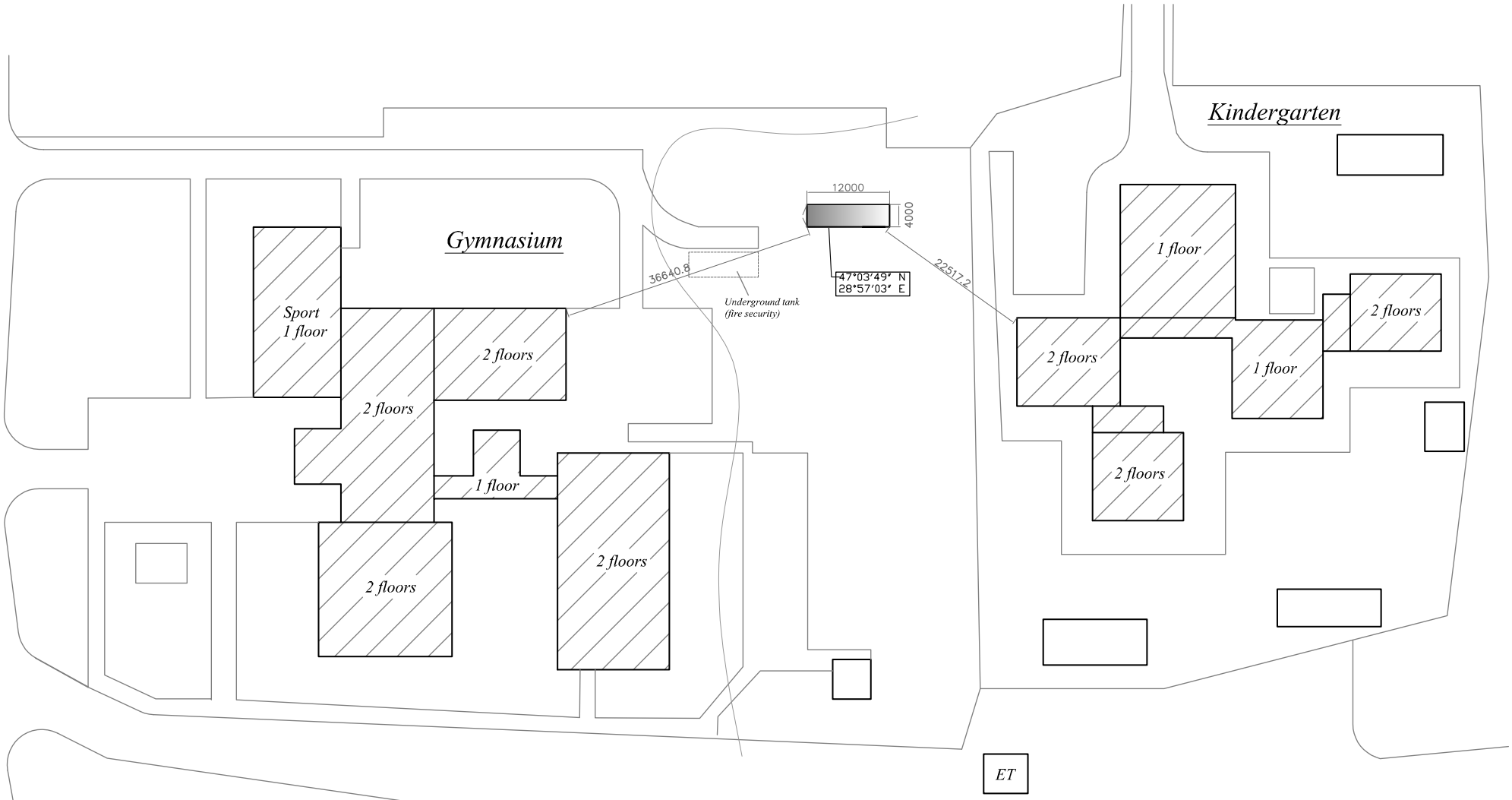
Drawing Title: **"Tibirica" Plot Plan**

Drawing No.: **JST-PP- 6402 - 01**

SRL "Santelana"

Code	8003	Tohatin

Rayon: mun. Chisinau



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method: Scale
23, aug, 2012		Turcanu D.		Besliu B.	JIS 3rd: Non

Preparatory Study on Project
for Biomass Heating Systems in Moldovan Rural Communities

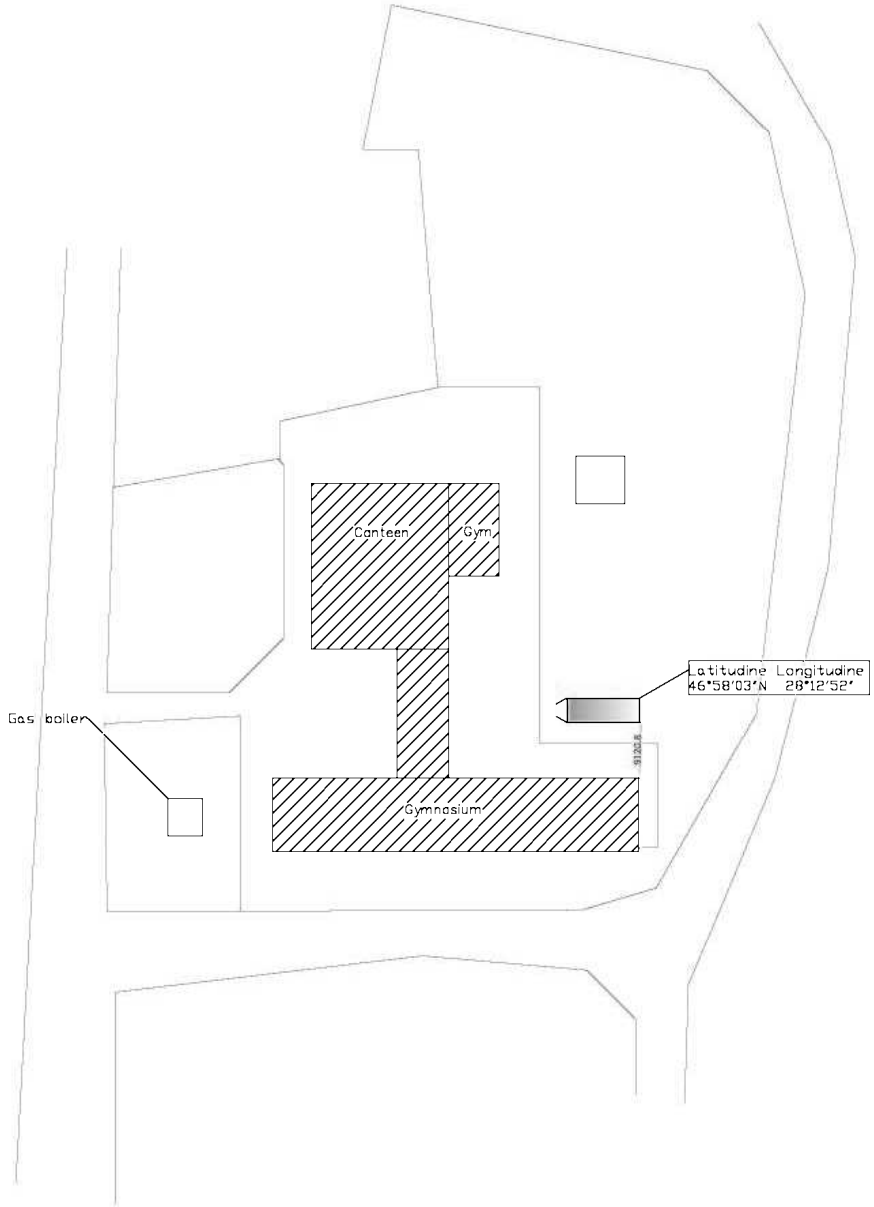
Drawing Title: **"Tohatin" Plot Plan**

Drawing No.: **JST-PP- 8003 - 01**

SRL "Santelana"

Code	7201	Siscani

Rayon: Nisporeni



No.	Equipment	Tag No.	Quantity	Materials	Remarks

Date, Month, Year	Design	Approval	Drawing Method	Scale
10.august.2012	Caracu V	Beshu B	JIS 3rd	Non

Preparatory Study on Project
for Biomass Heating Systems in Moldovan Rural Communities

