

**NTPC LIMITED**

(A Govt. of India Enterprise)

**CORPORATE ENGINEERING**

**NOTICE FOR EXTENSION OF EXPRESSION OF INTEREST (EOI) SUBMISSION DATE**

Ref No.: NTPC/PE/ET&PR/2220907/EXT/3

Date: 14.01.2023

This is in continuation to our notice inviting Expression of Interest (EOI) No.: NTPC/PE/ET&PR/2220907 Dated 07.09.2022 for setting up a pilot project for Thermal Energy Storage System (TESS) coupled with steam water cycle of one of the existing coal power plants of NTPC to augment its flexible operation to balance intermittency of renewable energy sources., uploaded on [www.ntpctender.com](http://www.ntpctender.com) website, having last date of EOI submission as 15.01.2023, the last date of submission stands extended to **15.03.2023**. This is the third extension of last date of EOI submission.

For detailed EOI and documents, please visit at [www.ntpctender.com](http://www.ntpctender.com) or may contact:

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**Registered office:** NTPC Bhawan, SCOPE Complex, 7, Institutional Area, Lodi Road, New Delhi- 110003. CIN: **L40101DL1975GOI007966** Website: [www.ntpc.co.in](http://www.ntpc.co.in)

Enclosures: -

- 1) Second Amendment to the EOI
- 2) Clarification/ response by NTPC towards queries of parties
- 3) Indicative Scheme for integration of TESS with thermal power plant
- 4) Heat Balance Diagram of a typical 500 MW Unit



## TESS EOI Amendment-2

Clause no.	Original Clause	Amended Clause
<b>Section-IV</b>	Responses shall be deemed non-responsive for following reasons:  “An Applicant submitting more than one response to this EOI either itself or through an affiliate or subsidiary company.”	Responses shall be deemed non-responsive for following reasons:  “An Applicant submitting more than one response to this EOI either itself or through an affiliate or subsidiary company. However, an applicant (in case of EPC company) can submit two separate EOI with different technology provider.”

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**Expression of Interest (EOI) For Setting Up A Pilot Project for Thermal Energy Storage System (TESS) Coupled with Steam Water Cycle of One of the Existing Coal Power Plant of NTPC to Augment its Flexible Operation to Balance Intermittency of Renewable Energy Sources.**

**Clarification no.1**

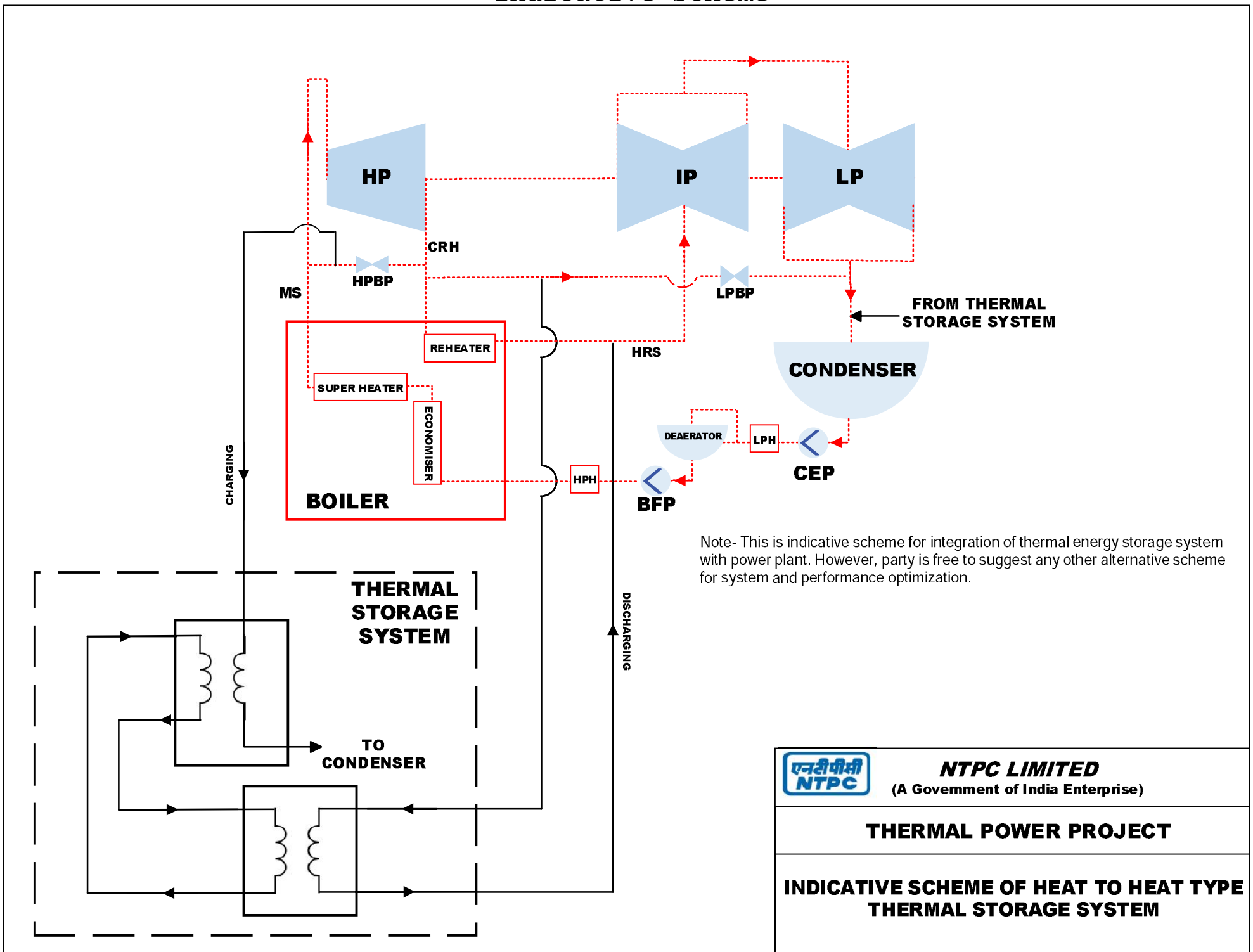
SN	Clause No.	Paragraph/Clause Text	Queries of Parties	NTPC Response
1	NA	NA	Please provide the boundary conditions for the heat supply i.e. live steam parameters, operating profile	Heat Balance diagrams for a typical 500 MW unit is attached for the reference at Annex-A
2	NA	NA	Please provide any available heat and mass balance alongside with the PFDs related to the steam supply system	
3	NA	NA	Please provide details or layout of the available space for the pilot thermal energy storage system	Site will be selected to suit layout requirement of proposed pilot plant. Hence, site selection will be done based on the data, including space requirement, to be submitted by applicant as response to this EOI. Accordingly, layout will be finalised during tendering stage based on actual selected site. However, for estimate purpose in EOI distance of offered plant shall be considered as 200 meter from the boiler/ turbine. Applicant shall also indicate unit rate for distance of pilot plant from boiler/ turbine.
4	Section - I EOI Information	Response validity 6 months from the last date for EOI submission	Response validity 6 months from the last date for EOI submission	For tendering purpose, techno-commercial data submitted by the party shall remain valid for 6 month from last date of EOI submission.
5	Section - II Information - § 2.4	The interested applicants will specify the technical specification, guarantee parameters, the total estimated project cost and shall propose the financial contribution to be shared by themselves and by NTPC	Please clarify what kind of financial contribution is anticipated	In case, technology is not proven even at demonstration scale, suitable financial risk sharing mechanism will be adopted. Accordingly, suitable bid evaluation mechanism shall be envisaged during tendering stage based on the data of EOI to minimise financial risk to NTPC with respect to Technology Readiness Level (TRL) of technology.
6	Section - II Information - § 2.6	NTPC reserves the right to implement the project either on nomination basis or through Request for Proposal (RFP) process amongst the shortlisted parties identified through this EOI Process	Please clarify if the applicant is allowed to change/add/dismiss project partners to carry out the project subsequent to answering the EOI	Change of technology provider will not be allowed for which techno-commercial information in EOI is submitted. However, in case, an applicant is a technology provider, it may change the EPC partner. However, if an applicant is an EPC company, it will not be allowed to change the technology provider.  Further, an applicant ( in case of EPC company) can submit two separate EOI with different technology provider. However, if an applicant is technology provider, he will not be allowed to submit more than one EOI application with different EPC company.


SN	Clause No.	Paragraph/Clause Text	Queries of Parties	NTPC Response
7	Section - II Information - § 2.8	The response(s) received in the EOI/ information received post feasibility study will be utilized by NTPC for: Shortlisting of parties for forthcoming Request for Proposals (RFP) / limited tenders by NTPC for undertaking demonstration/commercial project(s)	Please clarify on which stage the shortlist will be done	<p>Please refer Section-II clause no. 2.8, Quote:</p> <p><i>"The response(s) received in the EOI/ information received post feasibility study will be utilized by NTPC for:</i></p> <p><i>a. Identification for suitable technologies which fits the intended use cases</i> <i>AND/OR</i> <i>b. Formulation of specifications for various systems/stages required for execution of demonstration/commercial project(s)</i> <i>AND/OR</i> <i>c. Shortlisting of parties for forthcoming Request for Proposals (RFP) / limited tenders by NTPC for undertaking demonstration/commercial project(s)</i></p> <p><i>The Applicants may express their interest in respect of their offerings along with other inputs as indicated in relevant Annexures/formats."</i></p> <p>Unquote:</p> <p>As stated in above mentioned clause, suitable technology which fits the intended use case shall be shortlisted and tender document will be formulated based on data of short listed technologies. Mode of tendering will be decided based on the data of selected technology.</p>
8	Section - II Information - § 3.2	Routine maintenance of the systems for a period of 3 years from the date of commissioning	Please clarify if only 3 years maintenance is required from the applicant	Your understanding is correct.
9	Section - II Information - § 3.2	Sharing the stack and system level information for comprehensive understanding of the system	Please clarify if there are any minimum requirements under stack level information	The information shall be used for identification of suitable technology as well as formulation of technical specification and tender document. Hence, information may be provided considering this aspect.

SN	Clause No.	Paragraph/Clause Text	Queries of Parties	NTPC Response
10	Section-IV Consideration of Response	Responses that are incomplete, i.e., not accompanied by any of the applicable formats inter-alia covering letter power of attorney, applicable undertakings, provided in more details at annexure in Section-V	Please clarify if the submission of our estimated offer is accepted with authorized people to sign without accompanied with a power of attorney letter	Power of attorney Letter is required as per section-IV of EOI which states.  <i>"Responses shall be deemed non-responsive for following reasons:</i>  <i>• Responses that are incomplete, i.e., not accompanied by any of the applicable formats inter-alia covering letter power of attorney, applicable undertakings, provided in more details at annexure in Section-V.</i>  <i>• Responses not signed by authorized signatory and / or stamped in the manner indicated in this EOI."</i>
11	Section-V Application Form & Annexures Annexure 1	The entire document	Please clarify if this a mandatory document to be submitted with the EOI. From our point of view, this document imposes sting requirements which cannot be accepted at this preliminary stage where the responsibilities/liabilities are not clear	Please note that EOI is to get stake level information from the party and not to pose any stringent requirement. Same shall be considered accordingly and information sought shall be provided for responsiveness check as per section-IV of EOI. Further, roles and responsibilities given at clause no.3 of section-II are indicative.
12	Clause 2.2	In view of above, NTPC intends to set up a pilot project for thermal energy storage system either 10 MW/ 2 hrs. discharge duration OR 10MW/ 4 hours discharge duration based on techno economic analysis of the submitted data in this EOI, integrated with one of its existing coal power plant so that at low demand, the power plant's output can be curtailed by redirecting steam to heat storage media of thermal storage system. Further, when the power demand rises, the power plant's output could be readjusted by supplying additional heat from TESS in the form of steam. Therefore, with this philosophy, thermal power plant can continuously operate above economic load and at the same time can meet the requirement of grid stabilization.	1. Please clarify the use of steam from TESS: • Option-1: Usage in main and reheat steam with temperature and pressure requirements (please provide a heat balance diagram) or • Option-2: Usage as auxiliary steam requirements, with temperature, pressure, and mass flow rate requirements for TDBFP or 16ATA header  2. The power plant net output can be curtailed by redirecting steam or electricity to the heat storage media. We suggest amendment of EOI to include an option to redirect electricity to charge heat storage media. This will ensure capability to provide main steam at higher temperatures  Accordingly design and manufacturing cost will vary.	Intent of EOI is to set up pilot plant for thermal energy storage system coupled with steam water cycle of existing coal power plant which will store additional heat from steam cycle of plant when load demand at Generator output is low corresponding to boiler thermal load below technical minimum load and further stored energy from TESS will be discharged to steam cycle of plant while load demand at generator output will increase beyond the load corresponding to Boiler technical minimum load. Considering above, most efficient option shall be proposed by the party with technical justification to meet requirement of EOI. It may be noted that efficient system shall get weightage during bid evaluation in tender stage.
13	Clause 2.7	The intellectual property right (IPR) generated from the pilot project will be co-owned by NTPC and the applicant. NTPC shall not monetize the IPR (if any) developed through this pilot.	The intellectual property right (IPR) generated from the pilot project will be owned by the applicant at all times. NTPC shall not own/ monetize the IPR (if any) developed through this pilot.	IPR right for thermal energy storage system will remain with technology provider only. However, intellectual property rights for the process i.e. integration of thermal storage system with thermal power plant will be co-owned.

SN	Clause No.	Paragraph/Clause Text	Queries of Parties	NTPC Response
14	Clause 3.1	<p>NTPC'S Role-</p> <p>•NTPC shall provide power supply feeder from the nearest available switchgear. However complete electrical system from terminal point (power supply feeder at switchgear) onward shall be in the scope of vendor.</p>	<p>NTPC'S Role-</p> <p>•NTPC shall provide power supply through power supply feeder from the nearest available switchgear. However complete electrical system from terminal point (power supply feeder at switchgear) onward shall be in the scope of vendor.</p>	Agreed
15	Clause 3.1	<p>NTPC'S Role-</p>	<p>Addition of following roles-</p> <p>Providing design parameters and specific requirements like Feed water quality, temperature, pressure, Electrical single line</p>	Agreed. Heat balance diagram is attached. Further details will be shared during tender stage.