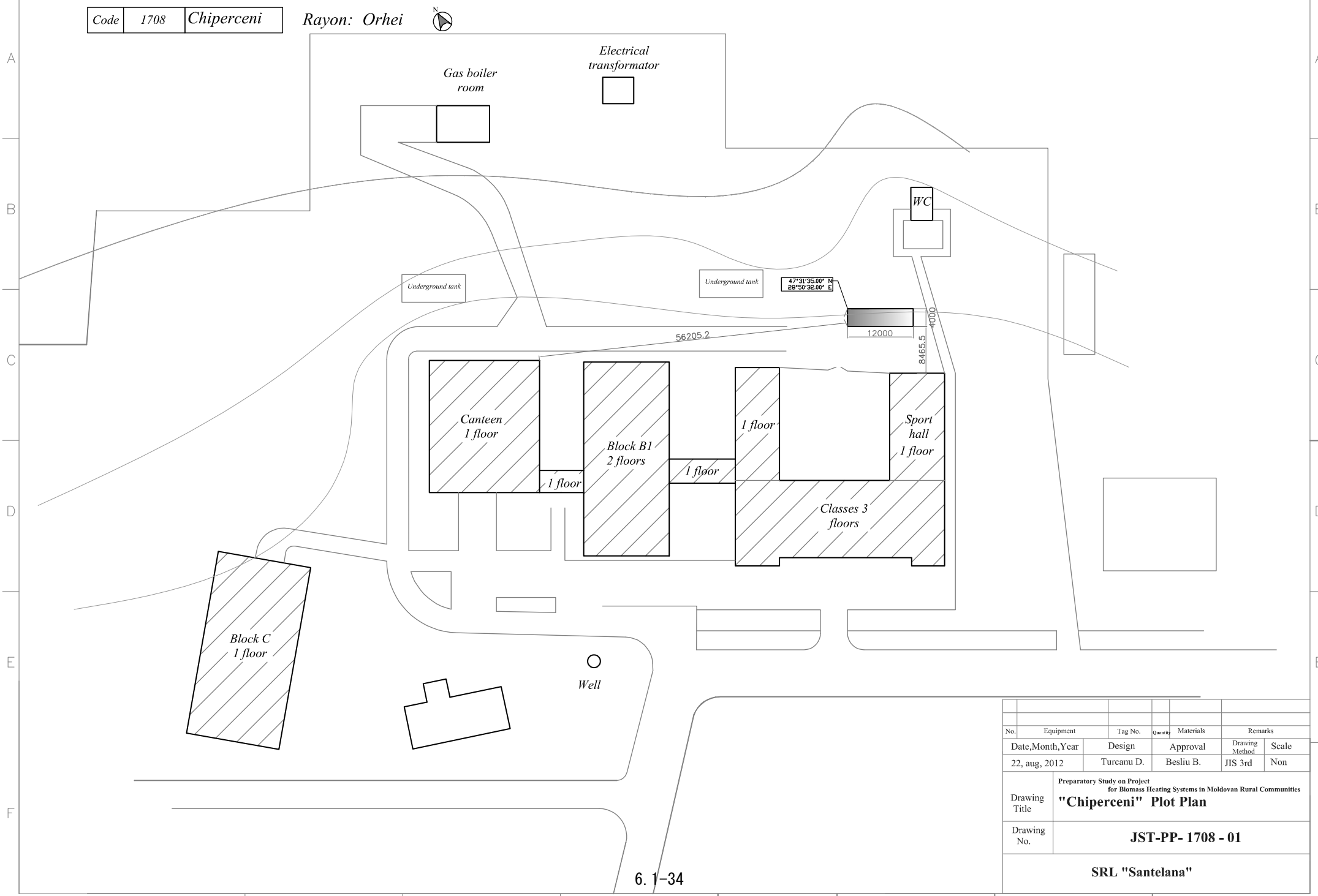
Drawing Title: **"Siscani " Plot Plan**
(In case of Complex Building on inclined ground)

Drawing No.: **JST-PP- 8101 - 01**

SRL "Santelana"

Code	1708	Chiperceni

Rayon: Orhei



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method: Scale
22, aug, 2012		Turcanu D.		Besliu B.	JIS 3rd: Non

Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities

Drawing Title: **"Chiperceni" Plot Plan**

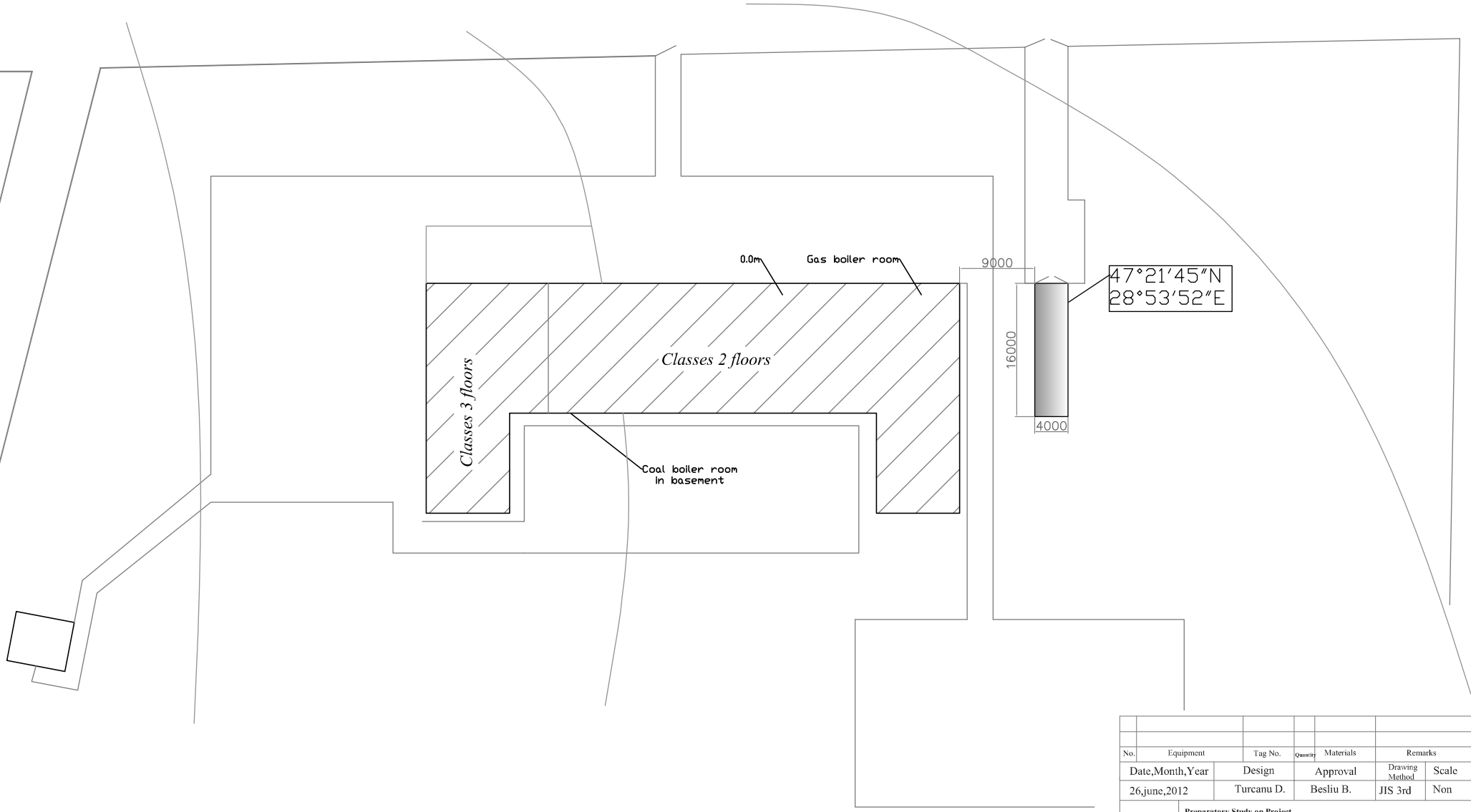
Drawing No.: **JST-PP- 1708 - 01**

SRL "Santelana"

6. 1-34

Code	1711	Piatra

Rayon: Orhei



No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date,Month,Year		Design		Approval	Drawing Method / Scale
26,june,2012		Turcanu D.		Besliu B.	JIS 3rd / Non

Drawing Title: Preparatory Study on Project for Biomass Heating Systems in Moldovan Rural Communities
"Piatra " Plot Plan
(In case of Complex Building on inclined ground)

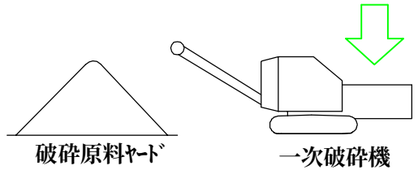
Drawing No.: **JST-PP- 1711 - 01**

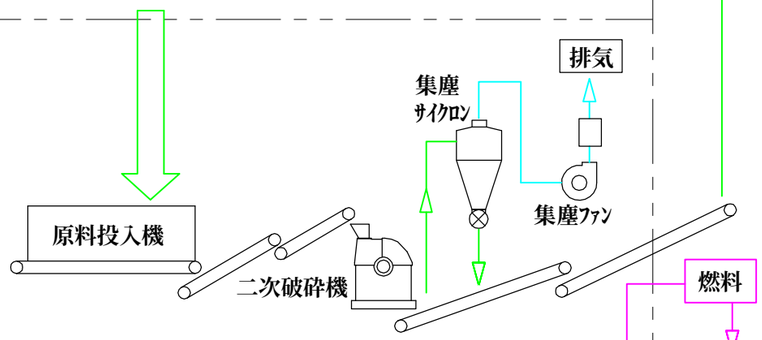
SRL "Santelana"

6.2 Provisional Sample Drawings of the Pellet Production Plant (in Japanese)

○一次破砕

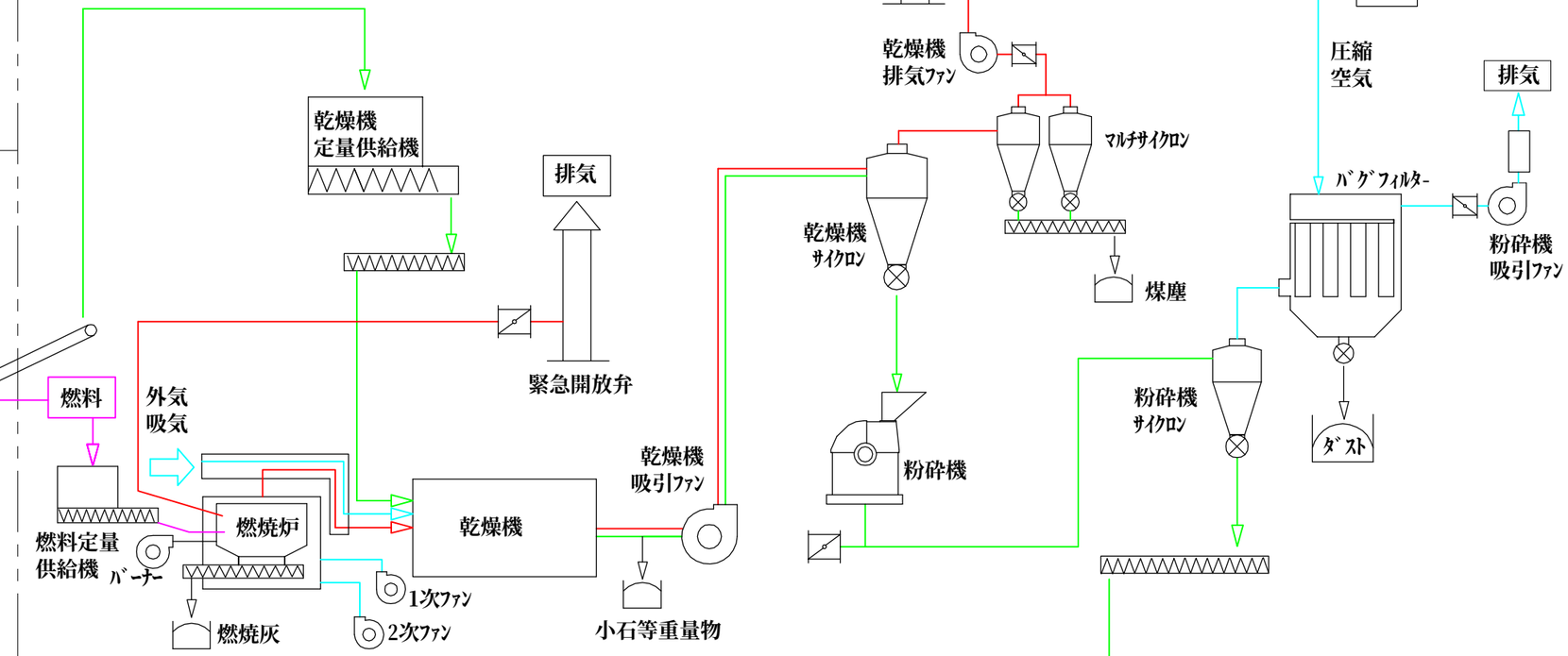
原料：農業畑地作業廃棄物
　　麦わら
　　植物残渣（ひまわりの茎、とうもろこしの茎）
　　果樹園、ぶどう園の剪定枝
※含水率　40～50%、金属類の混入無し
※原料詳細については要打合せ



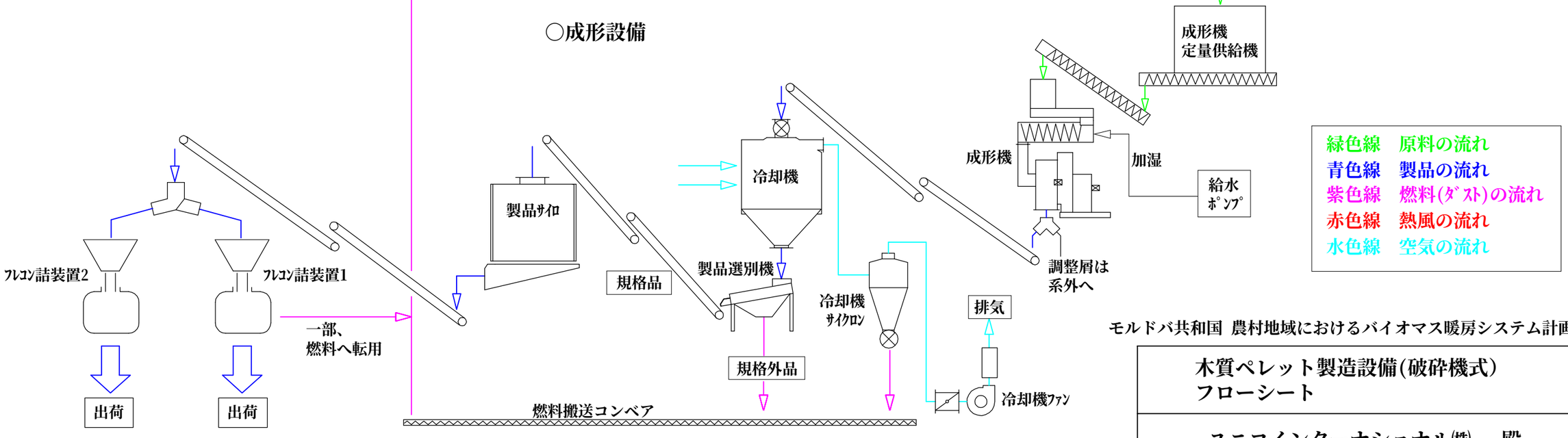


○二次破砕設備

○乾燥設備



○成形設備

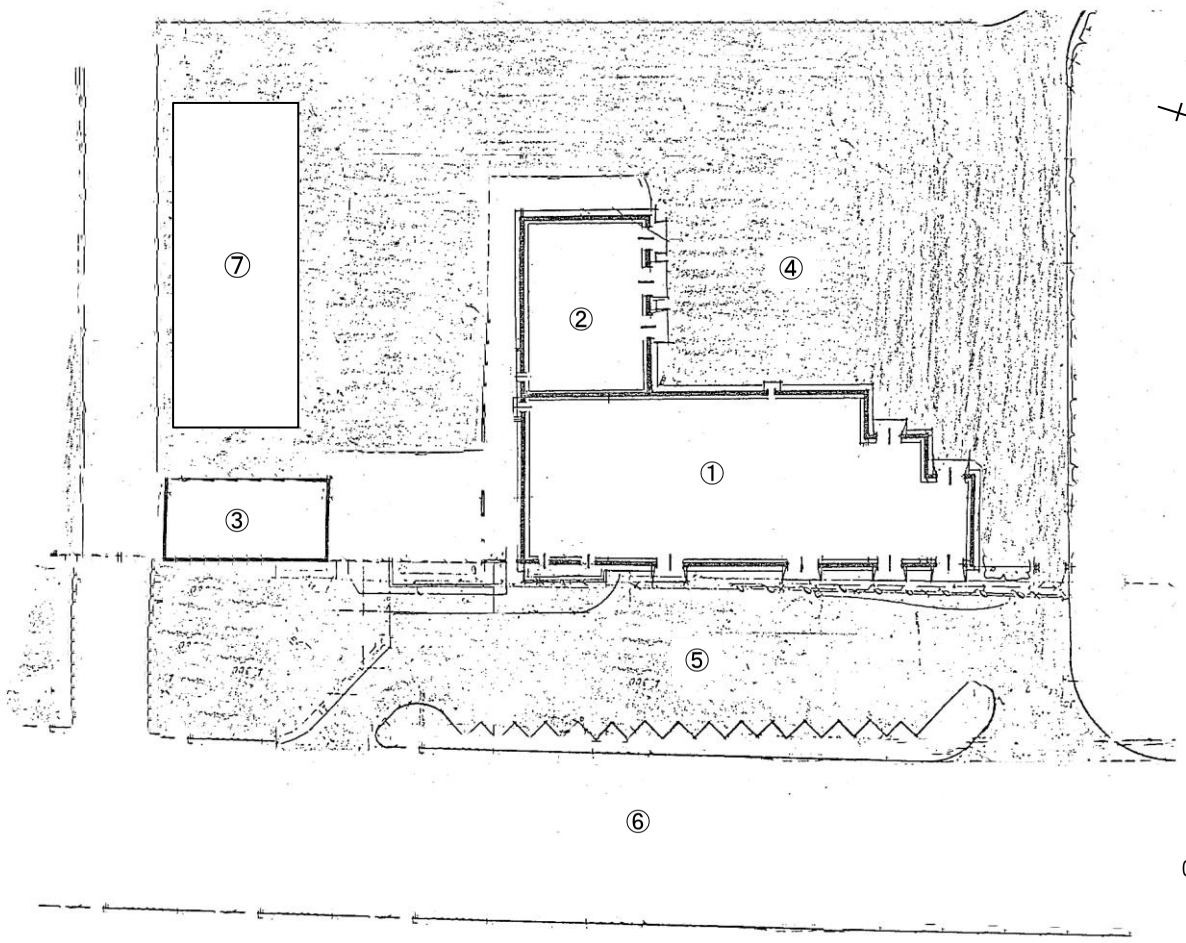


緑色線　原料の流れ
青色線　製品の流れ
紫色線　燃料(ﾀﾞｽﾄ)の流れ
赤色線　熱風の流れ
水色線　空気の流れ

モルドバ共和国　農村地域におけるバイオマス暖房システム計画

木質ペレット製造設備(破砕機式)
フローシート

ユニコインターナショナル㈱　殿



①	National Training Center
②	Workshop
③	2KR-PIU Office Building
④	Stock yard
⑤	Parking lots
⑥	Road
⑦	Pellet production plant site