# Indicative Scheme



 <b>NTPC LIMITED</b> (A Government of India Enterprise)
<b>THERMAL POWER PROJECT</b>
<b>INDICATIVE SCHEME OF HEAT TO HEAT TYPE THERMAL STORAGE SYSTEM</b>

# Annexure-A

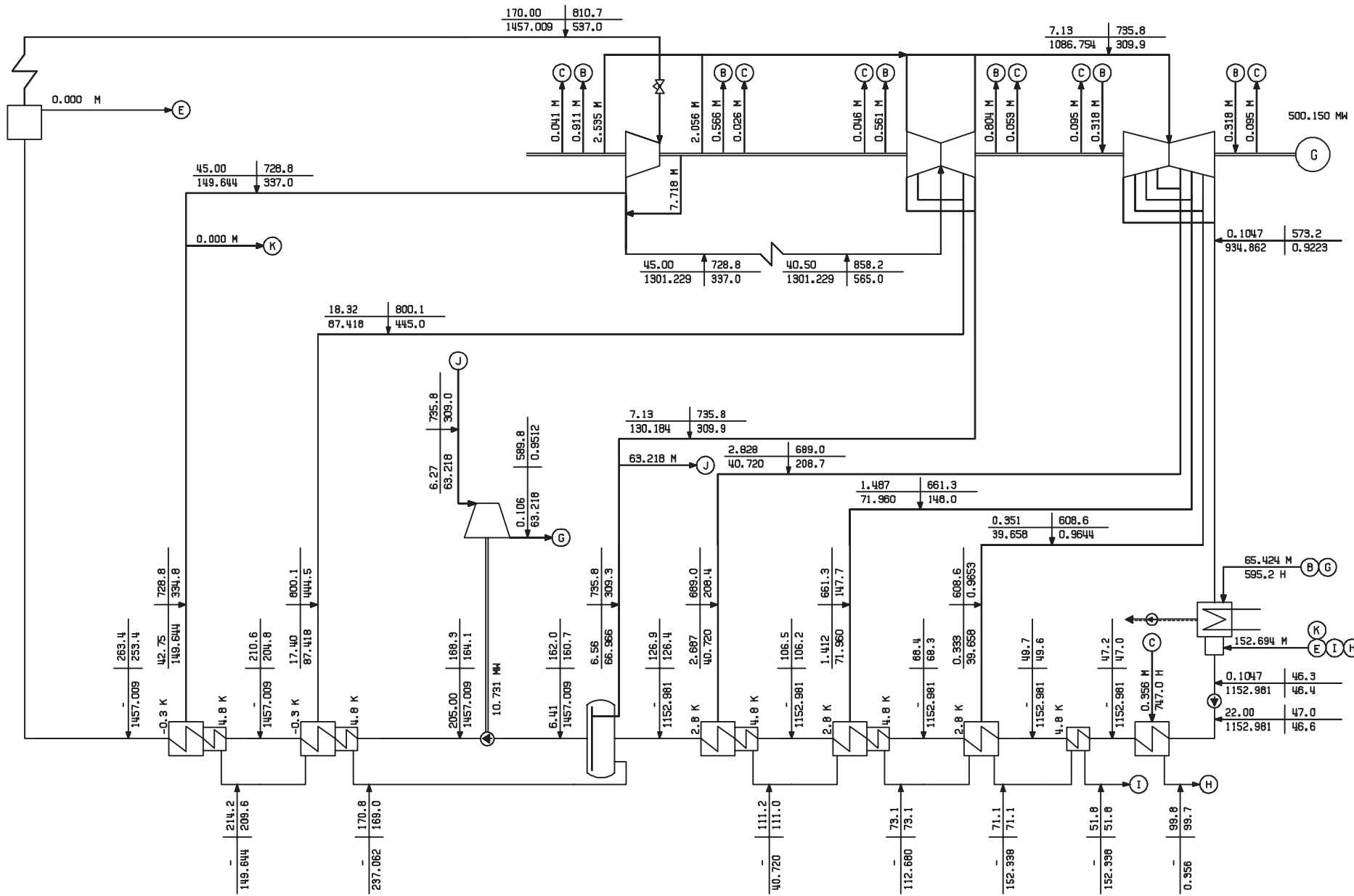
## HEAT BALANCE DIAGRAMS

Sl. No.	Document Title	Document Number
1	500MW 77MM HG(ABS) B.PR 0%MU.	PE-DC-336-100-N151
2	400MW 77MM HG(ABS) B.PR 0%MU.	PE-DC-336-100-N152
3	300MW 77MM HG(ABS) B.PR 0%MU.	PE-DC-336-100-N153
4	250MW 77MM HG(ABS) B.PR 0%MU.	PE-DC-336-100-N154
5	150MW 77MM HG(ABS) B.PR 0%MU.	PE-DC-336-100-N155
6	500MW 77MM HG(ABS) B.PR 3%MU.	PE-DC-336-100-N156
7	400MW 77MM HG(ABS) B.PR 3%MU.	PE-DC-336-100-N157
8	300MW 77MM HG(ABS) B.PR 3%MU.	PE-DC-336-100-N158
9	250MW 77MM HG(ABS) B.PR 3%MU.	PE-DC-336-100-N159
10	150MW 77MM HG(ABS) B.PR 3%MU.	PE-DC-336-100-N160
11	500MW 89MM HG(ABS) B.PR 3%MU.	PE-DC-336-100-N161
12	400MW 89MM HG(ABS) B.PR 3%MU.	PE-DC-336-100-N162
13	300MW 89MM HG(ABS) B.PR 3%MU	PE-DC-336-100-N163
14	250MW 89MM HG(ABS) B.PR 3%MU.	PE-DC-336-100-N164
15	150MW 89MM HG(ABS) B.PR 3%MU.	PE-DC-336-100-N165
16	VWO 77MM HG(ABS) B.PR 3%MU.	PE-DC-336-100-N166
17	VWO 77MM HG(ABS) B.PR 0%MU.	PE-DC-336-100-N167
18	VWO 89MM HG(ABS) B.PR 0%MU.	PE-DC-336-100-N168
19	VWO 89MM HG(ABS) B.PR 3%MU.	PE-DC-336-100-N169
20	500MW 77MM HG(ABS) B.PR 3%MU. BOTH HPH OUT	PE-DC-336-100-N170
21	500MW 89MM HG(ABS) B.PR 3%MU. BOTH HPH OUT	PE-DC-336-100-N171
22	MAX. OUTPUT 3%MU 0.1047 ATA BACK PR. BOTH HP HEATERS OUT	PE-DC-336-100-N172
23	MAX. OUTPUT 3%MU 0.1210 ATA BACK PR. BOTH HP HEATERS OUT	PE-DC-336-100-N173
24	MAX. OUTPUT 77MM HG(ABS) B.PR 0%MU BOTH HPH OUT	PE-DC-336-100-N174
25	MAX. OUTPUT 89MM HG(ABS) B.PR 0%MU BOTH HPH OUT	PE-DC-336-100-N175
26	MAX. OUTPUT 77MM HG(ABS) B.PR 0%MU ONE STRING OF HPHS OUT	PE-DC-336-100-N176



27	MAX. OUTPUT 77MM HG(ABS) B.PR 3%MU ONE STRING OF HPHS OUT	PE-DC-336-100-N177
28	MAX. OUTPUT 89MM HG(ABS) B.PR 3%MU ONE STRING OF HPHS OUT	PE-DC-336-100-N178
29	MAX. OUTPUT 89MM HG(ABS) B.PR 0%MU ONE STRING OF HPHS OUT	PE-DC-336-100-N179
30	500MW 77MM HG(ABS) B.PR 0%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N180
31	500MW 77MM HG(ABS) B.PR 3%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N181
32	400MW 77MM HG(ABS) B.PR 0%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N182
33	400MW 77MM HG(ABS) B.PR 3%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N183
34	400MW 77MM HG(ABS) B.PR 0%MU. MOD. SLIDING PRESSURE OPERATION	PE-DC-336-100-N184
35	400MW 77MM HG(ABS) B.PR 3%MU. MOD. SLIDING PRESSURE OPERATION	PE-DC-336-100-N185
36	300MW 77MM HG(ABS) B.PR 0%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N186
37	300MW 77MM HG(ABS) B.PR 0%MU MOD. SLIDING PRESSURE OPERATION	PE-DC-336-100-N187
38	300MW 77MM HG(ABS) B.PR 3%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N188
39	300MW 77MM HG(ABS) B.PR 3%MU. MOD. SLIDING PRESSURE OPERATION	PE-DC-336-100-N189
40	250MW 77MM HG(ABS) B.PR 0%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N190
41	250MW 77MM HG(ABS) B.PR 3%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N191
42	250MW 77MM HG(ABS) B.PR 0%MU. MOD. SLIDING PRESSURE OPERATION	PE-DC-336-100-N192
43	250MW 77MM HG(ABS) B.PR 3%MU. MOD. SLIDING PRESSURE OPERATION	PE-DC-336-100-N193
44	150MW 77MM HG(ABS) B.PR 0%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N194
45	150MW 77MM HG(ABS) B.PR 3%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N195
46	150MW 77MM HG(ABS) B.PR 0%MU. MOD. SLIDING PRESSURE OPERATION	PE-DC-336-100-N196
47	150MW 77MM HG(ABS) B.PR 3%MU. MOD. SLIDING PRESSURE OPERATION	PE-DC-336-100-N197
48	500MW 89MM HG(ABS) B.PR 3%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N198
49	400MW 89MM HG(ABS) B.PR 3%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N199
50	400MW 89MM HG(ABS) B.PR 3%MU. MOD.SLIDING PRESSURE OPERATION	PE-DC-336-100-N200
51	300MW 89MM HG(ABS) B.PR 3%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N201
52	300MW 89MM HG(ABS) B.PR 3%MU. MOD. SLIDING PRESSURE OPERATION	PE-DC-336-100-N202
53	250MW 89MM HG(ABS) B.PR 3%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N203
54	250MW 89MM HG(ABS) B.PR 3%MU. MOD. SLIDING PRESSURE OPERATION	PE-DC-336-100-N204
55	150MW 89MM HG(ABS) B.PR 3%MU. SLIDING PRESSURE OPERATION	PE-DC-336-100-N205
56	150MW 89MM HG(ABS) B.PR 3%MU. MOD. SLIDING PRESSURE OPERATION	PE-DC-336-100-N206
57	HP/LP BYPASS 3%MU TOP HEATER OUT OF SERVICE	PE-DC-336-100-N207

58	PARALLEL OPERATION	PE-DC-336-100-N208
59	HP/LP BYPASS SLIDING PR. OPERATION 0%MU TOP HEATER OUT	PE-DC-336-100-N209
60	325 MW 0%MU 0.1047 ATA BACK PR.	PE-DC-336-100-N210
61	325 MW 3%MU 0.1047 ATA BACK PR.	PE-DC-336-100-N215
62	325 MW 0%MU 0.1210 ATA BACK PR.	PE-DC-336-100-N216
63	325 MW 3%MU 0.1210 ATA BACK PR.	PE-DC-336-100-N217
64	300 MW 3%MU 33 DEG C CW TEMP. HALF CONDENSER OPERATION	PE-DC-336-100-N219
65	HOUSE LOAD OPERATION	PE-DC-336-100-N220
66	BMCR/VWO 3%MU 0.1047 ATA BACK PR.	PE-DC-336-100-N249



a

TURBINE GROSS OUTPUT = 508.489 MW  
 LESS MECH LOSSES = 1.444 MW  
 LESS GENERATOR LOSSES = 6.895 MW  
 LESS POWER REQD FOR TG INTEGRAL AUX = 0.150 MW

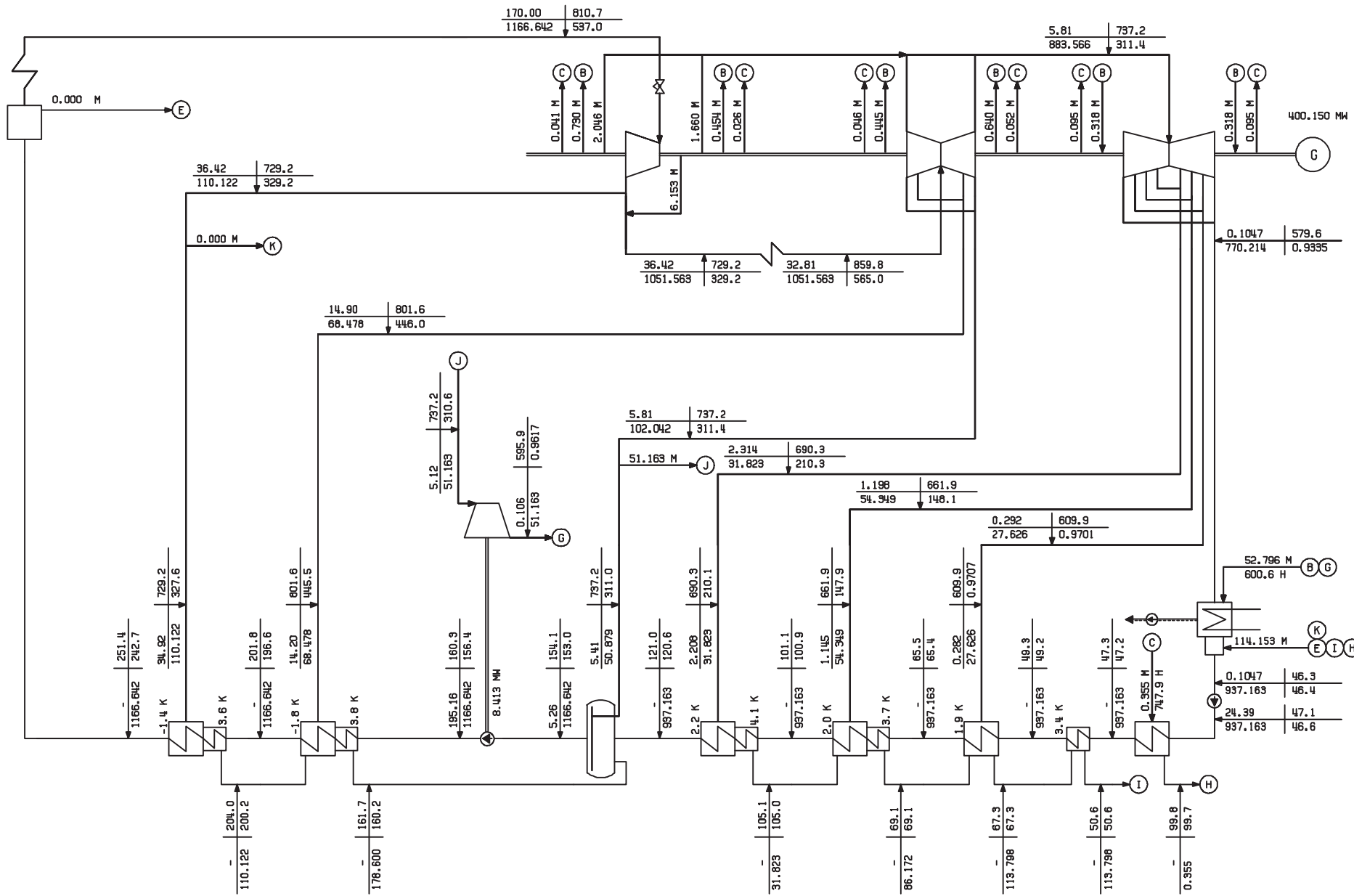
TURBINE NET OUTPUT = 500.000 MW

HEAT RATE = 1932 KCAL/KWHR

AT	KCAL/KG
T/H	*C (X)

M. . . MASS FLOW. . . T/H  
 H. . . ENTHALPY. . . KCAL/KG

PREP		500MW 0%MU 0.1047 ATR BACK PR.
CHKD		
APPD	JOB NO 336	
DATE 18.04.09	DRG NO PE - DC - 336 - 100-NI51	REV 00



a

TURBINE GROSS OUTPUT = 407.068 MW  
 LESS MECH LOSSES = 1.444 MW  
 LESS GENERATOR LOSSES = 5.474 MW  
 LESS POWER REQD FOR TG INTEGRAL AUX = 0.150 MW

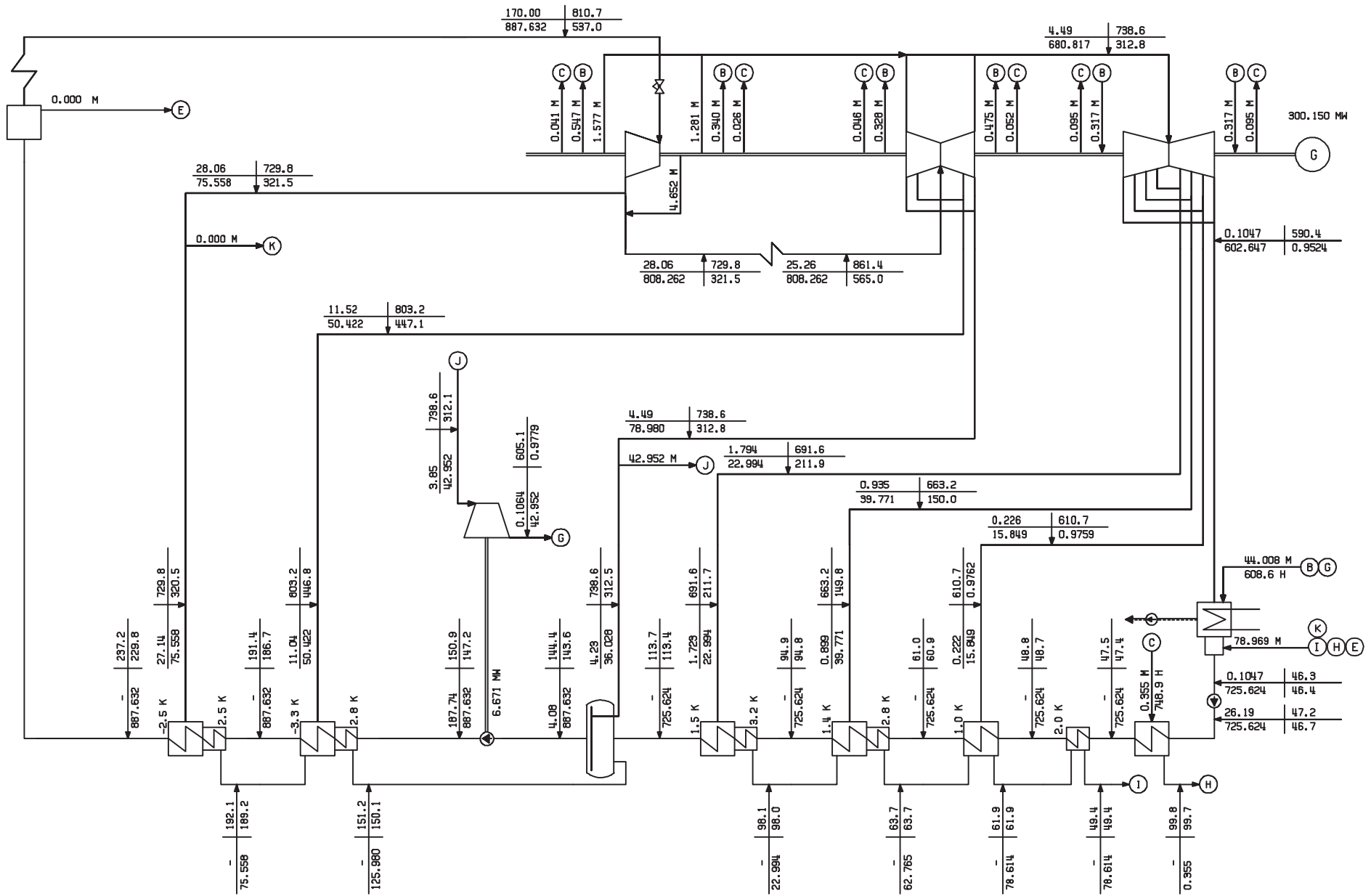
TURBINE NET OUTPUT = 400.000 MW

HEAT RATE = 1975 KCAL/KWHR

AT	KCAL/KG
T/H	*C (X)