6.3 Work Flow of the Housing and Boiler Fabrication

Time Axis →

Parts Axis ↓

Parts Axis	Purchase Inspection of module parts	Stock of BHS module materials	Cutting or bending shop	Semi-assemble shop (by welding)	Welding check by watch	Cleaning	Painting shop	Drying	Mechanical-assemble shop	Final inspection	Performance check	Shipping from factory	Final installation at each site
Boiler parts from Japan													
Boiler Fuel screw conveyer & its feed system Feed air fan Exhause fan Primary circulation pump Primary circulation pipes & their pipe fitting parts (including valves & flexible joints) Heat exchanger Control panel BHS electric wiring Assemble parts of BHS (bolts, nuts sealing parts, etc.)		Transportation of materials/parts from Japan by 20ft or 40ft container before starting mechanical assemble							Boiler Boiler fan Exhaust fan Primary circulation pump Primary circulation pipes & their pipe Heat exchanger Control panel BHS electric wiring	Final inspection	Performance check	Shipping	Skid Production
Boiler parts procured in Moldova and/or neighboring countries													
Silo	Procurement of materials/parts	Stock in outside yard											
Electric hoist Module door unit Module window unit Module lighting system & its electric work Module ventilator Module power supply box	Material purchase inspection	Stock in outside yard							Assemble of door unit Assemble of window				
Chimney Silo operation deck & stairs (with angle & expand metal) Exhaust duct (with flexible joint) Module framework beam & square pipe Module floor checker plate Module wall panel with insulation board Module roof with ripple plate	Material purchase inspection	Stock in outside yard	Cutting Cutting & bending Cutting Cutting & bending	Semi-assemble work by welding Framework for beam & pole Floor work	Welding check by watch	Cleaning	Painting	Drying	Module lighting system & its electric work Module ventilator Module power supply box Module wall pamel with insulation board Module roof with ripple plate				Module or Housing Production
Housing construction worka at site (if any)									Housing construction works at site				
BHS installation site work (Japanese side work)													
Drawing center line of anchor on BHS foundation Check center line of anchor postion Drilling of chemical anchor hole Setting of BHS moduel on foundation Hummering of chemical anchor Setting doors & window eaves, if necessary Installation of silo & deck, stairs Connecting a fuel conveyer Installation of chimney Connecting a exhaust duct									Drawing center line of anchor on BHS foundation Check center line of anchor postion Drilling of chemical anchor hole Setting of BHS moduel on foundation Hummering of chemical anchor Setting doors & window eaves, if necessary Installation of silo & deck, stairs Connecting a fuel conveyer Installation of chimney Connecting a exhaust duct				Construction Work at site
By JST													
BHS installation site work (Works to be done by local contribution)													
By Beneficiary Digging for foundation position Infusing aggregate Compacting by rammer Infusing of flaterized concrete Drawing center line Fitting of reinforced steel rod Casting framework Infusing of foundation concrete Concrete resting period				Digging for Infusing Compacting by rammer Infusing of flaterized concrete Drawing center line Fitting of reinforced steel Casting Infusing of foundation Concrete resting period									
BHS installtion site work (Works to be done by local contribution)													
Electric work for power box Drain pipe work for BHS & rainwater Tie-in work for circulation pipe													Electric work for power box Drain pipe work for BHS & rainwater

Rev.	Date	By
Rev. 1	15-Aug.-12	Denda

No.	Equipment	Tag No.	Quantity	Materials	Remarks
Date, Month, Year	Design	Approval			Drawing Method / Scale
15-Jul-12	Yamano				None
Drawing Title	Module Assembling & Installation Sequence				
Drawing No.	**JST-MA-001-01**				
Mitsui Consultants Co. Ltd.					

6.4 Supplemental Data of 100 Candidate Sites

6.4 Supplemental Data of 100 Candidate Sites

Biomass Pellet Boiler Capacity Estimation - 100sites (1boiler/site)

General Information					Building information: Objective Code 1:Kindergarten, 2:Primary school, 3:Gymnasium, 4:Lyceum, 5:Other school, 6:Com. & Cult. Center, Library, Gym, 7:Church, 8:Hospital, Medical clinic, Rehabilitation Centre, 9:Mayoralty bld.)				Existing heating system		Estimated boiler capacity kWh	Decided boiler capacity kWh 1Boiler/Site
										Source of heat		
No.	Code No.	Rayon	Village	Survey Date	Objective code	Persons of Full day use	No. of Visitors	Total Area (m2)	Boiler capacity kWh	G: Gas C: Coal E: Electric S: Stove T:Termocom		
1	1903	Ialoveni	Răzeni	2012/2/24	4	896		6,309	736	C&G	475	580
2	1802	Hînceşti	Lăpuşna	2012/3/1	1	791		5,471	N/A	C	445	580
3	802	Gagauzia	Congaz	2012/3/2	4	1,060		7,648	1400	G	672	580
4	1301	Briceni	Corjeuţi	2012/3/7	4	820		4,200	232	G	294	348
5	1101	Glodeni	Ciuciulea	2012/3/1	4	830		3,269	240	C	432	580
6	1003	Sîngerei	Sîngerei Noi	2012/9/3	4	642		3,500	330	G	271	348
7	2202	Anenii - Noi	Mereni	2012/2/24	112	658		4,260	N/A	G	349	348
8	304	Drochia	Sofia	2012/3/6	4	557		3,292	290	G	285	348
9	805	Gagauzia	Ceadîr - Lunga	2012/3/2	13	807		8,272	300	G	286	348
10	604	Floreşti	Ghindeşti	2012/3/9	4	520		2,876	200	G	330	348
11	3201	Rezina	Ignaţei	2012/3/10	4	490		5,676	300	G	345	348
12	7203	Nisporeni	Varzaresti	2012/5/2	14	740		6,101	480	G	521	580
13	6902	Floresti	Frumusica	2012/4/27	4	658		3,804	200	G	386	407
14	2103	Ungheni	Costuleni	N/A	14	698		4,302	540	G	344	348
15	404	Cantemir	Goteşti	2012/2/2	4	565		4,576	N/A	C	392	407
16	303	Drochia	Cotova	2012/3/9	4	450		4,177	208	C	357	407
17	402	Cantemir	Pleşeni	2012/3/14	3	436		3,360	294	G	335	348
18	1302	Briceni	Larga	2012/3/7	4	400	50	4,020	320	G	307	348
19	1005	Sîngerei	Cotiujenii Mici	2012/3/10	13	369		3,220	160	G	331	348
20	6802	Falesti	Calinesti	2012/5/11	4	530		3,762	N/A	C	377	407

General Information					Building information Objective Code 1:Kindergarten, 2:Primary school, 3:Gymnasium, 4:Lyceum, 5:Other school, 6:Com. & Cult. Center, Library, Gym, 7:Church, 8:Hospital, Medical clinic, Rehabilitation Centre, 9:Mayoralty bld.)				Existing heating system		Estimated boiler capacity kWh	Decided boiler capacity kWh 1Boiler/Site
										Source of heat		
No.	Code No.	Rayon	Village	Survey Date	Objective code	Persons of Full day use	No. of Visitors	Total Area (m2)	Boiler capacity kWh	G: Gas C: Coal E: Electric S: Stove T:Termocom		
21	6301	Cantemir	Cociulia	2012/5/8	4	587		7,130	N/A	G	532	580
22	1706	Orhei	Jora de Mijloc	2012/2/29	13	447		3,440	400	G	289	348
23	7702	Straseni	Micauti	2012/5/11	36	537	150	5,752	300	G	542	580
24	1712	Orhei	Susleni	2012/2/29	4	326		2,551	200	G	248	232
25	801	Gagauzia	Chirşova	2012/3/13	138	618		7,266	368	G	466	580
26	1501	Gagauzia	Cişmicioi	2012/3/14	4	578		4,150	240	G	415	407
27	7703	Straseni	Scoreni	2012/5/4	4	480		5,000	0	S	463	580
28	1803	Hînceşti	Buţeni	2012/3/1	3	360		6,999	N/A	C	595	580
29	306	Drochia	Suri	2012/6/3	14	465		5,550	464	G	466	580
30	2104	Ungheni	Pîrliţa	2012/3/15	3	400		4,500	280	C	344	348
31	1714	Orhei	Furceni	2012/2/27	13	342		3,141	0	S	307	348
32	2701	Gagauzia	Cioc - Maidan	2012/3/13	13	486		3,670	360	G	289	348
33	1601	Taraclia	Cairaclia	2012/3/14	4	307		3,000	300	G	316	348
34	403	Cantemir	Ciobalaccia	2012/3/2	4	456		5,400	502	G	465	580
35	8102	Gagauzia	Besalma	2012/5/7	4	570		3,200	175	G	257	348
36	1108	Glodeni	Glodeni	2012/3/1	1	292		2,580	0	T	229	232
37	1110	Glodeni	Sturzovca	2012/3/10	38	378		2,920	270	G	213	232
38	1705	Orhei	Trebujeni	2012/2/27	3	223		2,580	230	C	116	232
39	1702	Orhei	Brăneşti	2012/2/27	14	195		2,415	0	E	187	232
40	501	Cahul	Burlacu	2012/3/3	14	410		4,576	N/A	C	412	407
41	2802	Căuşeni	Copanca	2012/3/14	1	200		1,600	100	G	124	232
42	8002	Chisinau	Cricova	2012/5/10	1	485		3,360	0	T	186	232
43	2602	Drochia	Gribova	2012/3/6	3	184		2,720	120	G	208	232

General Information					Building information Objective Code 1:Kindergarten, 2:Primary school, 3:Gymnasium, 4:Lyceum, 5:Other school, 6:Com. & Cult. Center, Library, Gym, 7:Church, 8:Hospital, Medical clinic, Rehabilitation Centre, 9:Mayoralty bld.)				Existing heating system		Estimated boiler capacity kWh	Decided boiler capacity kWh 1Boiler/Site
										Source of heat		
No.	Code No.	Rayon	Village	Survey Date	Objective code	Persons of Full day use	No. of Visitors	Total Area (m2)	Boiler capacity kWh	G: Gas C: Coal E: Electric S: Stove T:Termocom		
44	1303	Briceni	Criva	2012/3/7	3	180		746	100	G	102	232
45	301	Rezina	Cuizauca	N/A	4	344		2,600	7	S	462	407
46	1107	Glodeni	Dusmani	N/A	139	381	70	4,100	N/A	G	565	580
47	6101	Anenii Noi	Maximovca	2012/5/3	1	230		1,713	N/A	G	103	232
48	7401	Ocnita	Sauca	2012/5/12	3	191		2,070	0	S	242	232
49	2401	Telenesti	Cazanesti	N/A	13	328		3,306	462	C&S	227	232
50	6302	Cantemir	Tartaul	2012/5/8	13	473		4,980	210	C	786	580
51	8004	Chisinau	Bubuieciu	2012/5/3	11	471		2,630	0	T	195	232
52	3501	Soroca	Căinarii Vechi	2012/3/9	1	137		1,176	120	G	99	232
53	6603	Drochia	Popestii de Sus	2012/4/27	4	404		6,200	200	G	319	580
54	7501	Rezina	Mateuti	2012/5/25	3	303		3,495	200	G	345	348
55	701	Leova	Ceadîr	2012/3/13	3	216		1,217	100	C	129	232
56	1009	Sîngerei	Ciuciueni	2012/3/9	133	216		1,488	180	C	91	232
57	6402	Calarasi	Tibirica	2012/4/26	4	452		7,260	120	C	625	580
58	1206	Edineţ	Ruseni	2012/3/7	3	180		2,363	260	G	226	232
59	2901	Ştefan Vodă	Feşteliţa	2012/3/14	1	179		2,400	150	G	142	232
60	8003	Chisinau	Tohatin	2012/5/3	13	409		5,260	0	T	305	348
61	6601	Drochia	Mindic	2012/4/27	3	362		3,859	280	G	390	407
62	6901	Floresti	Zaluceni	2012/4/27	3	101		725	98	C&G	85	232
63	7201	Nisporeni	Siscani	2012/5/2	3	300		3,183	200	G	317	348
64	1708	Orhei	Chiperceni	N/A	3	217		1,969	372	G	158	232
65	1711	Orhei	Piatra	2012/3/9	13	325		3,356	360	G	236	232

General Information					Building information Objective Code 1:Kindergarten, 2:Primary school, 3:Gymnasium, 4:Lyceum, 5:Other school, 6:Com. & Cult. Center, Library, Gym, 7:Church, 8:Hospital, Medical clinic, Rehabilitation Centre, 9:Mayoralty bld.)				Existing heating system		Estimated boiler capacity kWh	Decided boiler capacity kWh 1Boiler/Site
										Source of heat		
No.	Code No.	Rayon	Village	Survey Date	Objective code	Persons of Full day use	No. of Visitors	Total Area (m2)	Boiler capacity kWh	G: Gas C: Coal E: Electric S: Stove T:Termocom		
66	7202	Nisporeni	Calimanesti	2012/5/2	139	198	30	1,800	180	G	127	232
67	6701	Dubasari	Oxentea	2012/5/11	178	366	156	1,710	207	G	231	348
68	6202	Basarabesca	Carabetovca	2012/5/7	4	290		2,000	160	G	191	232
69	7801	Telenesti	Tintareni	2012/5/10	4	371		2,750	154	C	140	232
70	7101	Ialoveni	Hansca	2012/5/12	3	200		2,000	154	C	134	232
71	202	Criuleni	Măşcăuţi	2012/2/29	269	334		2,782	N/A	C	223	232
72	8101	Gagauzia	Congazcic	2012/5/7	13	332		3,036	240	G	200	232
73	1004	Sîngerei	Copăceni	2012/3/3	3	180		5,172	180	C	481	580
74	6602	Drochia	Tarigrad	2012/4/27	4	259		3,654	200	G	292	348
75	506	Cahul	Larga Nouă	2012/3/14	13	264		3,986	500	C	379	407
76	706	Leova	Tochile Răducani	2012/3/13	3	204		2,000	0	S	200	232
77	7001	Hincesti	Ivanovca	2012/5/12	3	223		2,458	160	C	139	232
78	6201	Basarabesca	Sadaclia	2012/5/7	1	148		1,152	120	G	100	232
79	7701	Straseni	Micleuseni	2012/5/4	1	162		730	0	S	59	116
80	504	Cahul	Alexanderfeld	2012/3/3	3	209		3,335	200	G	317	348
81	7402	Ocnita	Hadarauti	N/A	13	236		3,014	125	G	242	348
82	7601	Singerei	Marinesti	2012/5/11	13	265		1,640	140	G	174	232
83	1202	Edinet	Hancauti	N/A	3	182		2,071	0	S	104	116
84	6401	Calarasi	Dereneu	2012/4/26	49	211	50	3,148	300	C&S	400	407
85	1105	Glodeni	Iabloane	2012/3/10	33	289		2,250	200	G	245	348
86	401	Cantemir	Vişneovca	2012/3/13	3	198		3,066	0	S	313	348
87	6604	Drochia	Moara de Piatra	2012/4/27	3	185		2,315	N/A	G	184	232
88	1405	Rîşcani	Hilinţi	2012/3/6	13	255		3,190	0	S	328	348

General Information					Building information Objective Code 1:Kindergarten, 2:Primary school, 3:Gymnasium, 4:Lyceum, 5:Other school, 6:Com. & Cult. Center, Library, Gym, 7:Church, 8:Hospital, Medical clinic, Rehabilitation Centre, 9:Mayoralty bld.)				Existing heating system		Estimated boiler capacity kWh	Decided boiler capacity kWh 1Boiler/Site
No.	Code No.	Rayon	Village	Survey Date	Objective code	Persons of Full day use	No. of Visitors	Total Area (m2)	Boiler capacity kWh	Source of heat G: Gas C: Coal E: Electric S: Stove T:Termocom		
89	1201	Edineţ	Parcova	2012/3/6	3	163		1,867	0	S	163	116
90	9002	Criuleni	Raculesti	N/A	3	219		2,800	200	G	196	232
91	1204	Edineţ	Bleşteni	2012/3/6	3	158		711	100	C	116	232
92	1709	Orhei	Ivancea	2012/2/27	3	147		2,600	260	G	178	232
93	2402	Telenesti	Zgardesti	N/A	13	142		2,315	240	C	200	232
94	8001	Chisinau	Singera	2012/5/3	3	344		4,715	0	T	499	580
95	2503	Cimislia	Cimislia	2012/3/14	1	187		3,000	120	G	276	348
96	1205	Edinet	Corpaci	N/A	3	166		2,808	0	S	264	348
97	906	Donduşeni	Scăieni	2012/3/7	3	180		3,245	0	S	325	407
98	2601	Drochia	Drochia	N/A	3	240		2,500	240	G	200	232
99	6403	Calarasi	Temeleuti	2012/4/26	3	177		3,600	180	G	315	348
100	8201	Donduseni	Taul	2012/5/7	3	266		3,500	322	G	411	407

Type & Size	Boiler number
Stove 232kW (0.2 M kcal/h)	**3**
Stove 464kW (0.4M kcal/h)	**37**
232kW (0.2 M kcal/h)	**30**
407kW (0.35M kcal/h)	**12**
580kW (0.5M kcal/h)	**18**
Total	**100**

Note: Termocom is a central haeting system by a public corporation .

6.5 Supplemental Data of 24 Sites for Pellet Boiler Installation

6.5 Supplemental Data of 24 Sites for Pellet Boiler Installation

Biomass Pellet Boiler Capacity Estimation - 24sites (1boiler/site)

General Information					Building information				Existing heating system		Estimated boiler capacity kWh	Decided boiler capacity kWh 1Boiler/Site
					Objective Code 1:Kindergarten, 2:Primary school, 3:Gymnasium, 4:Lyceum, 5:Other school, 6:Com. & Cult. Center, Library, Gym, 7:Church, 8:Hospital, Medical clinic, Rehabilitation Centre, 9:Mayoralty bld.)					Source of heat		
No.	Code No.	Rayon	Village	Survey Date	Objective Code	Persons of Full day use	No. of Visitors	Total Area (m2)	Boiler capacity kwh	G: Gas C: Coal E: Electric S: Stove T:Termocom		
1	1903	Ialoveni	Răzeni	2012/2/24	4	896		6,309	736	C&G	475	580
2	1802	Hînceşti	Lăpuşna	2012/3/1	1	791		5,471	N/A	C	445	580
3	2202	Anenii - Noi	Mereni	2012/2/24	112	658		4,260	N/A	G	349	348
4	3201	Rezina	Ignaţei	2012/3/10	4	490		5,676	300	G	345	348
5	7203	Nisporeni	Varzaresti	2012/5/2	14	740		6,101	480	G	521	580
6	1706	Orhei	Jora de Mijloc	2012/2/29	13	447		3,440	400	G	289	348
7	7702	Straseni	Micauti	2012/5/11	36	537	150	5,752	300	G	542	580
8	1712	Orhei	Susleni	2012/2/29	4	326		2,551	200	G	248	232
9	7703	Straseni	Scoreni	2012/5/4	4	480		5,000	0	S	463	580
10	1803	Hînceşti	Buţeni	2012/3/1	3	360		6,999	N/A	C	595	580
11	2104	Ungheni	Pîrliţa	2012/3/15	3	400		4,500	280	C	344	348
12	1714	Orhei	Furceni	2012/2/27	13	342		3,141	0	S	307	348
13	1705	Orhei	Trebujeni	2012/2/27	3	223		2,580	230	C	116	232
14	1702	Orhei	Brăneşti	2012/2/27	14	195		2,415	0	E	187	232
15	8002	Chisinau	Cricova	2012/5/10	1	485		3,360	0	T	186	232
16	301	Rezina	Cuizauca	N/A	4	344		2,600	0	S	462	407
17	6101	Anenii Noi	Maximovca	2012/5/3	1	230		1,713	N/A	G	103	232
18	8004	Chisinau	Bubuieciu	2012/5/3	11	471		2,630	0	T	195	232
19	7501	Rezina	Mateuti	2012/5/25	3	303		3,495	200	G	345	348
20	6402	Calarasi	Tibirica	2012/4/23	4	452		7,260	120	C	625	580

General Information					Building information Objective Code 1:Kindergarten, 2:Primary school, 3:Gymnasium, 4:Lyceum, 5:Other school, 6:Com. & Cult. Center, Library, Gym, 7:Church, 8:Hospital, Medical clinic, Rehabilitation Centre, 9:Mayoralty bld.)				Existing heating system		Estimated boiler capacity kWh	Decided boiler capacity kWh 1Boiler/Site
										Source of heat		
No.	Code No.	Rayon	Village	Survey Date	Objective Code	Persons of Full day use	No. of Visitors	Total Area (m2)	Boiler capacity kwh	G: Gas C: Coal E: Electric S: Stove T:Termocom		
21	8003	Chisinau	Tohatin	2012/5/3	13	409		5,260	0	T	305	348
22	7201	Nisporeni	Siscani	2012/5/2	3	300		3,183	200	G	317	348
23	1708	Orhei	Chiperceni	N/A	3	217		1,969	372	G	158	232
24	1711	Orhei	Piatra	2012/3/9	13	325		3,356	360	G	236	232
25		Chisinau	2KR Training Cent	N/A					N/A	G		116
Total number of beneficially						10,421	150					

Type & Size	Boiler number
116kw(0.1M kcal/h)	**1**
232kw(0.2 M kcal/h)	**8**
348kw(0.3M kcal/h)	**8**
407kw(0.35M kcal/h)	**1**
580kw(0.5M kcal/h)	**7**
Total	**25**

Note: Termocom is a central haeting system by a public corporation .