M... MASS FLOW... T/H  
 H... ENTHALPY... KCAL/KG

PREP		400MW 0%MU 0.1047 ATR BACK PR.
CHKD		
APPD	JOB NO 336	
DATE	18.04.09	DRG NO PE - DC - 336-100-N152 REV 00

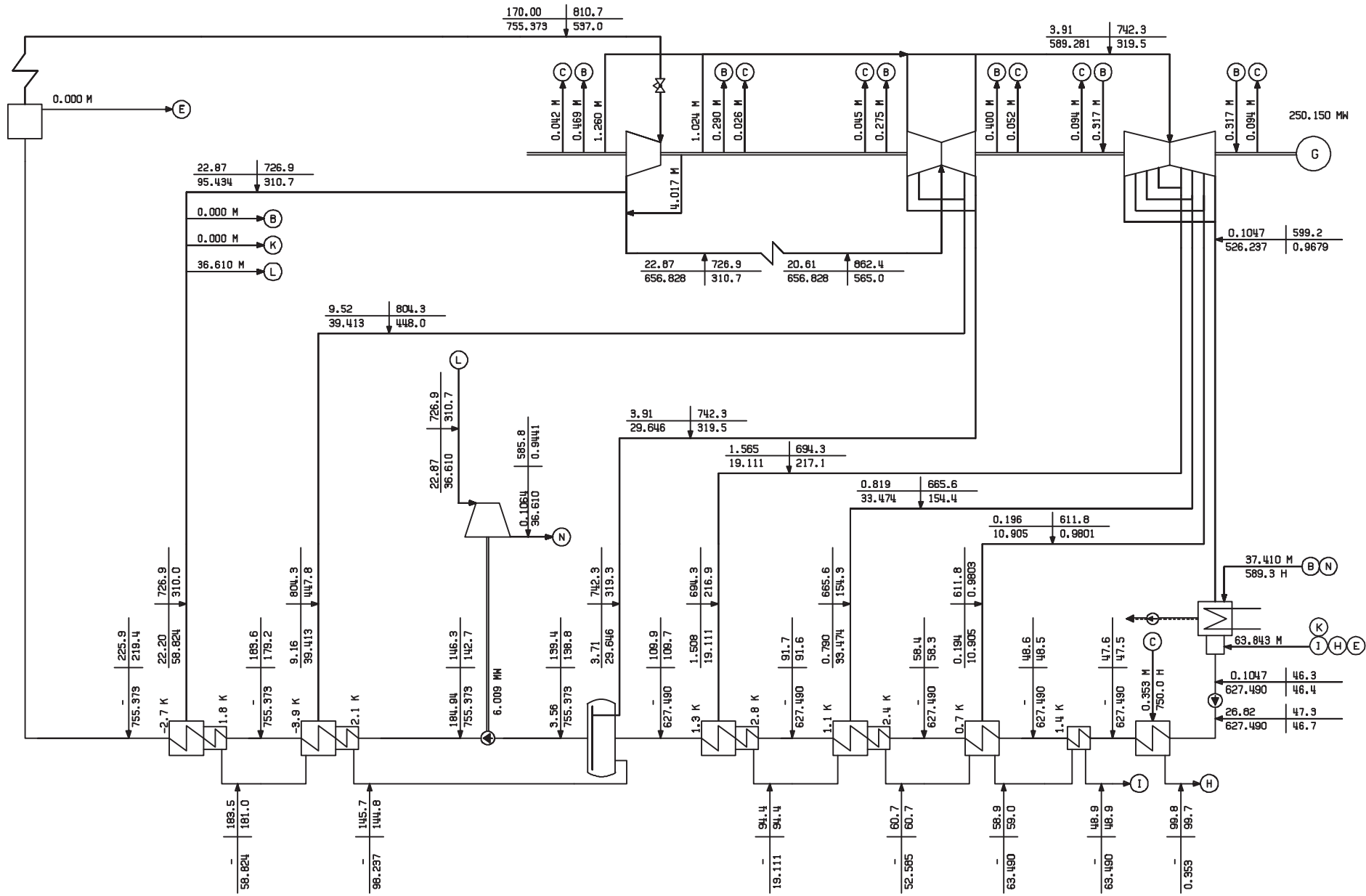


a

AT	KCAL/KG
T/H	*C (X)

M. . . . MASS FLOW. . . . T/H  
 H. . . . ENTHALPY. . . . KCAL/KG

PREP			
CHKD		300MW OXMU 0.1047 AT BACK PR.	
APPD		JOB NO 336	
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N153	REV 00

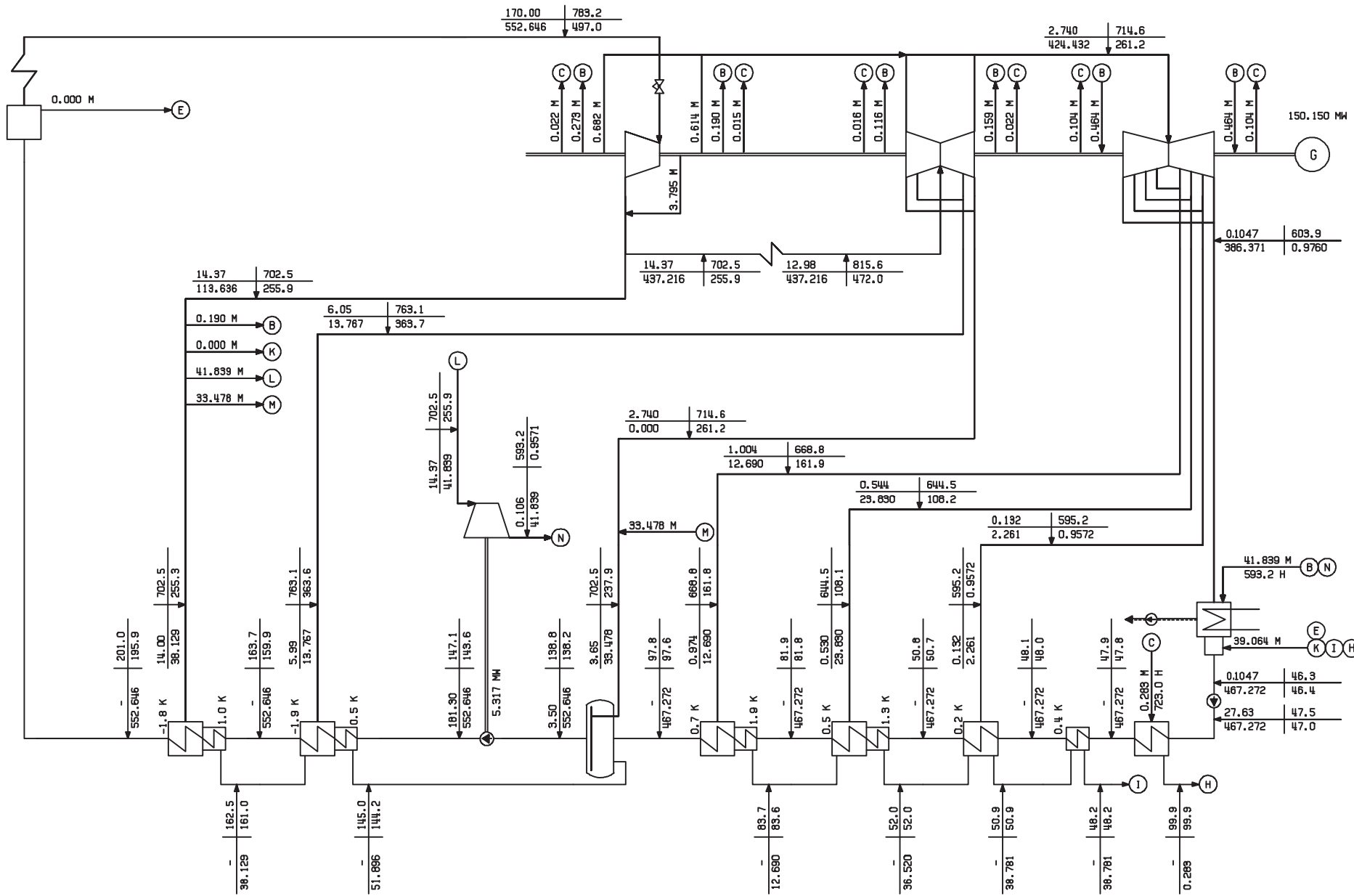


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AT	KCAL/KG
T/H	*C (X)

M. ... MASS FLOW. ... T/H  
 H. ... ENTHALPY. ... KCAL/KG

PREP	
CHKD	250MM OXMU 0.1047 ATA BACK PR.
APPD	JOB NO 336
DATE	18.04.09 DRG NO PE - DC - 336 - 100-N154 REV 00

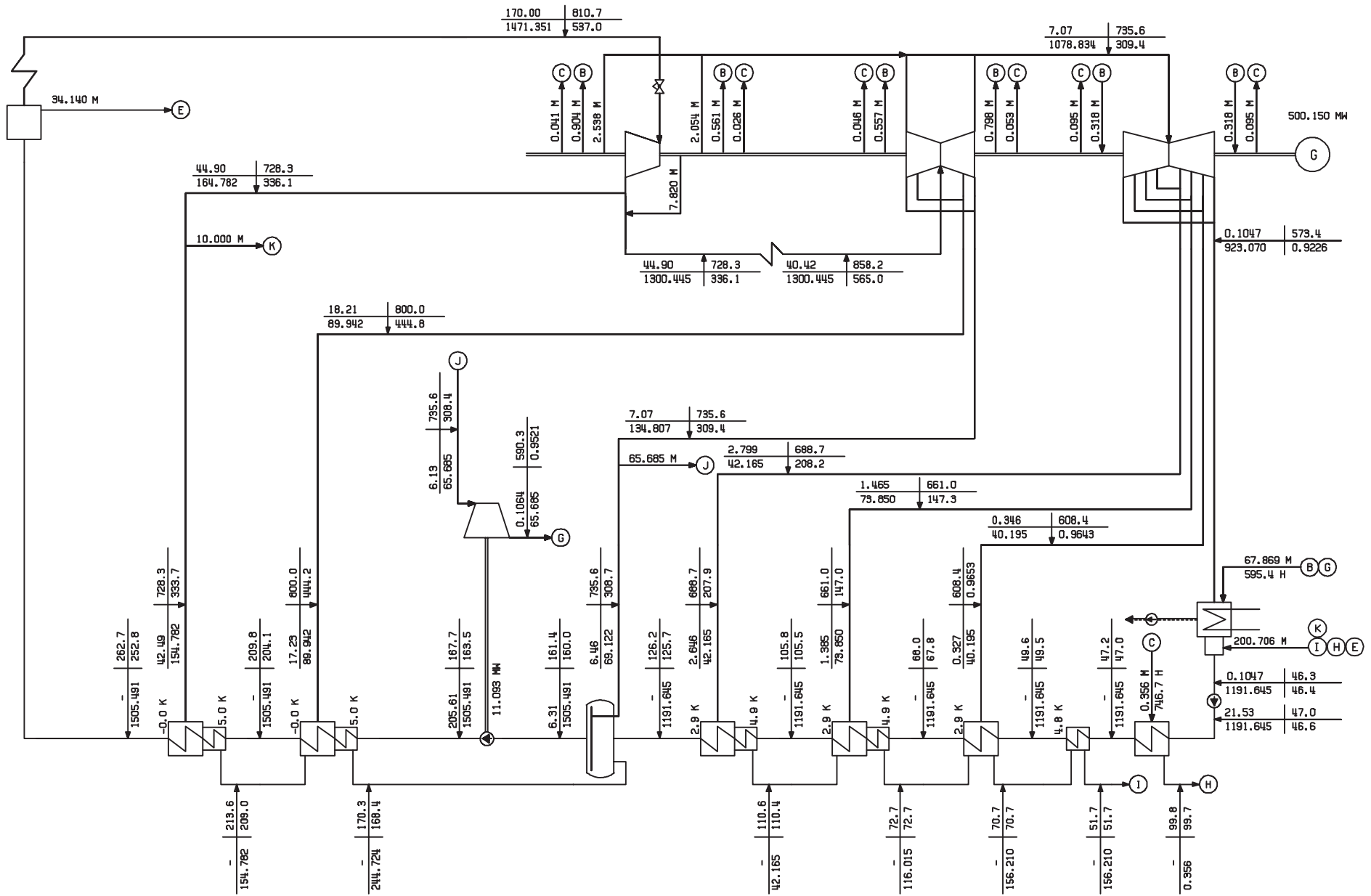


a

AT	KCAL/KG
T/H	*C (X)

M . . . MASS FLOW . . . T/H  
H . . . ENTHALPY . . . . . KCAL/KG

PREP		150MW OXMU 0.1047 ATA BACK PR.
CHKD		
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N155 REV 00

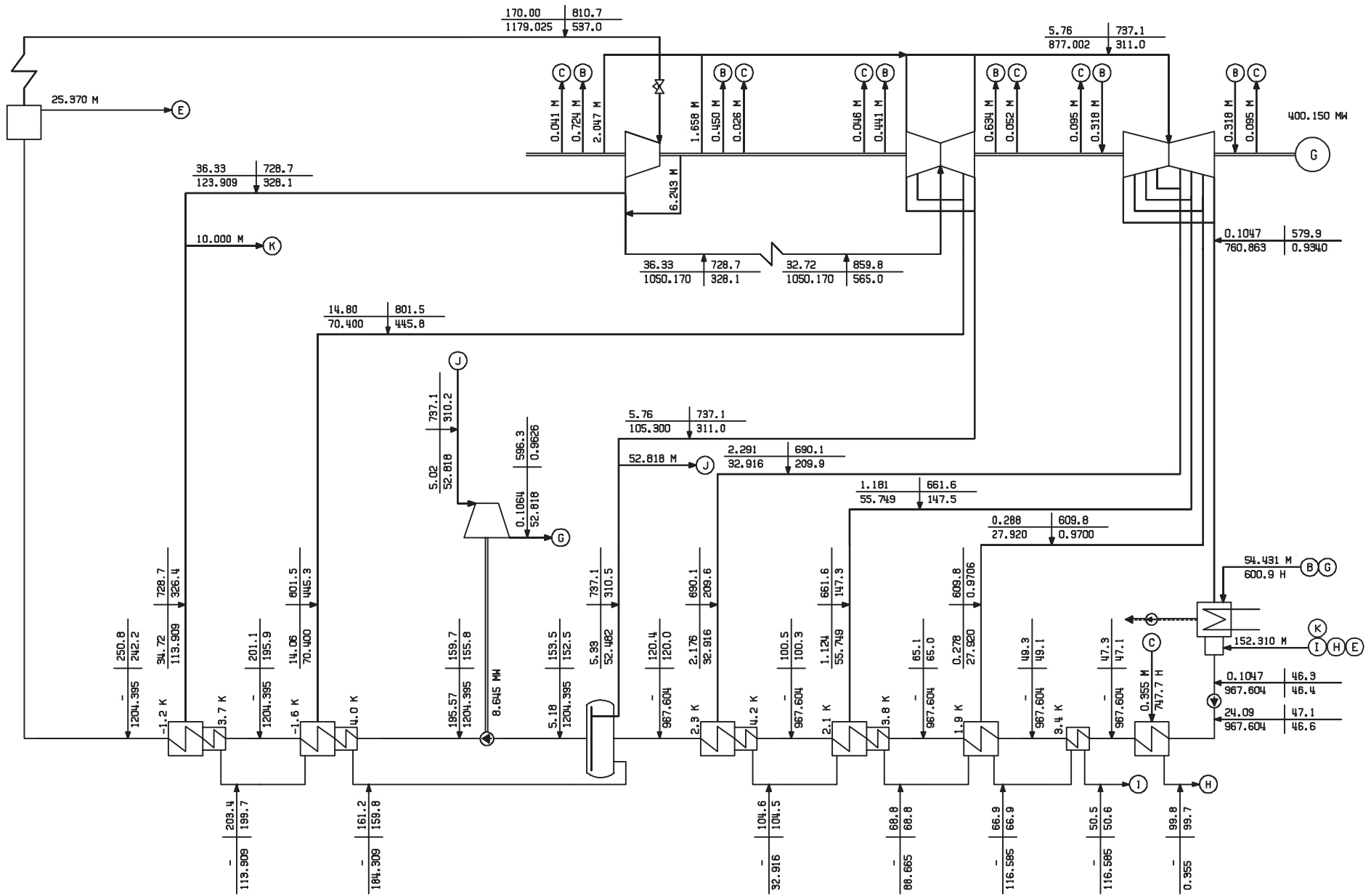


AT	KCAL/KG
T/H	*C (X)