6.6 Scoping Results

Appendix 6.6 Scoping results

<table>
<tr><th rowspan="2">Environmental Item</th><th colspan="3">Contents and size of impact</th></tr>
<tr><th>Evaluation</th><th>Pellet boiler</th><th>Evaluation</th><th>Pellet production plant</th></tr>
<tr><td>Air</td><td>B</td><td>Emissions of SOx and NOx will be mitigated compared with fossil fuel use.
As there is no emission standard for particulate matter in Moldova, EU standards are adopted as a matter of best practices. Particulate emissions from Japanese-manufactured pellet boilers procured for this project are expected to range between 50 and 150 mg/m^3. These emission levels meet the relevant EU standards, and there is no adverse impact on air quality.

<u>Emission standards</u> (Particulate Matter)
(unit: mg/m^3)<table><tr><th>Moldova</th><th>IFC *1</th><th>EU Standards *2</th><th>Japan *3</th></tr><tr><td>N/A</td><td>50 or up to 150 if justified by environmental assessment</td><td>150
(at 10 % O_2)</td><td>300</td></tr></table>*1 IFC EHS guidelines Air Emissions and Ambient air quality/ Table 1.1.2 - Small Combustion Facilities Emissions Guidelines (3MWth - 50 MWth)
*2 European Standards EN 303-5
*3 Air Pollution Control Act, implementation restrictions, emission standard of dust (Article 4)</td><td>D</td><td>No adverse impact on surroundings and human health will be expected.</td></tr>
<tr><td>Water</td><td>D</td><td>No adverse impact on underground water will be expected because no waste water and leachate will be generated from these facilities.</td><td>D</td><td>No adverse impact on underground water will be expected because no waste water and leachate will be generated from this plant.</td></tr>
<tr><td>Soil</td><td>D</td><td>Medical substances are not used and light diesel oil used for ignition of boilers will be kept in the storehouse appropriately. So the soil pollution will not be expected.</td><td>D</td><td>Medical substances are not used and light diesel oil used for ignition of boilers will be kept in the storehouse appropriately. So the soil pollution will not be expected.</td></tr>
<tr><td>Waste</td><td>E</td><td>Although about combustion reduces the fuel volume by approximately 95%, the residual ash includes nutrients such as potassium, magnesium, phosphorus, calcium. So the ash will be used as organic fertilizer in the field.</td><td>D</td><td>No waste will be generated.</td></tr>
<tr><td>Noise and Vibration</td><td>D</td><td>Neither noise nor vibration will occur.</td><td>D</td><td>Although some noise will be expected during operation, there is no residence near the plant and it will be prevented with the installation of soundproof wall or greenbelt.</td></tr>
<tr><td>Subsidence</td><td>D</td><td>No use of underground water, no subsidence.</td><td>D</td><td>No use of underground water, no subsidence.</td></tr>
</table>

<table>
<tr><th rowspan="2">Environmental Item</th><th colspan="4">Contents and size of impact</th></tr>
<tr><th>Evaluation</th><th>Pellet boiler</th><th>Evaluation</th><th>Pellet production plant</th></tr>
<tr><td>Odor</td><td>D</td><td>No odor source.</td><td>D</td><td>No odor source.</td></tr>
<tr><td>Topography and Geology</td><td>D</td><td>No adverse impact on topography and geology will be expected.</td><td>D</td><td>No adverse impact on topography and geology.</td></tr>
<tr><td>Landscape</td><td>D</td><td>As pellet boilers are installed in existing facilities, no adverse impact on landscape would be expected.</td><td>D</td><td>As this plant is installed in existing facility, no adverse impact on landscape would be expected.</td></tr>
<tr><td>Accidents</td><td>B</td><td>There is a potential for accidents and injuries, such as burns when extracting ash from boilers and unintentional ignition in storages. The occurrence of such accidents can be greatly reduced by the implementation of security systems, safety considerations and operator training programs for industrial accident prevention.</td><td>B</td><td>There is a potential for accidents and injuries during the operation of pelletizing equipment and other heavy machinery (e.g. forklifts). The occurrence of such accidents can be greatly reduced by the implementation of an industrial safety program including safety education and establishment of occupational safety manual.</td></tr>
<tr><td>Water usage</td><td>D</td><td>Little (only circulation of hot water)</td><td>D</td><td>Little</td></tr>
<tr><td>Climate change</td><td>E</td><td>The planned boilers use biomass fuel, which is deemed carbon neutral. Accordingly, CO_2 emissions can be expected to be considerably reduced compared to the use of fossil fuels such as natural gas and coal.</td><td>B</td><td>Electricity consumption during pellet production and the transportation of agricultural residue and pellet are expected to create some CO_2 emissions.</td></tr>
<tr><td>Fauna and flora</td><td>D</td><td>No adverse impact on fauna and flora.</td><td>D</td><td>No adverse impact on fauna and flora</td></tr>
<tr><td>Involuntary resettlement</td><td>D</td><td>No resettlement</td><td>D</td><td>No resettlement</td></tr>
<tr><td>Local economy (employment and livelihood, etc.)</td><td>B</td><td>The implementation of this project is expected to reduce the number of operators. Existing fossil fuel boilers require three operators per facility on average. The planned pellet boilers require only two operators per facility on average.</td><td>E</td><td>Implementation of this project is expected to create jobs in the pellet production and agricultural residue and pellet transportation processes.</td></tr>
<tr><td>Utilization of land and local resources</td><td>D</td><td colspan="3"><u>Utilization of land</u>
No adverse impact on land utilization would be expected.

<u>Utilization of local resources</u>
Ratio of the wheat straw utilized in pellet fuel resource for this project against the whole storage in Moldova was calculated to be 6.0 %. Besides the other crop residue such as sunflower seed, maize straw, etc. can also be used as the pellet materials. So the adverse impact on existing usage such as poultry bed and plowing under the fields etc. would be very small.
<table>
<tr><th rowspan="2">Storage of wheat straw</th><th rowspan="2">(a)Consumption of straw in the project</th><th colspan="4">(b)Other use of straw</th><th rowspan="2">(a)+(b)</th><th rowspan="2">Balance</th></tr>
<tr><th>Poultry bed (chicken)</th><th>Poultry bed (cow)</th><th>plowing</th><th>Total</th></tr>
<tr><td>t/y</td><td>t/y</td><td>t/y</td><td>t/y</td><td>t/y</td><td>t/y</td><td>t/y</td><td>t/y</td></tr>
<tr><td>481,290</td><td>28,994.70</td><td>2,764.8</td><td>152,280.0</td><td>5,461.5</td><td>160,506.3</td><td>189,501.0</td><td>291,788.9</td></tr>
<tr><td>-</td><td>6.0%</td><td>0.6%</td><td>31.6%</td><td>1.1%</td><td>33.3%</td><td>39.4%</td><td>60.6%</td></tr>
</table></td></tr>
<tr><td>Social institutions such as social</td><td>E</td><td colspan="2">These boilers contribute to a stable heat supply to educational facilities, and are therefore expected to make a positive impact on communities.</td><td>E</td><td>This equipment helps establish a stable fuel supply for the target educational facilities, and is therefore expected to make a positive impact</td></tr>
</table>

Environmental Item	Contents and size of impact			
	Evaluation	Pellet boiler	Evaluation	Pellet production plant
capital and local decision-making institutions				on communities.
Existing social infrastructures and services	E	These boilers contribute to a stable heat supply to educational facilities, and are therefore expected to make a positive impact on social infrastructures.	E	This equipment helps establish a stable fuel supply for the target educational facilities, and is therefore expected to make a positive impact social infrastructures.
Vulnerable social groups (poor and indigenous peoples, etc.)	D	No adverse impact would be expected.	D	No adverse impact would be expected.
Equality of benefits and losses	D	As these pellet boilers are equally installed into 39 educational facilities in central area in Moldova, equality of benefits would be secured.	D	Pellets produced in this plant would be distributed to the 39 educational facilities in central area in Moldova. So no inequality of benefits would be expected.
Equality in the development process	D	2KR-PIU had disclosed the information of this project and provided the detailed contents on the website of MoAFI and newspaper before offering. And in the process of selection site, beneficiaries were selected with objective criteria in a fair manner.	D	
Gender	D	No adverse impact on gender would be expected.	D	No adverse impact on gender would be expected.
Children's rights	E	Because this project is targeted mainly at schools and kindergartens, the beneficial impact on children is expected to be very large.		
Cultural heritage	D	No cultural heritage exists in each site.	D	No cultural heritage exists in each site.
Local conflicts of interest	D	As this project is done mainly in educational facilities, no conflict would occur.	D	As this plant is installed in 2KR-PIU's land, no conflict would be expected.
Infection diseases such as HIV/AIDS	D	Nothing	D	Nothing
Working conditions including occupational safety	D	Resting rooms for operators are to be installed in each project site and no dangerous work is included. Working conditions are enough.	D	SPM (suspended particular molecule) from agricultural residue would be expected to floating in the plant. In order to prevent inhaling the substance, employees shall be distributed with masks etc.

Evaluation: A (Significant adverse impact on the environment is expected.), B (Its potential adverse environmental impact is less adverse than that of A), C (Size of adverse impact on the environment is not obvious.), D (minimal or no adverse environmental impact), E (Positive impact is expected by implementing project)

6.7 Environmental Check List

Appendix 6.7　Environmental Check List (Other Infrastructure Projects)

Category	Environmental Item	Main Check Item	Environmental Impact				Environmental Problems	Result and mitigation measures
			Big	Small	No	Unclear		
1 Permits and Explanation	(1)EIA and Environmental Permits	1) Have EIA reports been officially completed?						This project will not be required to conduct EIA.
		2) Have EIA reports been approved by authorities of the host country's government?						
		3) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied?						
		4) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?						
	(2) Explanation to the local stakeholders	1) Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public?						Responsible entities shall explain to the local people and make them understand the project.
		2) Are proper responses made to comments from the public and regulatory authorities?						Responsible entities shall respond appropriately.
	(3) Alternative plan	1) Is a number of alternative plans on this project considered, which include the environmental and social considerations?						Straw boilers and briquette boilers were considered.
2 Mitigation Measures	(1) Air Quality	1) Do air pollutants, (such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust) emitted from the proposed infrastructure facilities and ancillary facilities comply with the country's emission standards and ambient air quality standards?		X			Dust, SOx and NOx from boilers	Pellet boilers to be installed can meet the EU standards.
		2) Do electricity or heat source used in the buildings such as accommodation facilities adopt low emission factor fuel (CO2, NOx and SOx)?			X			Nothing
	(2) Water Quality	1) Do effluents or leachates from various facilities, such as infrastructure facilities and the ancillary facilities comply with the country's effluent standards and ambient water quality standards?			X			Neither wastewater nor leachate will be expected from both boiler and pellet production plant.

Category	Environmental Item	Main Check Item	Environmental Impact				Environmental Problems	Result and mitigation measures
			Big	Small	No	Unclear		
	(3) Wastes	1) Are wastes from the infrastructure facilities and ancillary facilities properly treated and disposed of in accordance with the country's standards?			X		Ash	Ash will be utilized as fertilizer in the fields.
	(4) Soil Contamination	1) Are adequate measures taken to prevent contamination of soil and groundwater by the effluents or leachates from the infrastructure facilities and the ancillary facilities?			X			Neither Waste water nor leachate will be expected from both boiler and pellet production plant.
	(5) Noise and Vibration	1) Do noise and vibrations comply with the country's standards?			X		Noise from pellet production plant	Pellet production plant will be constructed in the existing estate and there is no residence near the estate. So no adverse impact will occur.
	(6) Subsidence	1) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?			X			Nothing
	(7) Odor	1) Are there any odor sources? Are adequate odor control measures taken?			X			Nothing
3 Natural Environment	(1) Protected Areas	1) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?			X			No protected areas near the facilities.
	(2) Ecosystem and biota	1) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)?			X			Nothing
		2) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions?			X			Nothing
		3) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem?			X			Nothing

Category	Environmental Item	Main Check Item	Environmental Impact				Environmental Problems	Result and mitigation measures
			Big	Small	No	Unclear		
		4) Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?			X			Nothing
	(3) Hydrology	1) Is there a possibility that hydrologic changes due to the project will adversely affect surface water and groundwater flows?			X			Nothing
	(4) Topography and Geology	1) Is there a possibility the project will cause large-scale alteration of the topographic features and geologic structures in the project site and surrounding areas?			X			Nothing
4 Social Environment	(1) Resettlement	1) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?			X			Nothing
		2) Is adequate explanation on relocation and compensation given to affected persons prior to resettlement?			X			Nothing
		3) Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?			X			Nothing
		4) Is the compensation already paid before the resettlement?			X			Nothing
		5) Is the compensation policy established in paper?			X			Nothing
		6) Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?			X			Nothing
		7) Are agreements with the affected persons obtained prior to resettlement?			X			Nothing
		8) Is the organizational framework established to properly implement resettlement?			X			Nothing
		9) Is a plan developed to monitor the impacts of resettlement?			X			Nothing

Category	Environmental Item	Main Check Item	Environmental Impact				Environmental Problems	Result and mitigation measures
			Big	Small	No	Unclear		
		10) is a grievance management system developed?			X			2KR-PIU shall establish the system with project implementation entities (mayor).
	(2) Living and Livelihood	1) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?		X			Dust	Pellet boiler Concentration of particulate matter will be controlled under the EU standards level. So no adverse impact will be expected.
	(3) Heritage	2) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?			X			Nothing
	(4) Landscape	1) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?			X			Nothing
		2) Is there a possibility that the project will adversely affect the local landscape because of large-sized accommodation facilities or tall buildings?			X			Nothing
	(5) Ethnic Minorities and Indigenous Peoples	1)Are considerations given to reduce the impacts on culture and lifestyle of ethnic minorities and indigenous peoples?			X			Nothing
	(6) working conditions	1)Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?			X		Health damage by inhaling SPM(Suspended Particular Molecule)	Pellet production plant In order to prevent to inhale the SPM from agricultural residue, wearing masks etc. shall be considered.
		2) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?			X			Pellet production plant Under management of 2KR-PIU, proper training shall be conducted to the employees.

Category	Environmental Item	Main Check Item	Environmental Impact				Environmental Problems	Result and mitigation measures
			Big	Small	No	Unclear		
		3) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public sanitation) for workers etc.?			X			Pellet production plant Under management of 2KR-PIU, proper training shall be conducted to the employees.
		4) Are appropriate measures being taken to ensure that security guards involved in the project do not violate safety of other individuals involved, or local residents?			X			Nothing
5 Others	(1) Impacts during Construction	1) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?			X			Nothing
		2) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts?			X			Nothing
		3) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?			X			Nothing
	(2) Monitoring	1) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts?			X			No considerable adverse impact on nature environment and social environment will be expected. So monitoring will not be required.
		2) Are the items, methods and frequencies included in the monitoring program judged to be appropriate?			X			Ditto
		3) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)?			X			Ditto
		4) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?			X			Ditto

Category	Environmental Item	Main Check Item	Environmental Impact				Environmental Problems	Result and mitigation measures
			Big	Small	No	Unclear		
6 Note	Reference to Checklist of Other Sectors	1) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).			X			Nothing
		2) For projects, such as installation of telecommunication cables, power line towers, and submarine cables, where necessary, pertinent items described in the Power Transmission and Distribution Lines, and Pipelines checklists should also be checked.			X			Nothing
	Note on Using Environmental Checklist	1) If necessary, the impacts to transboundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).			X			Pellet production plant Though CO_2 emission will increase, the impact on global warming will be little enough to be neglected.

6.8 Calculation of Greenhouse Gas Emission Reductions

Appendix 6.8 Calculation of Greenhouse gas emission reductions

(1) Project Boundary

Project boundary of this project is the following.

1) Baling of agricultural residuals at production fields
2) Transportation of agricultural residuals from fields to the pellet production plant
3) Pellet production
4) Transportation of pellets from pellet production plant to boilers
5) Boiler operation

(2) Baseline Emissions

Baseline scenario is identified as below.

"If this project is not implemented at 24 public buildings in rural areas, fuel switching from fossil fuels (coal, natural gas, etc) to biomass fuel would not occur because of the financial reason of each village. Then fossil fuels would be used continuously at the existing heating facilities in absence of any support such as Japan's grant aid. "

Baseline emissions (BE_y) consist of 1) CO_2 emission from burning process of fossil fuels ($BE_{PFi,y}$) and 2) CO_2 emission of existing boilers from power consumption ($BE_{e,y}$). BE_y can be calculated by the following formula.

$$\boldsymbol{BE_y = BE_{PFi,y} + BE_{e,y}}$$

BE_y	Baseline CO_2 emission in year y [t CO_2/y]
$BE_{PF,i}$	Baseline CO_2 emission from burning fossil fuel type i [t CO_2/y]
$BE_{e,y}$	Baseline CO_2 emission from electricity consumption [t CO_2/y]

1) Burning of fossil fuels

$$\boldsymbol{BE_{PFi,y} = PC_{pel,y} \times (1 - \frac{M_{pel}}{100}) \times NCV_{pel,y} \times \frac{\gamma_{PJ}}{\gamma_{BE}} \times EF_{CO2,PFi}}$$

$$\boldsymbol{PC_{pel,y} = BHC_{PJ} \times \frac{1}{NCV_{pel,y}} \times \frac{1}{\gamma_{PJ}} \times OT_{PJ,y} \times OR_{PJ,y}}$$

$PC_{pel,y}$	Consumption of pellet in boiler in year y [t/y]
$NCV_{pel,y}$	Net calorific value of pellet [MWh/t]
M_{pel}	Moisture content of pellet [%]
γ_{PJ}	Average net efficiency of heat generation of the pellet boiler
γ_{BE}	Average net efficiency of heat generation of the existing boiler
$EF_{CO2,PFi}$	CO_2 emission factor for the fossil fuel i displaced by pellet [t CO_2/MWh]
BHC_{PJ}	Heat-capacity of pellet boiler [MWh]
$OT_{PJ,y}$	Operating time of pellet boiler in year y [hr/y]
$OR_{PJ,y}$	Operating rate of the pellet boiler in year y

Table Numerical value of each parameter

Parameter		Value	Unit	Remarks
$PC_{pel,y}$		7,842.22	t/y	
$NCV_{pel,y}$		3.5	MWh/t	
M_{pel}		10.0	%	English Handbook for Wood Pellet Combustion (pellets@las)
γ_{PJ}		0.860	-	Maker catalog value
γ_{BE}	Coal	0.670	-	Maker catalog value
	NG	0.920	-	Maker catalog value
	Electricity	0.330	-	Maker catalog value
$EF_{CO2,Pfi}$	Coal	0.340	tCO_2/MWh	2006 IPCC default values
	NG	0.201	tCO_2/MWh	2006 IPCC default values
	Electricity	0.660	tCO_2/MWh	2006 IPCC default values
BHC_{PJ}		116	kWh	Rated heat output of boiler
		232	kWh	Rated heat output of boiler
		407	kWh	Rated heat output of boiler
		464	kWh	Rated heat output of boiler
		580	kWh	Rated heat output of boiler
$OT_{PJ,y}$		4,320	hr/y	24 hours/day x 180 days
$OR_{PJ,y}$		0.600	-	90% (6:00 - 18:00), 30% (18:00 - 6:00)

(Source: JICA Survey Team)

CO_2 emission ($BE_{PFi,y}$) was calculated to be 8,066.8 tCO_2/y.