M. ... MASS FLOW. ... T/H  
H. ... ENTHALPY. ... KCAL/KG

PREP		
CHKD		500MW 3XMU 0.1047 ATB BACK PR.
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N156 REV 00



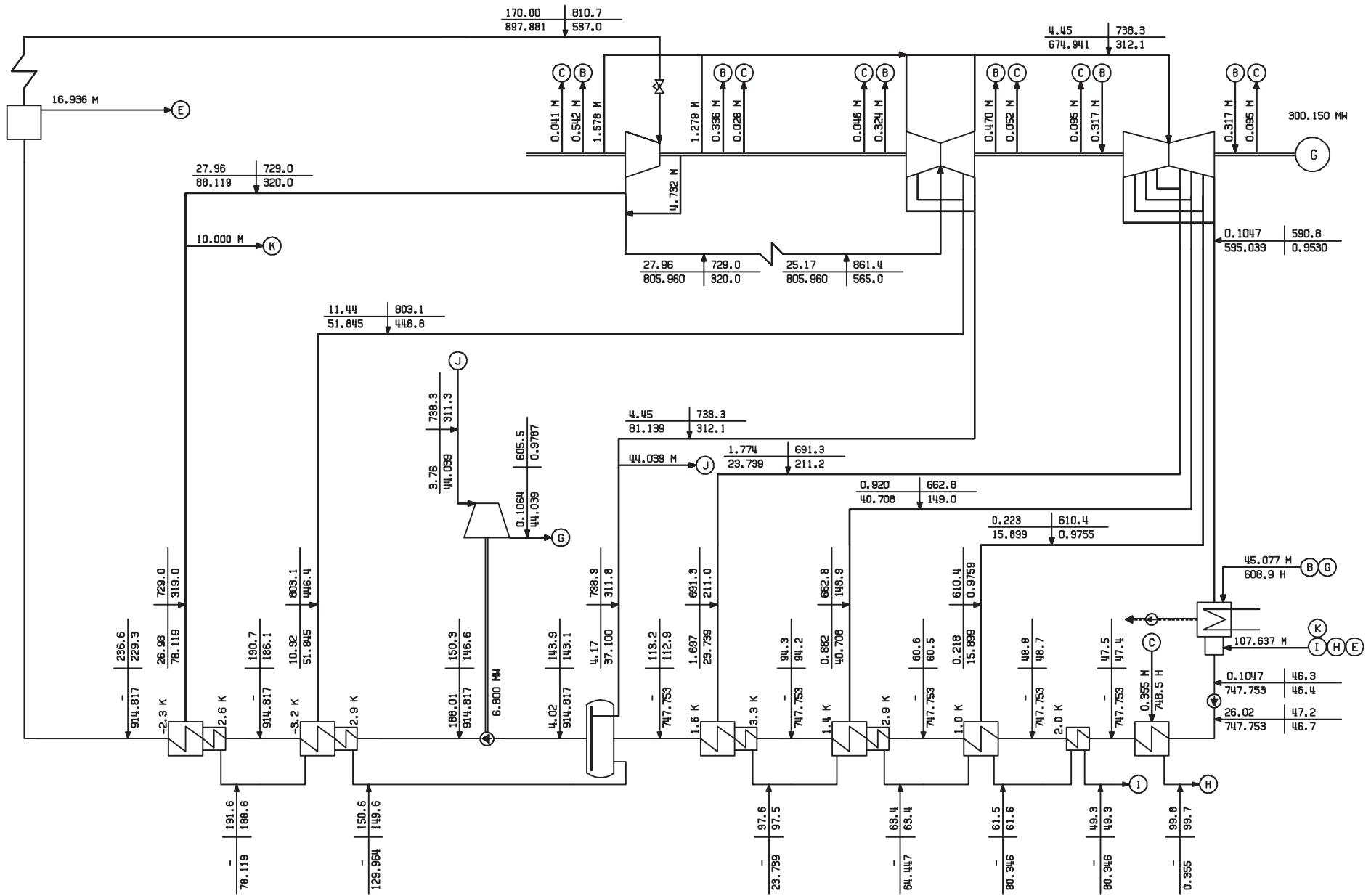


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AT	KCAL/KG
T/H	*C (X)

M. ... MASS FLOW. ... T/H  
 H. ... ENTHALPY. ... KCAL/KG

PREP		
CHKD		400MW 3XMU 0.1047 ATA BACK PR.
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N157 REV 00

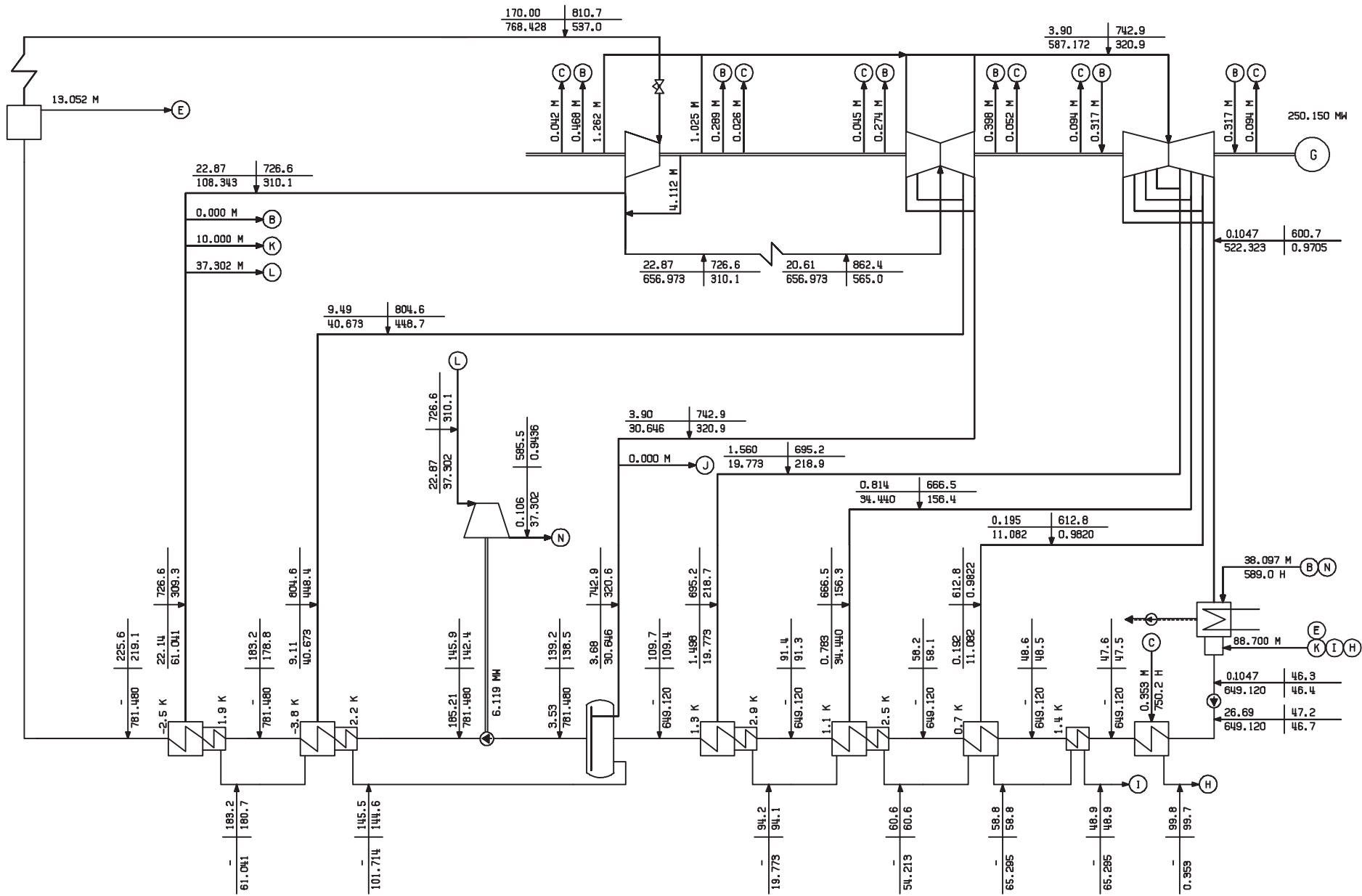


a

AT	KCAL/KG
T/H	*C (X)

M. . . . MASS FLOW. . . . T/H  
 H. . . . ENTHALPY. . . . KCAL/KG

PREP		
CHKD		300MW 3XMU 0.1047 ATB BACK PR.
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N158 REV 00

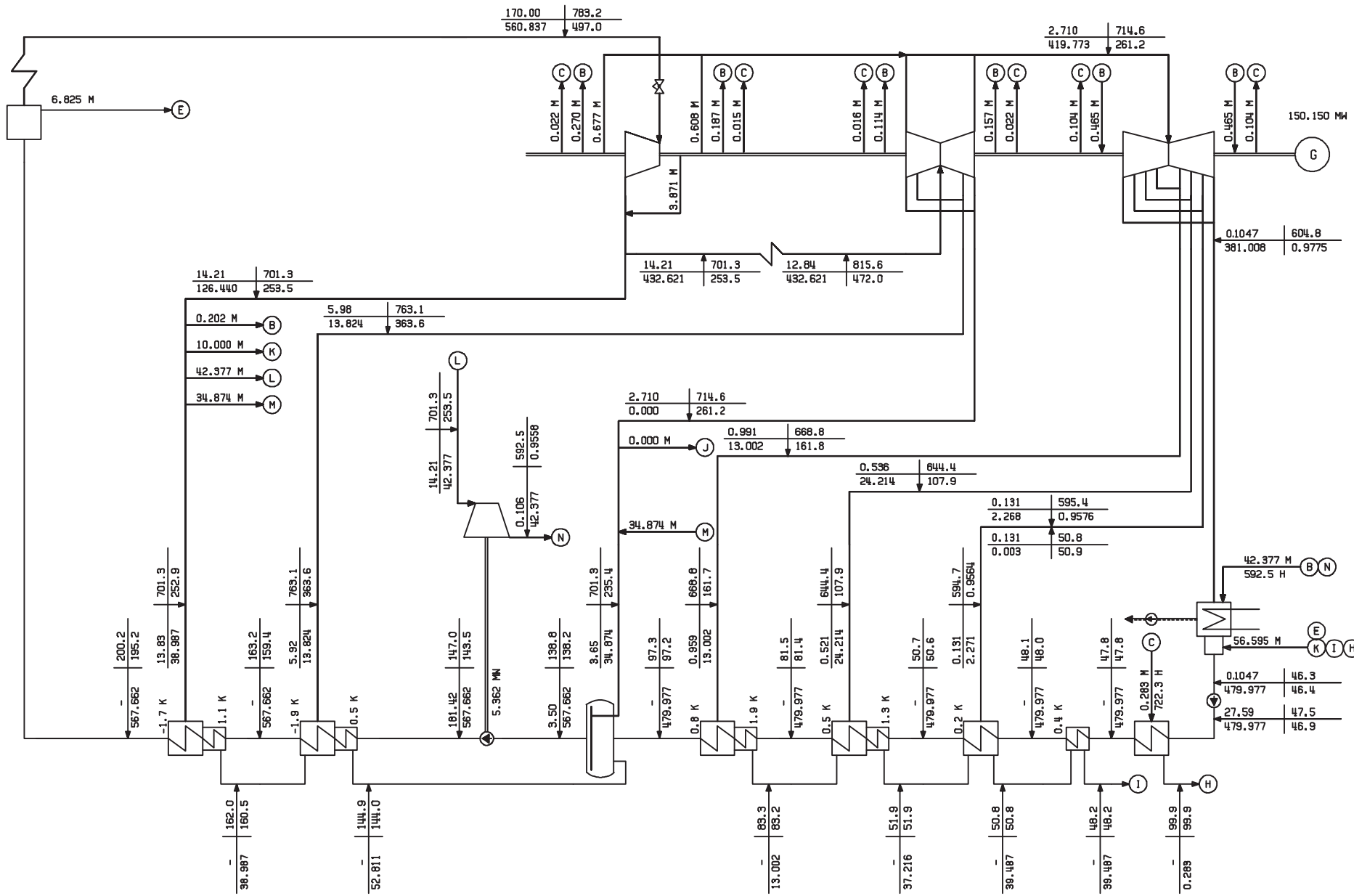


a

AT | KCAL/KG  
 T/H | \*C (X)

M. . . . MASS FLOW. . . . T/H  
 H. . . . ENTHALPY. . . . KCAL/KG

PREP		250MW 3%MU 0.1047 ATA BACK PR.
CHKD		
APPD	JOB NO 336	
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N159 REV 00

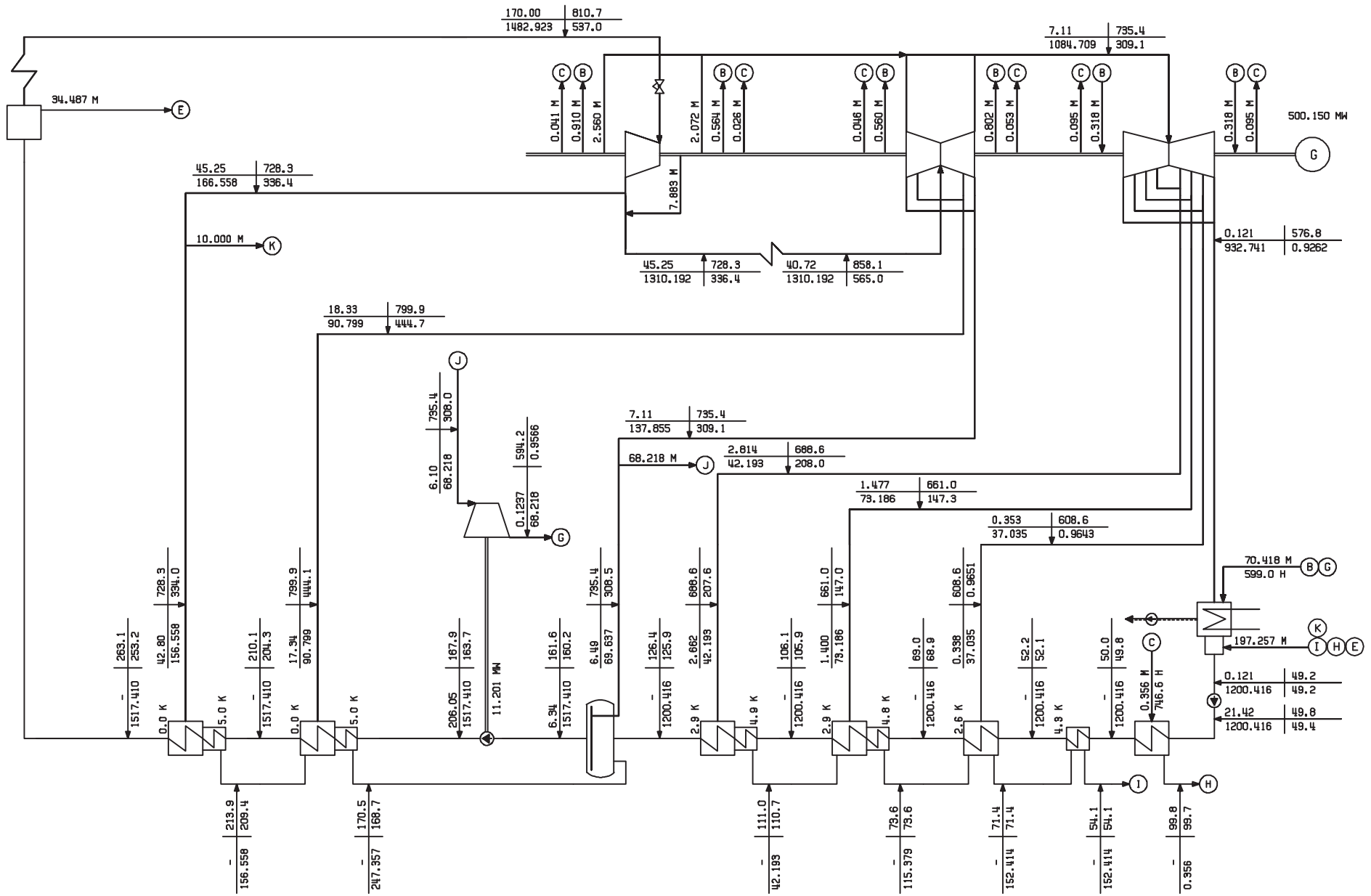


a

AT	KCAL/KG
T/H	*C (X)