2) Power consumption of existing boiler

$$\boldsymbol{BE_{e,y} = PEC_{BL,y} \times EF_e}$$

$PEC_{BL,y}$ Electricity consumption of existing boiler in year *y* [MWh/y]

EF_e CO_2 emission factor of electricity [t CO_2/MWh]

Table Numerical value of each parameter

Parameter	Value	Unit	Remarks
$PEC_{BL,y}$	158.60	MWh/y	
EF_e	0.660	tCO_2/MWh	2006 IPCC default values

(Source: JICA Survey Team)

CO_2 emission ($BE_{e,y}$) was calculated to be 104.0 tCO_2/y.

From above calculations the baseline emission (BE_y) from 24 heating systems was calculated to be 8,170.8 t CO_2/y.

(3) Project Emissions

As biomass fuel is carbon neutral in accordance with Kyoto protocol, CO_2 emission from biomass burning is considered to be "zero".

Therefore the processes where CO_2 is emitted from are the following;

1) Baling process of agricultural residue ($PE_{rol,y}$);

2) Transporting process of agricultural residue from the fields to the pellet production plant ($PE_{F\text{-}P,y}$);

3) Pellet production process ($PE_{pel,y}$);

4) Transportation process of pellet from pellet production plant to boilers ($PE_{P\text{-}B,y}$);

5) Boiler operation process ($PE_{boiler,y}$)

Project emissions (PE_y) can be calculated by the following formula.

$$\boldsymbol{PE_y = PE_{rol,y} + PE_{F-P,y} + PE_{pel,y} + PE_{P-B,y} + PE_{boiler,y}}$$

$PE_{rol,y}$	Project CO_2 emission during rolling of agricultural residue [t CO_2/y]
$PE_{F\text{-}P,y}$	Project CO_2 emission from transportation of rolled agricultural residue from fields to the pellet production plant in year *y* [t CO_2/y]
$PE_{pel,y}$	Project CO_2 emission from pellet production [t CO_2/y]
$PE_{P\text{-}B,y}$	Project CO_2 emission from pellet transportation from the pellet production plant to boilers in year *y* [t CO_2/y]
$PE_{boiler,y}$	Project CO_2 emission from boiler operation [tCO_2/y]

1) Baling process of agricultural residue on fields

CO_2 emissions ($PE_{rol,y}$) is attributable to the tractor fuel consumption in baling agricultural residue in the fields and calculated by the following formula.

$$\boldsymbol{PE_{rol,y} = DAF_{tractor,y} \times \frac{1}{FE_{tractor}} \times EF_{PFi}}$$

$PE_{rol,y}$	CO_2 emission during baling of agricultural residue [t CO_2/y]
$DAF_{tractor,y}$	Average tractor trip distance in fields (baling process) in year *y* [km/y]
$FE_{tractor}$	Average tractor fuel consumption efficiency [km/kg]
EF_{PFi}	CO_2 emission factor for the fuel *i* consumed by trucks [t CO_2/kg-fuel]

Table Numerical value of parameter

Parameter	Value	Unit	Remarks
$DAF_{tractor,y}$	12,102	km/y	Caltivation area (ha/y) x Tractor trip distance (km/ha)
$FE_{tractor}$	2.12	km/kg	Information provided by 2KR-PIU
EF_{PFi}	0.00314	tCO_2/kg-fuel	2006 IPCC default values

(Source: JICA Survey Team)

2) Transportation of baled agricultural residue from fields to pellet production plant

CO_2 emission ($PE_{F\text{-}P,y}$) is attributable to the fuel consumption of trucks which transport the baled agricultural residue from each field to the pellet production plant and calculated by the following formula.

$$PE_{F-P,y} = PC_{BM,y} \div TL_{tr.F-P} \times DAF_{F-P} \div FE_{tr,F-P} \times EF_{tr,F-P}$$

$$PC_{BM,y} = PC_{pel,y} \times 1/(1 - \frac{M_{BM} - M_{pel}}{100})$$

$PC_{BM,y}$	Quantity of agricultural residue put into the pellet production plant [t/y]
$TL_{tr,F\text{-}P}$	Average truck load of agricultural residue in year *y* from fields to pellet production plant [t/truck]
$DAF_{F\text{-}P}$	Average truck round trip distance from fields to pellet production plant [km]
$FE_{tr,F\text{-}P}$	Average fuel consumption efficiency of trucks [km/kg]
$EF_{tr,F\text{-}P}$	CO_2 Emission factor for the trucks transporting agricultural residue [t CO_2/kg-fuel]
$PC_{pel,y}$	Consumption of pellet in boilers in year *y* [t/y]
M_{BM}	Moisture content of agricultural residue [%]

Table Numerical value of parameter

Parameter	Value	Unit	Remarks
$PC_{BM,y}$	8,713.58	t/y	
$TL_{tr,F\text{-}P}$	10	t/truck	
$DAF_{F\text{-}P}$	16	km	From Field to Pellet production plant : Avg. 8km (one way)
$FE_{tr,F\text{-}P}$	2.55	km/kg	Information provided by 2KR-PIU
$EF_{tr,F\text{-}P}$	0	tCO_2/kg-fuel	IPCC Guidelines/Europe Diesel
$PC_{pel,y}$	7,842.22	t/y	
M_{BM}	20.0	%	English Handbook for Wood Pellet Combustion (pellets@las)

(Source: JICA Survey Team)

3) Pellet production

CO_2 emission ($PE_{pel,y}$) is attributable to the electricity consumption for pelletizing, drying and crashing processes and calculated by the following formula.

$$PE_{pel,y} = PEC_{pel,y} \times EF_e$$

$PEC_{pel,y}$	Electricity consumption in year *y* [MWh/y]
EF_e	CO_2 emission factor of electricity [t CO_2/MWh]

Table Numerical value of parameter

Parameter	Value	Unit	Remarks
$PEC_{pel,y}$	2,268	MWh/y	
EF_e	0.660	tCO_2/MWh	Electricity emission factors Review (European Bank)

(Source: JICA Survey Team)

4) Pellet transportation

CO_2 emission ($PE_{P\text{-}B,y}$) is attributable to the fuel consumption of trucks from the pellet production plant to each boiler and calculated by the following formula.

$$PE_{P-B,y} = PC_{pel,y} \div TL_{tr,P-B} \times DAF_{P-B} \div FE_{tr,P-B} \times EF_{tr,P-B}$$

$PC_{pel,y}$	Quantity of pellet used in year *y* [t/y]
$TL_{tr,P\text{-}B}$	Average loading capacity of truck transporting pellet from the pellet production plant to boilers [t/truck]
$DAF_{P\text{-}B}$	Average round trip distance from pellet production plant to boilers [km]
$FE_{tr,P\text{-}B}$	Average fuel consumption efficiency of trucks [km/kg]
$EF_{tr,P\text{-}B}$	CO_2 Emission factor for the trucks transporting pellet [t CO_2/kg-fuel]

Table Numerical value of parameter

Parameter	Value	Unit	Remarks
$PC_{pel,y}$	7,842.22	t/y	
$TL_{tr,P\text{-}B}$	1.5	t/truck	
$DAF_{P\text{-}B}$	130	km	From Pellet production plant to boilers : Avg. 65km (onee way)
$FE_{tr,P\text{-}B}$	2.55	km/kg	Information provided by 2KR-PIU
$EF_{tr,P\text{-}B}$	0.00314	tCO_2/kg-fuel	IPCC Guidelines/Europe Diesel

(Source: JICA Survey Team)

5) Boiler operation

CO_2 emissions ($PE_{boiler,y}$) are attributable to the electricity consumption of equipments such as fuel supply conveyor, positive blower, cyclone dust precipitator, etc.

$$PE_{boiler,y} = PEC_{boiler,y} \times EF_e$$

$PEC_{boiler,y}$	Electricity consumption in year *y* [MWh/y]
EF_e	CO_2 emission factor of electricity [tCO_2/MWh]

Table Numerical value of parameter

Parameter	Value	Unit	Remarks
$PEC_{boiler,y}$	263.08	MWh/yr	
EF_e	0.660	tCO_2/MWh	Electricity emission factors Review (European Bank)

(Source: JICA Survey Team)

Project Emissions (PE_y) can be calculated to be 2,541.6 tCO_2/y.

Table Project emissions of each process

Emission process		CO_2 emission
Baling of agricultural residue at fields	$PE_{rol,y}$	17.9 tCO_2/y
Transportation of baled agricultural residue from fields to pellet production plant	$PE_{F\text{-}P,y}$	17.1 tCO_2/y
Pellet production	$PE_{pel,y}$	1,496.8 tCO_2/y
Pellet transportation	$PE_{P\text{-}B,y}$	836.9 tCO_2/y
Boiler operation	$PE_{boiler,y}$	172.9 tCO_2/y
Total		2,541.6 tCO_2/y

(4) Estimated CO_2 Emission Reductions

As per the calculations below, emission reductions (ER_y) are estimated at 5.629.2 tCO_2/y.

$$ER_y = BE_y - PE_y$$
$$= 8{,}170.8 - 2{,}541.6$$
$$= 5{,}629.2\ tCO_2/y$$