M. . . . MASS FLOW. . . . T/H  
H. . . . ENTHALPY. . . . KCAL/KG

PREP				
CHKD				150MW 3%MU 0.1047 ATA BACK PR.
APPD			JOB NO 336	
DATE	18.04.09	DRG NO	PE - DC - 336 - 100-N160	REV 00

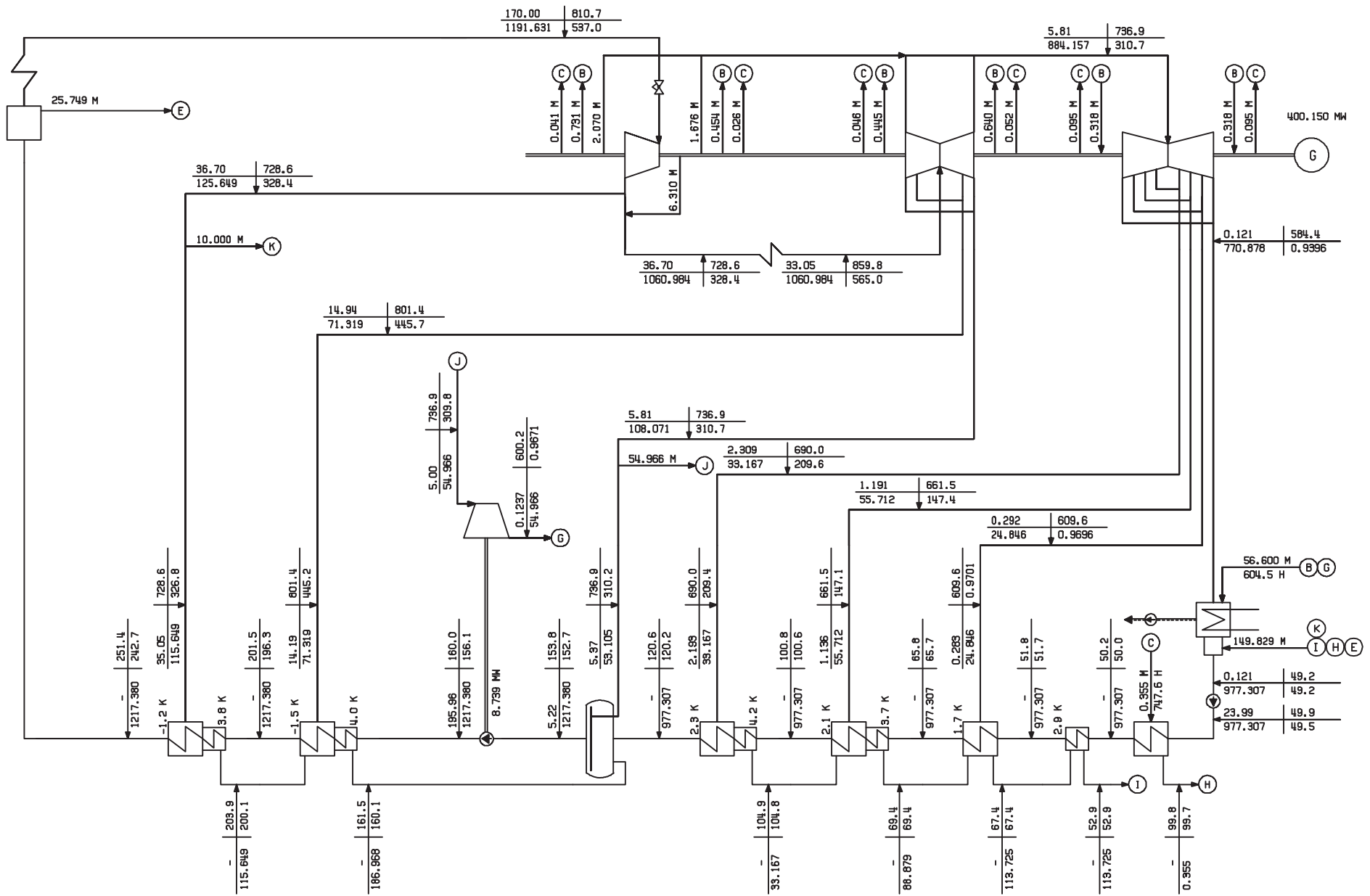


a

AT	KCAL/KG
T/H	*C (<X>)

M. . . . MASS FLOW. . . . T/H  
 H. . . . ENTHALPY. . . . KCAL/KG

PREP		
CHKD		500MM 3%MU 0.1210 ATA BACK PR.
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N161 REV 00

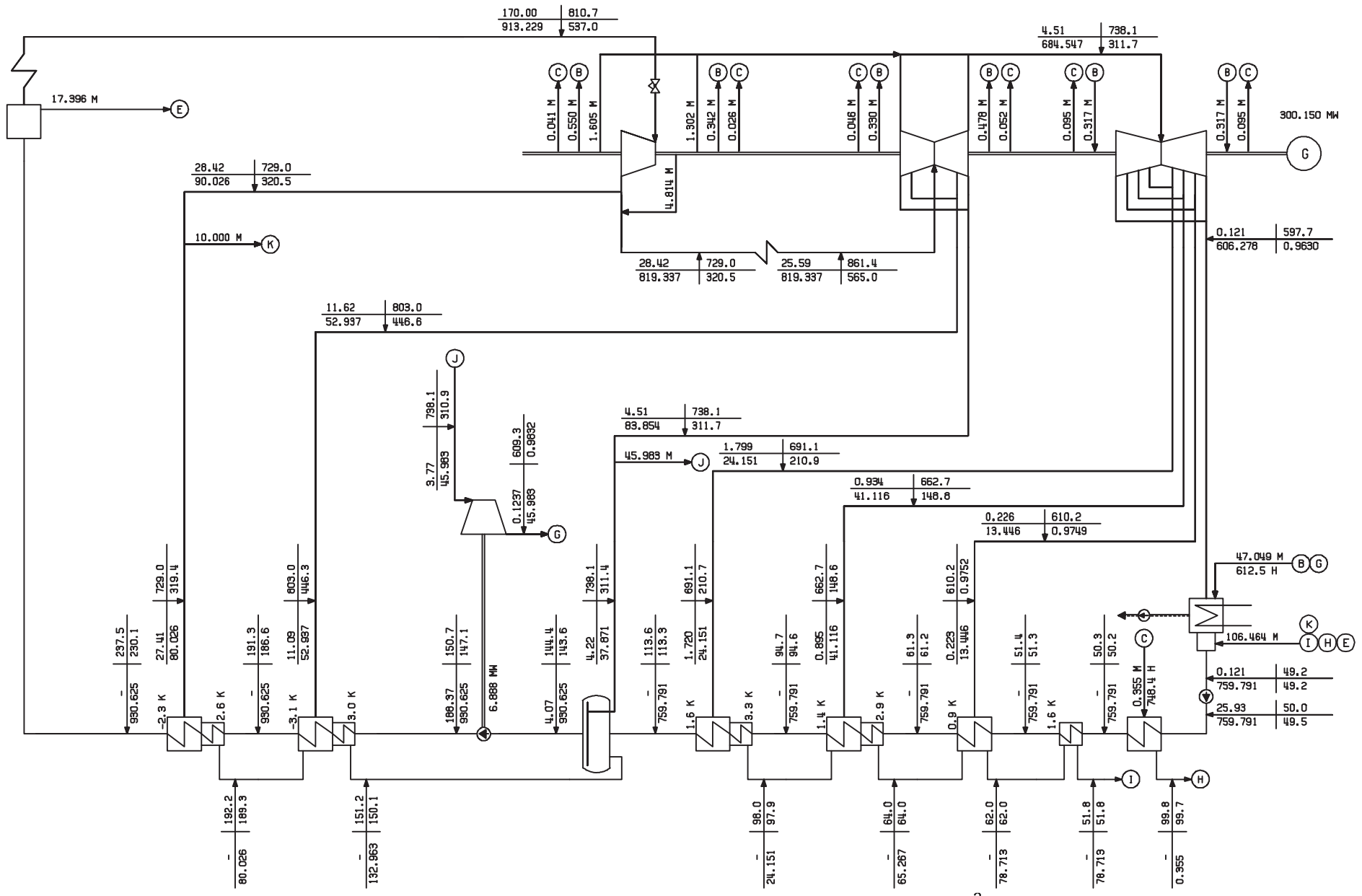


a

AT	KCAL/KG
T/H	*C (<X)

M. ... MASS FLOW. ... T/H  
 H. ... ENTHALPY. .... KCAL/KG

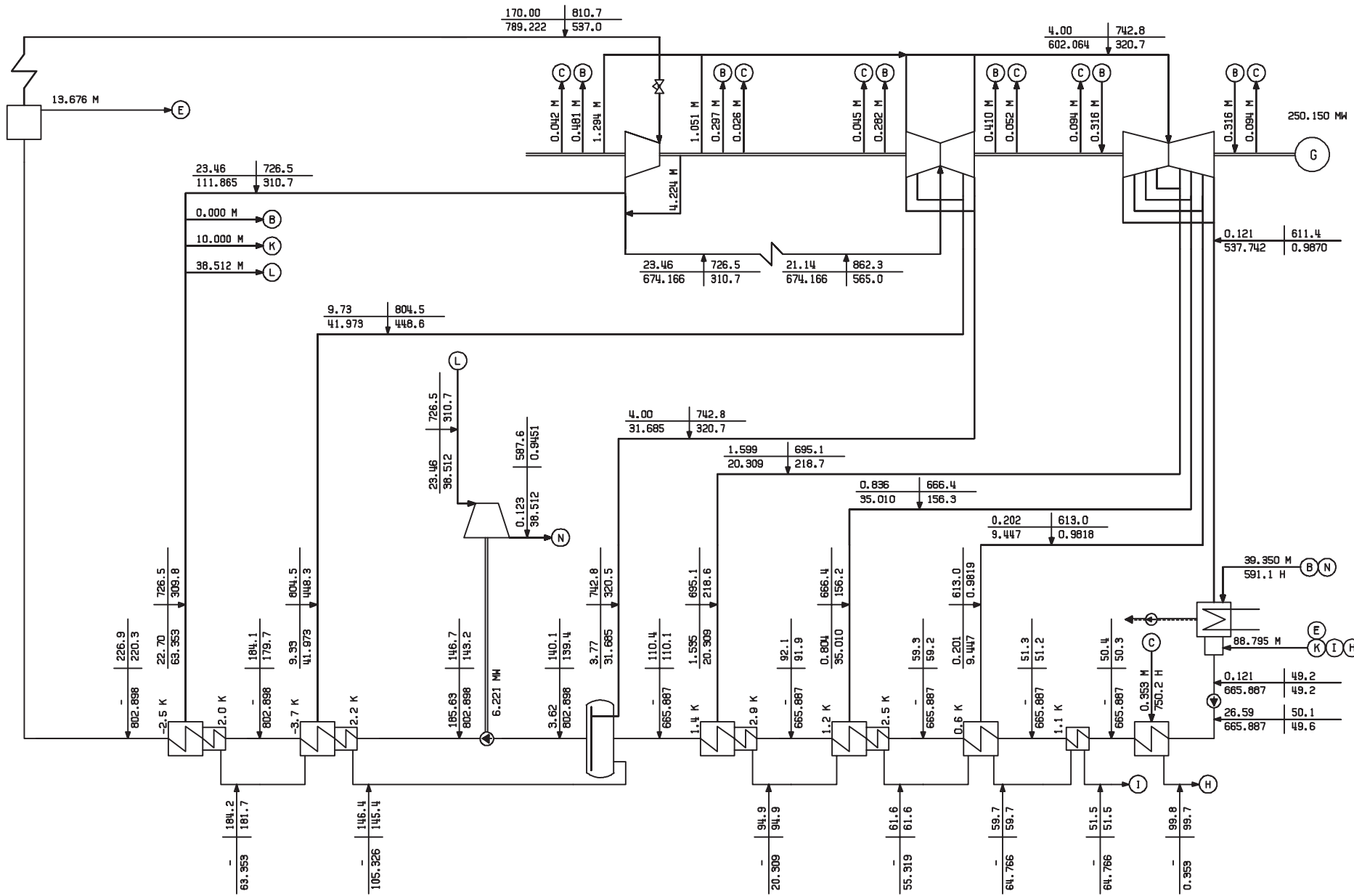
PREP		400MW 3XMU 0.1210 ATA BACK PR.
CHKD		
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N162 REV 00



AT | KCAL/KG  
T/H | °C (X)

M. . . . MASS FLOW. . . . T/H  
H. . . . ENTHALPY. . . . KCAL/KG

PREP		
CHKD		300MM 3XMU 0.1210 ATA BACK PR.
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N163 REV 00

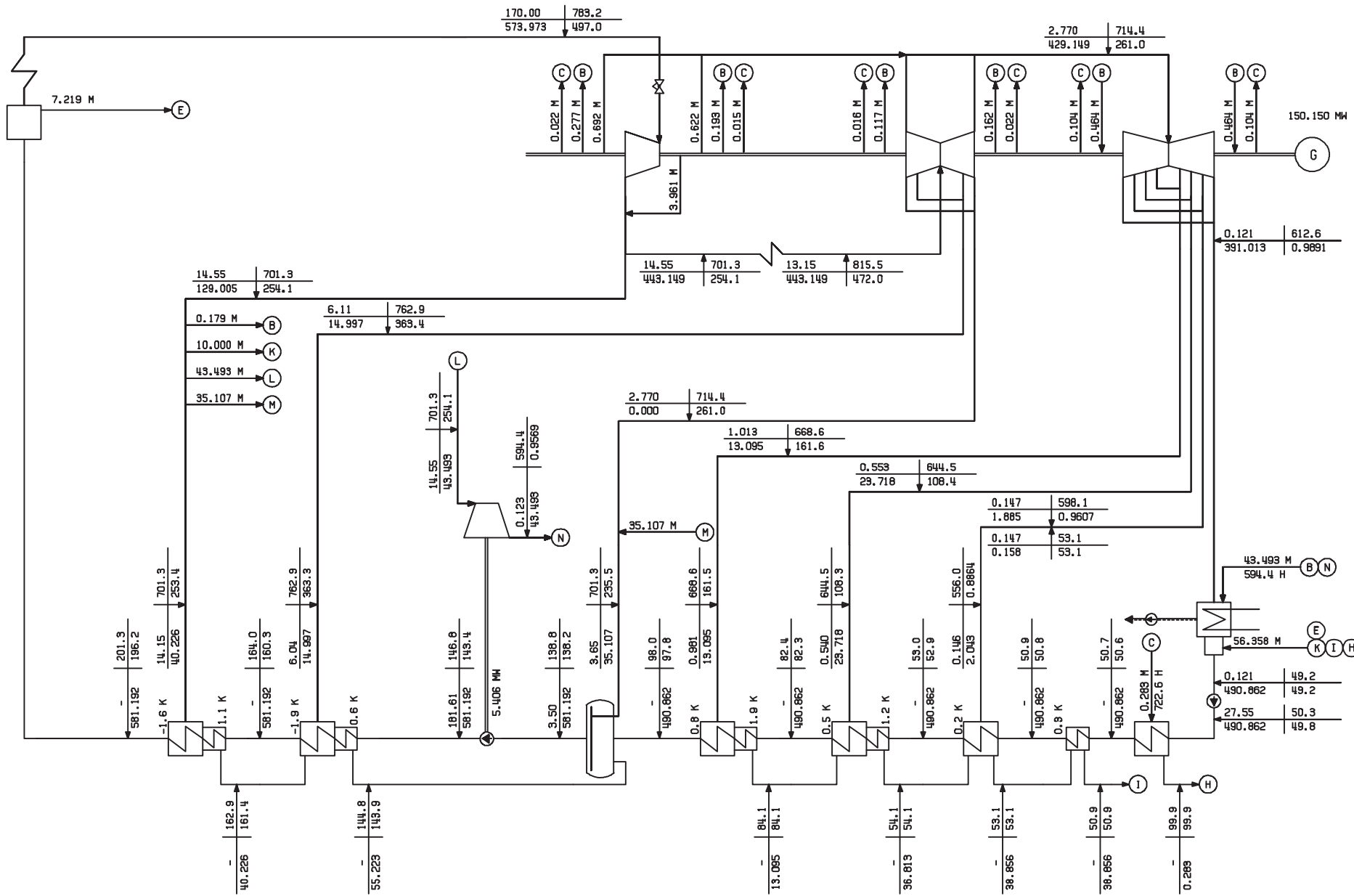


AT | KCAL/KG  
T/H | \*C (X)

M... MASS FLOW... T/H  
H... ENTHALPY... KCAL/KG

PREP		
CHKD		250MW 3%MU 0.1210 ATA BACK PR.
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N164 REV 00



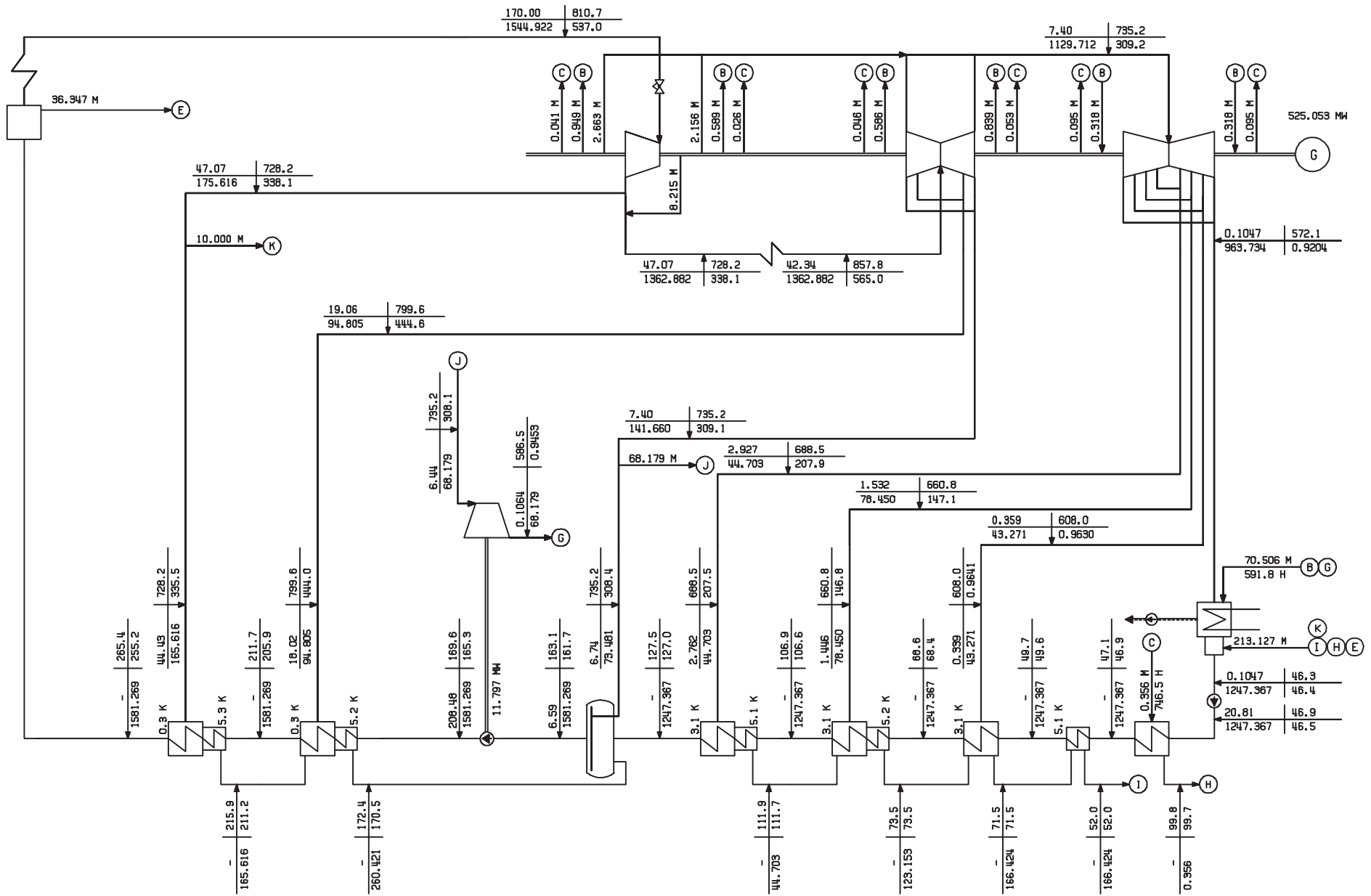


a

AT	KCAL/KG
T/H	*C (X)

M. . . . MASS FLOW. . . . T/H  
 H. . . . ENTHALPY. . . . KCAL/KG

PREP		150MW 3%MU 0.1210 ATA BACK PR.
CHKD		
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N165 REV 00

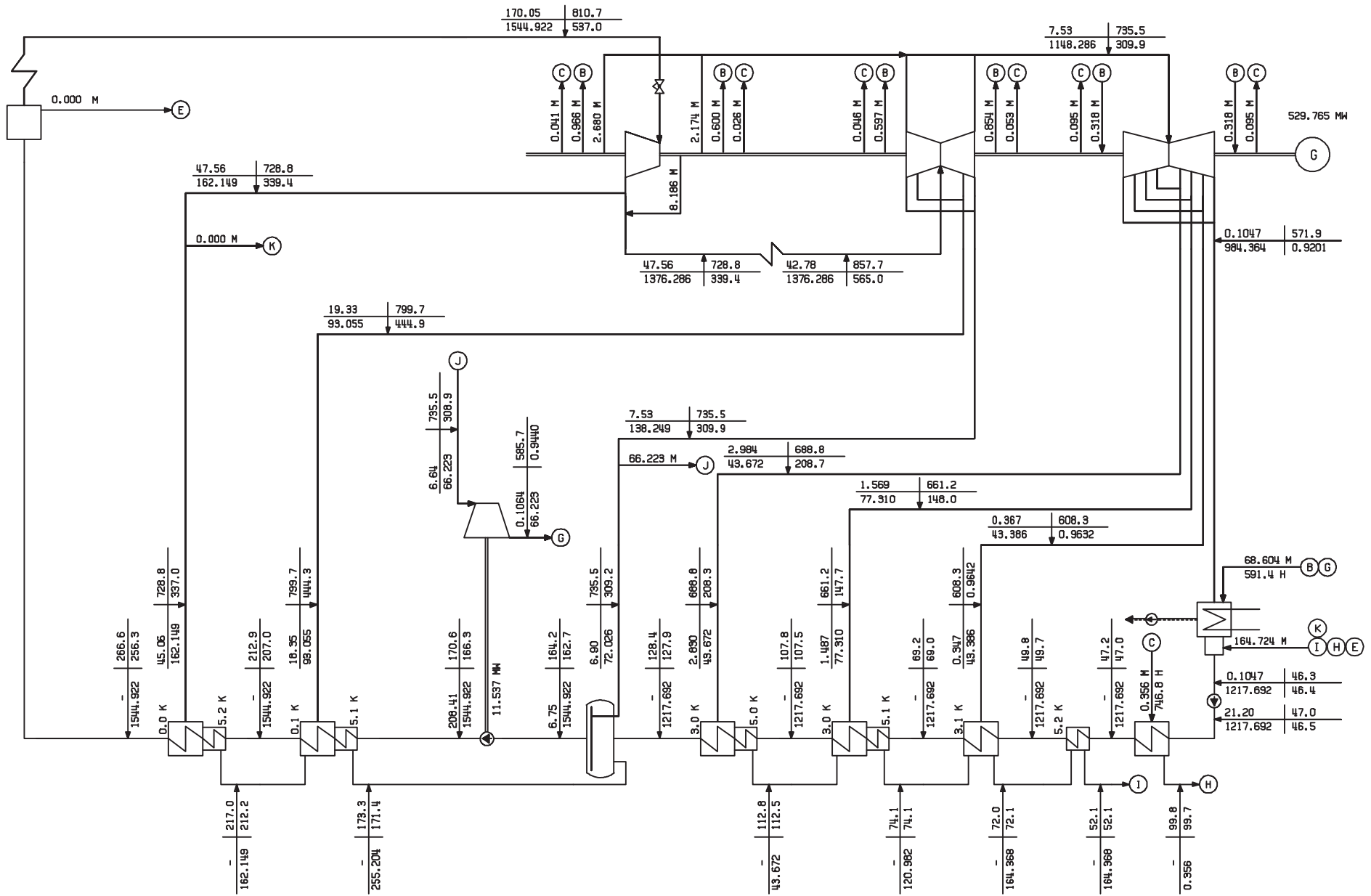


a

AT | KCAL/KG  
T/H | °C (X)

M. ... MASS FLOW. ... T/H  
H. ... ENTHALPY. ... KCAL/KG

PREP		
CHKD		VMO 3%MU 0.1047 ATA BACK PR.
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N166 REV 00

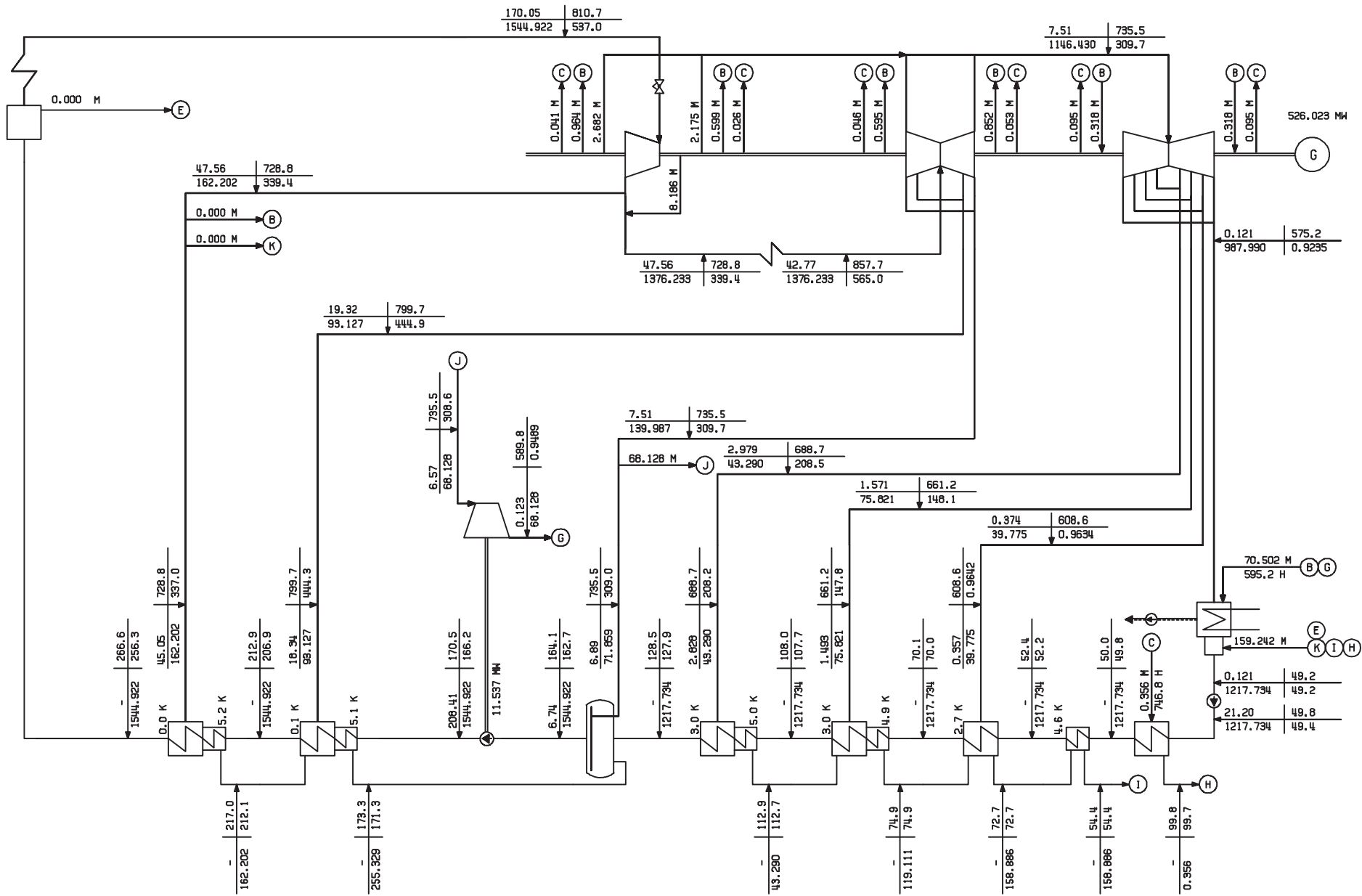


a

AT	KCAL/KG
T/H	*C (X)

M. ... MASS FLOW. ... T/H  
 H. ... ENTHALPY. ... KCAL/KG

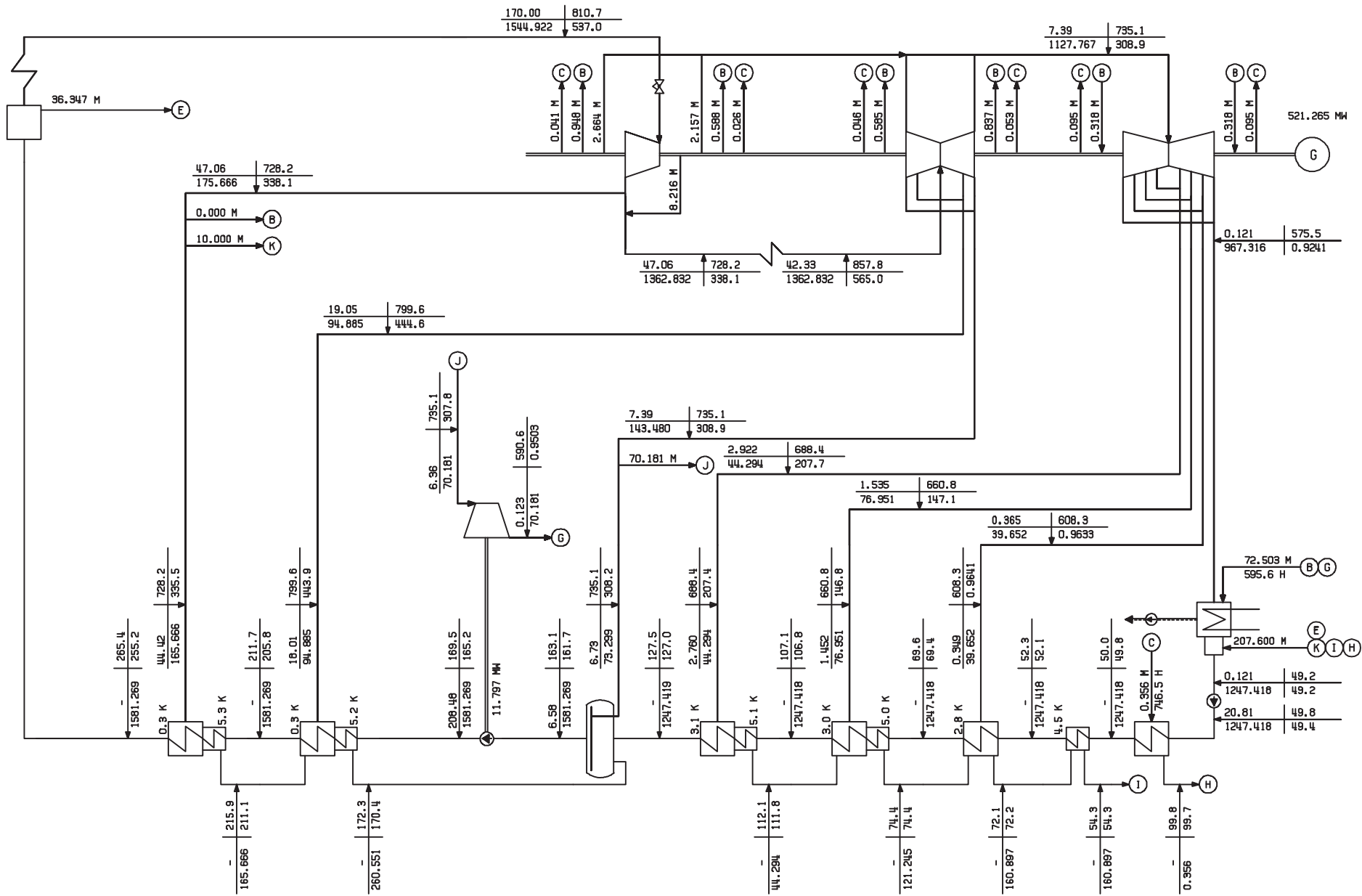
PREP		VMO 02MU 0.1047 ATA BACK PR.
CHKD		
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N167 REV 00



AT	KCAL/KG
T/H	*C (X)

M. . . . MASS FLOW. . . . T/H  
H. . . . ENTHALPY. . . . KCAL/KG

PREP		VWO OZMU 0.1210 ATA BACK PR.
CHKD		
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N168 REV 00

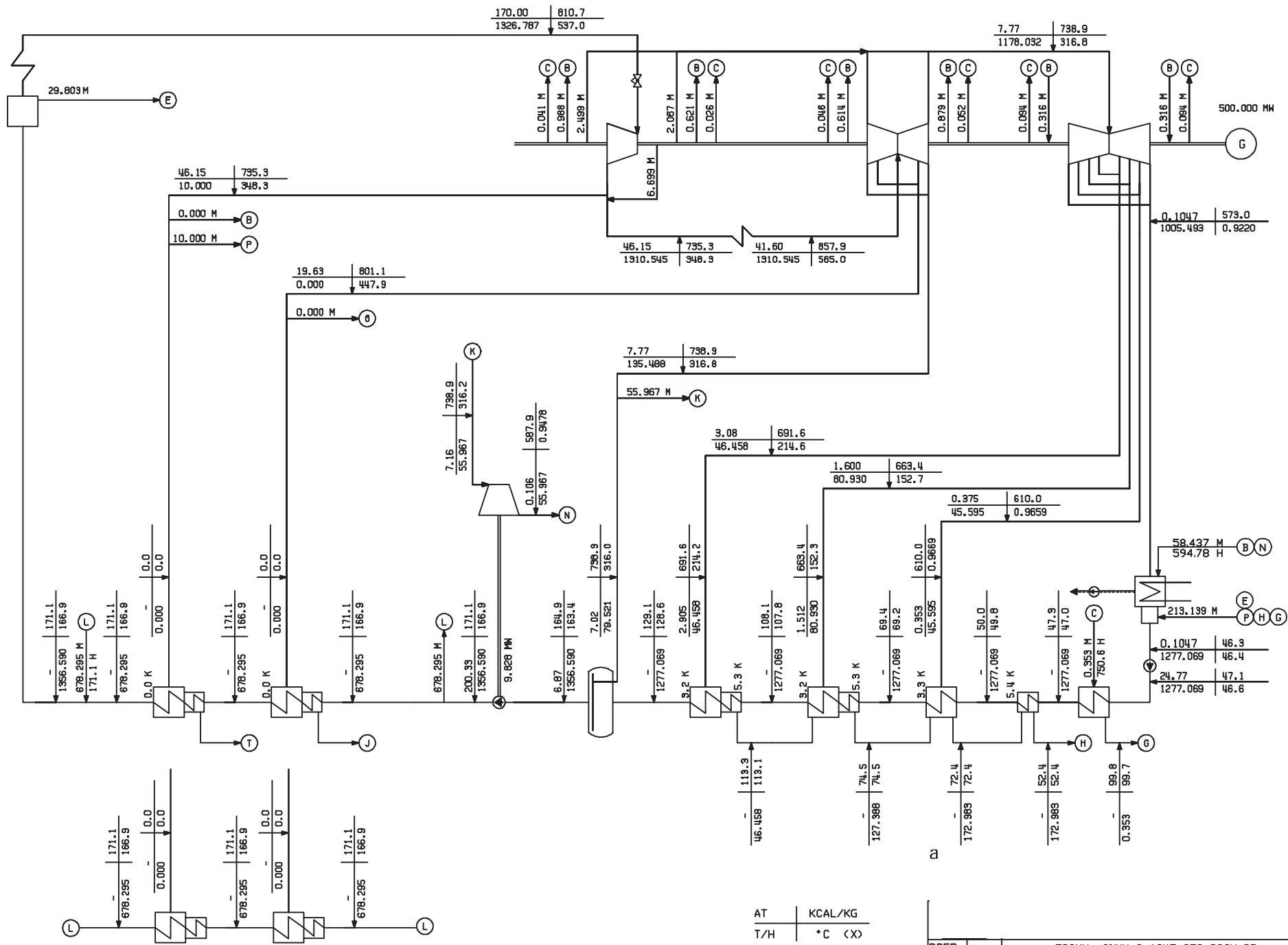


a

AT	KCAL/KG
T/H	*C (X)

M. . . . MASS FLOW. . . . T/H  
 H. . . . ENTHALPY. . . . KCAL/KG

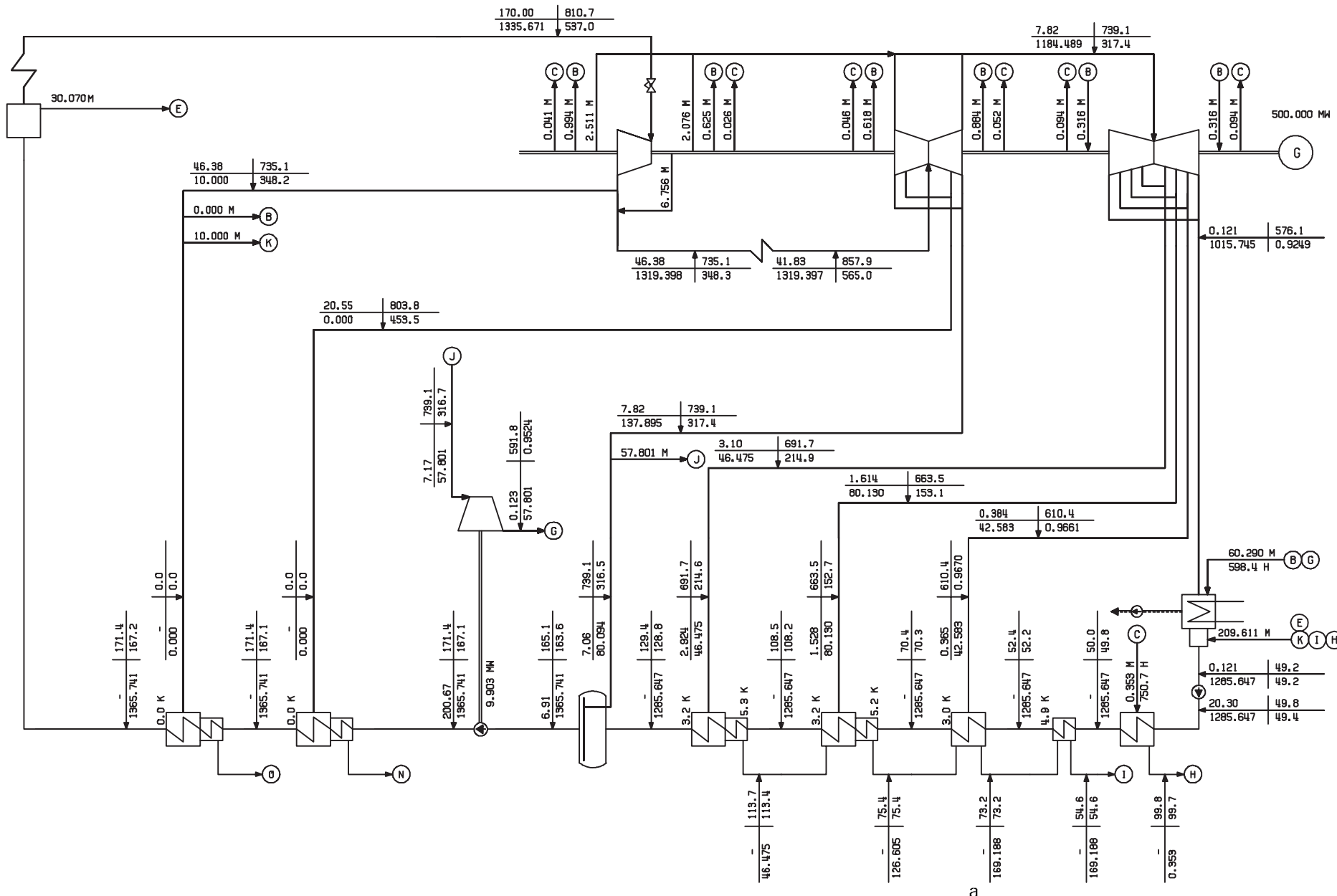
PREP			
CHKD		VWO 3XMU 0.1210 ATA BACK PR.	
APPD		JOB NO 336	
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N169	REV 00



AT | KCAL/KG  
T/H | °C (X)

M... MASS FLOW... T/H  
H... ENTHALPY... KCAL/KG

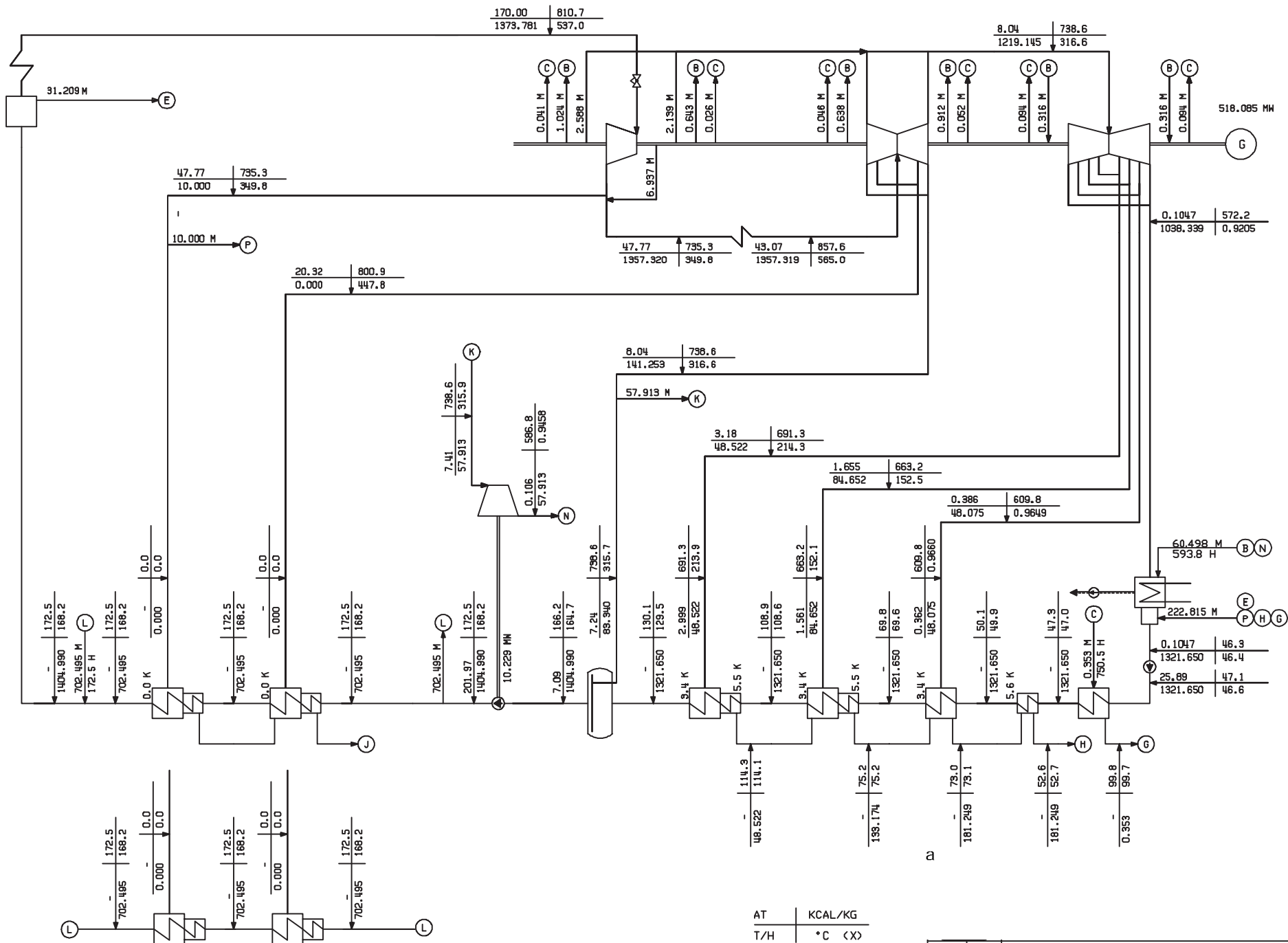
PREP		500MW 3/2MU 0.1047 ATA BACK PR
CHKD		BOTH HP HEATER OUT OF SERVICE
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N170 REV 00



AT | KCAL/KG  
T/H | °C (X)

M. ... MASS FLOW. ... T/H  
H. ... ENTHALPY. .... KCAL/KG

PREP		500MM 3/2MU 0.1210 ATA BACK PR.
CHKD		BOTH HP HEATERS OUT OF SERVICE
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N171 REV 00

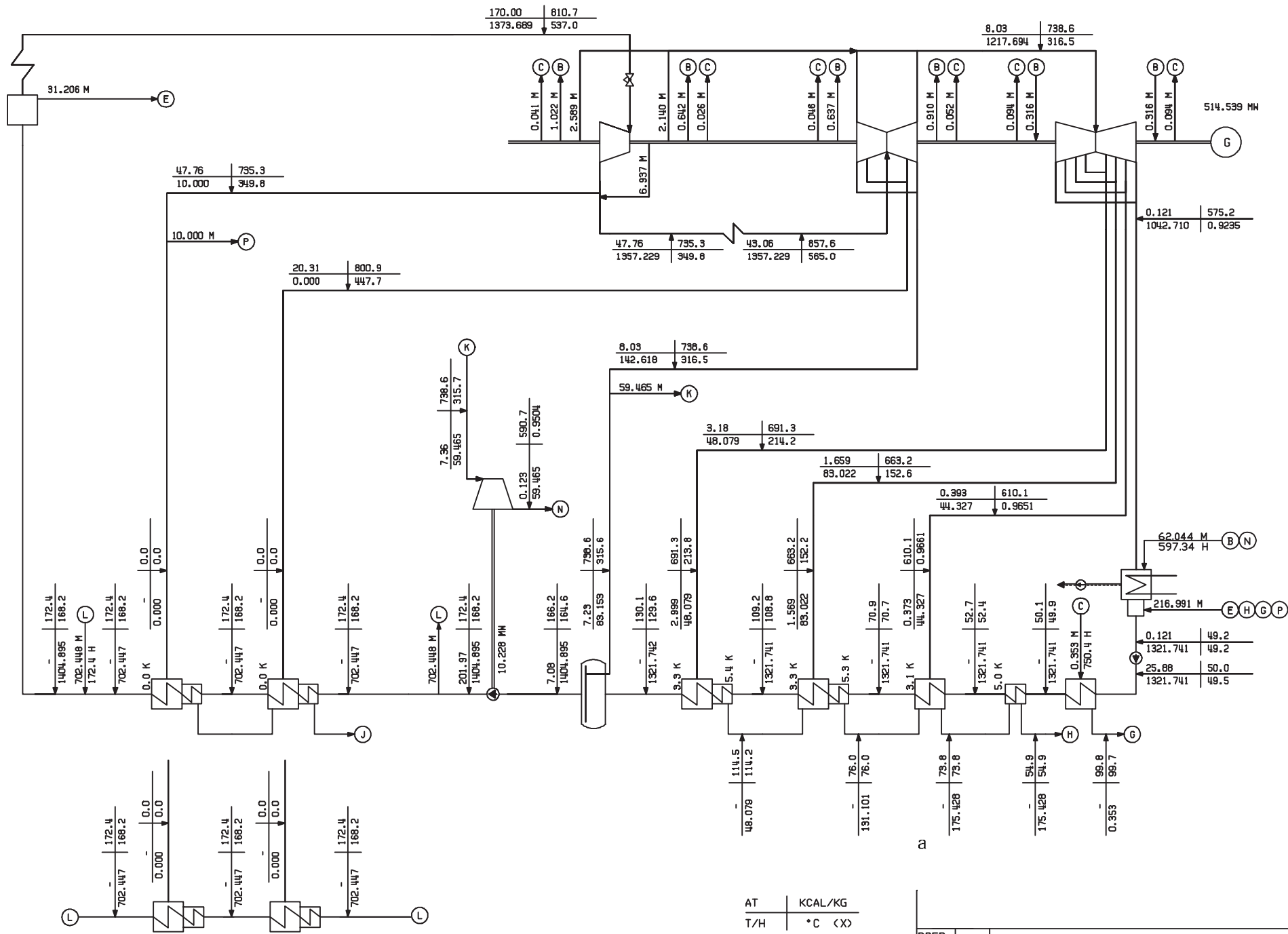


AT | KCAL/KG  
T/H | °C (X)

M ... MASS FLOW ... T/H  
H ... ENTHALPY ... KCAL/KG

PREP		MAX OUTPUT 3/2U 0.1047 ATA BACK PR
CHKD		BOTH HP HEATER OUT OF SERVICE
APPD	JOB NO 336	
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N172 REV 00





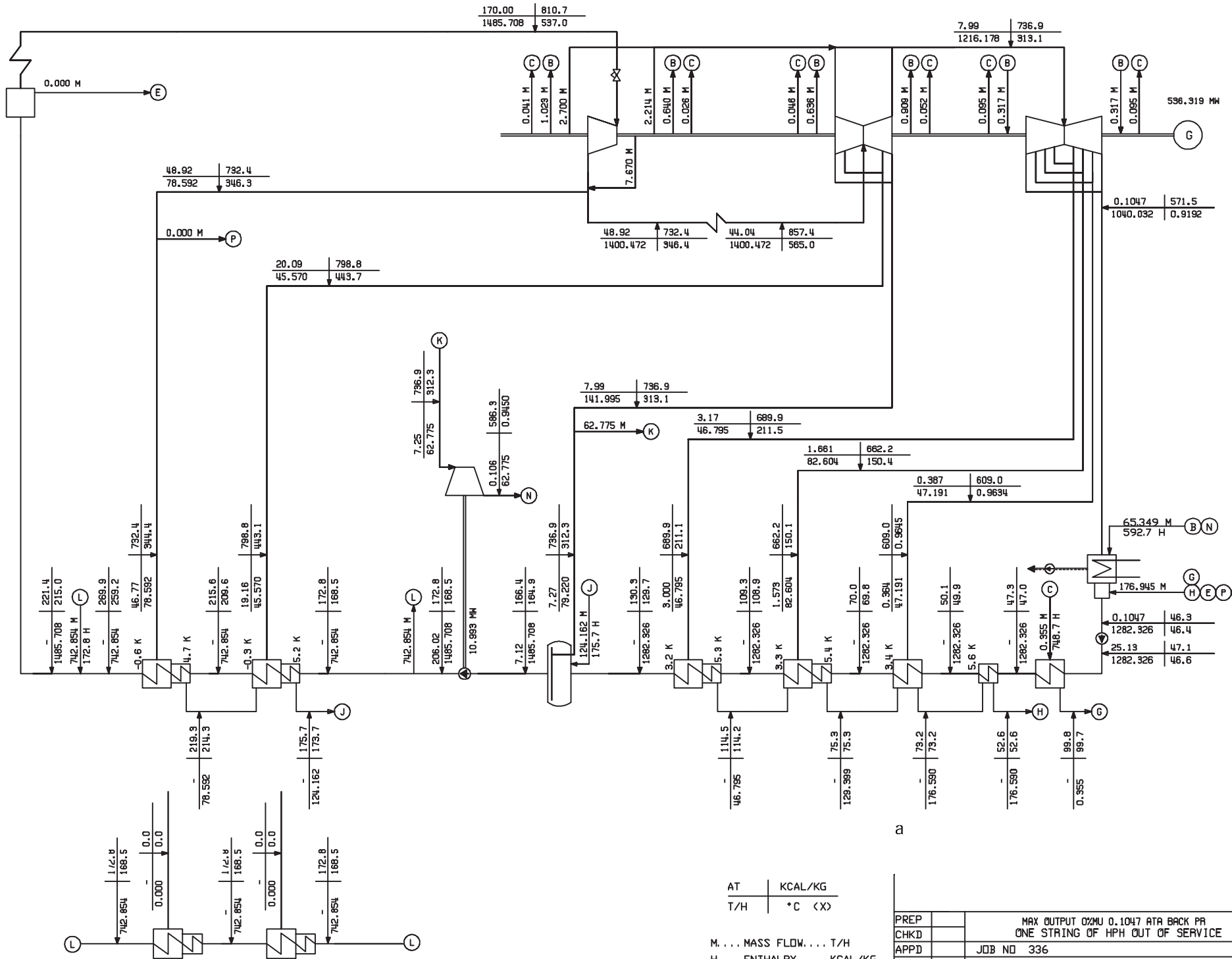
AT | KCAL/KG  
 T/H | °C (X)

M. . . . MASS FLOW. . . . T/H  
 H. . . . ENTHALPY. . . . KCAL/KG

PREP		MAX OUTPUT 3/2MU 0.1210 ATA BACK PR
CHKD		BOTH HP HEATER OUT OF SERVICE
APPD	JOB NO 336	
DATE 18.04.09	DRG NO PE - DC - 336 - 100-N173	REV 00



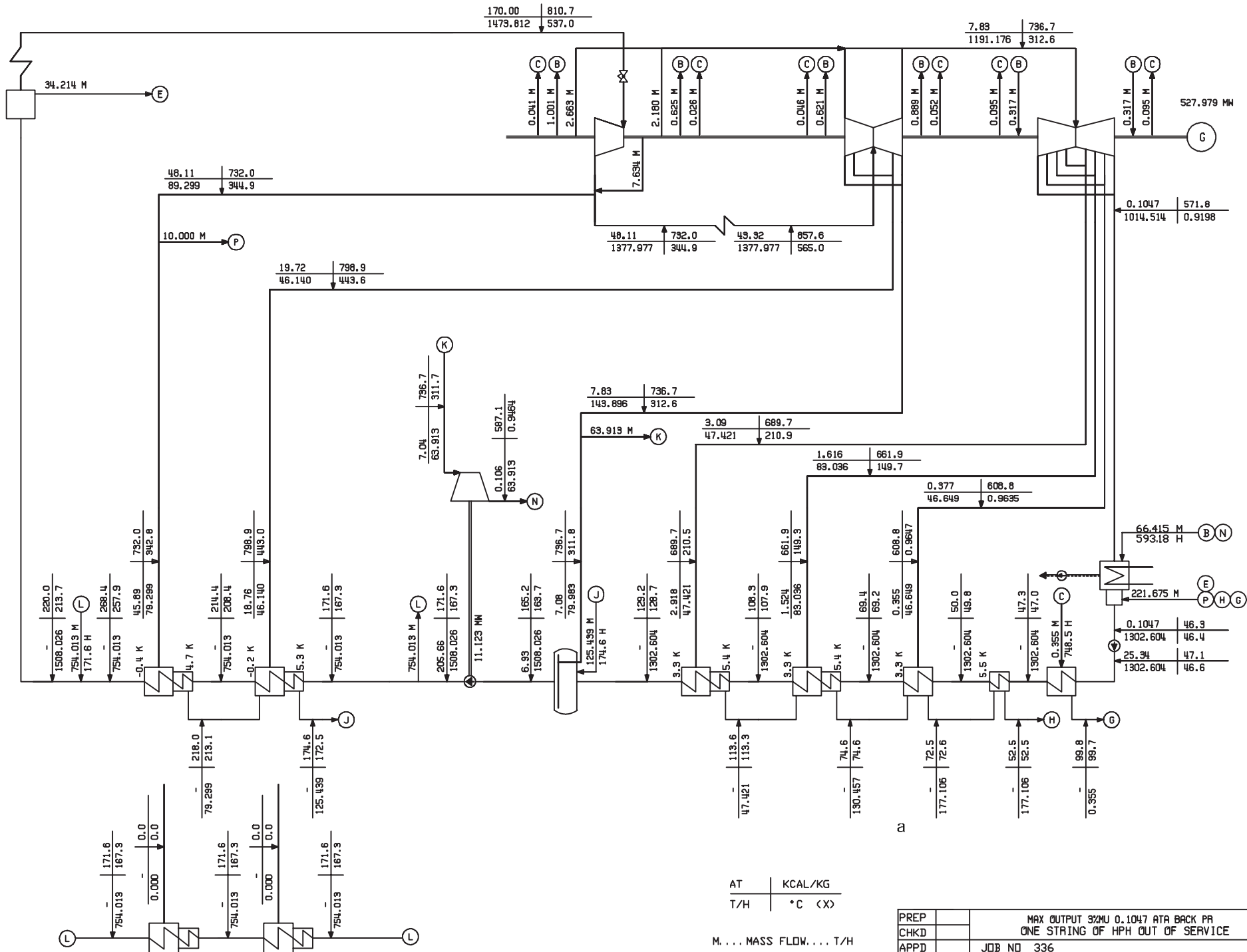




AT | KCAL/KG  
T/H | °C (X)

M. ... MASS FLOW. ... T/H  
H. ... ENTHALPY. .... KCAL/KG

PREP		MAX OUTPUT OXMU 0.1047 ATA BACK PR
CHKD		ONE STRING OF HPH OUT OF SERVICE
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N176 REV 00

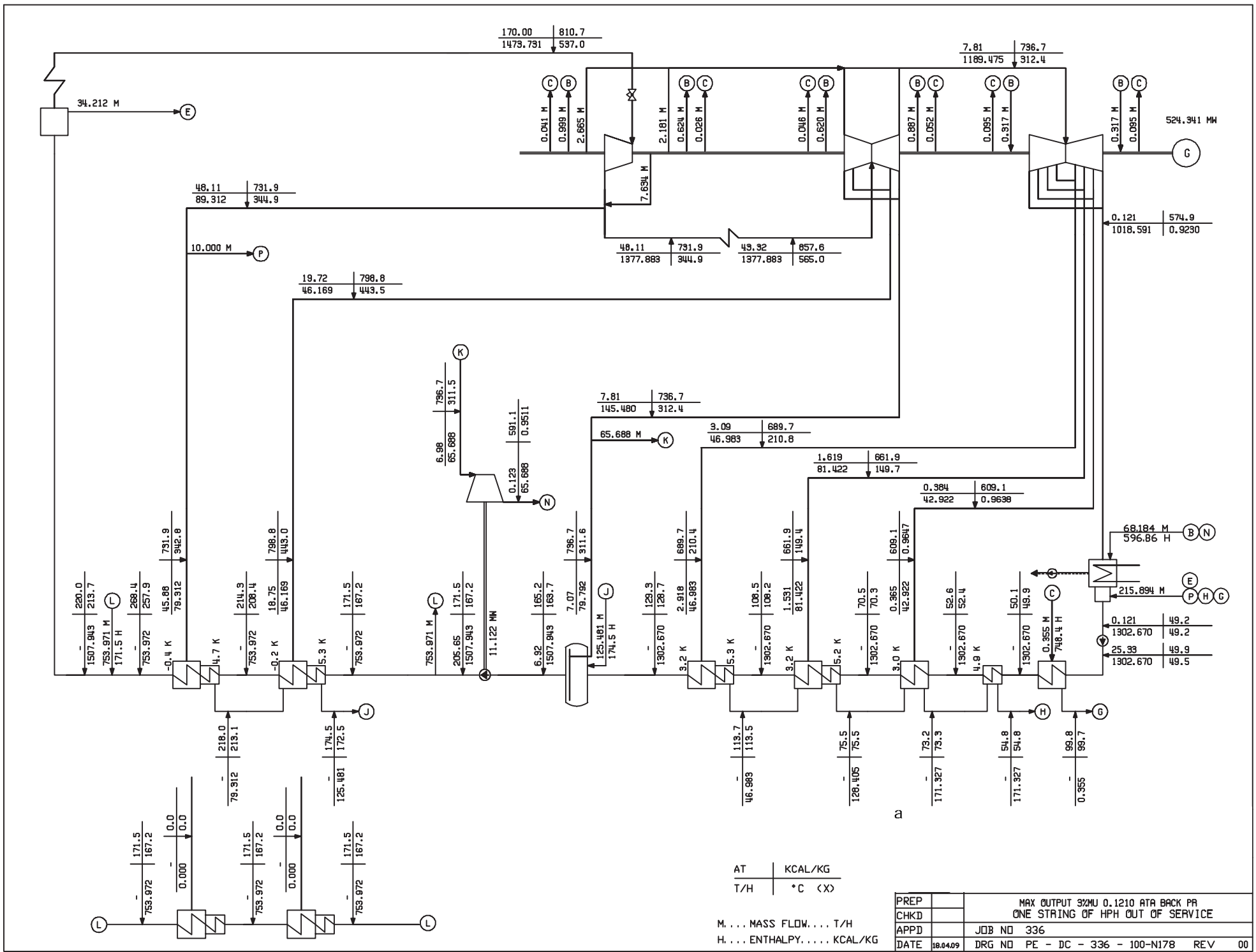


AT | KCAL/KG  
T/H | °C (X)

M. ... MASS FLOW... T/H  
H. ... ENTHALPY... KCAL/KG

PREP			
CHKD			
APPD		JOB NO 336	
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N177	REV 00

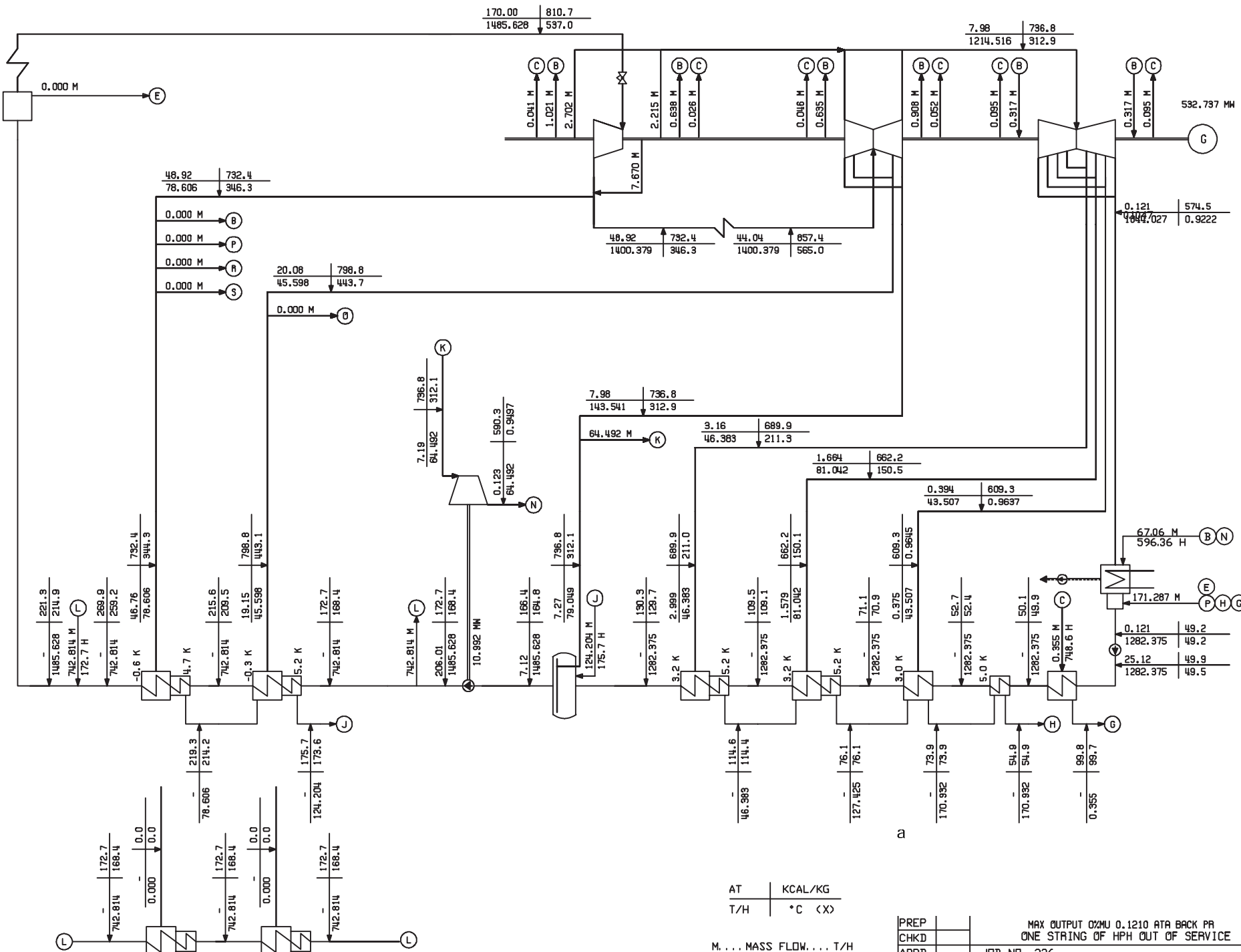
MAX OUTPUT 3/2MU 0.1047 ATA BACK PR  
ONE STRING OF HPH OUT OF SERVICE



AT | KCAL/KG  
T/H | °C (X)

M. ... MASS FLOW... T/H  
H. ... ENTHALPY... KCAL/KG

PREP		MAX OUTPUT 3/2MU 0.1210 ATA BACK PR
CHKD		ONE STRING OF HPH OUT OF SERVICE
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N178 REV 00

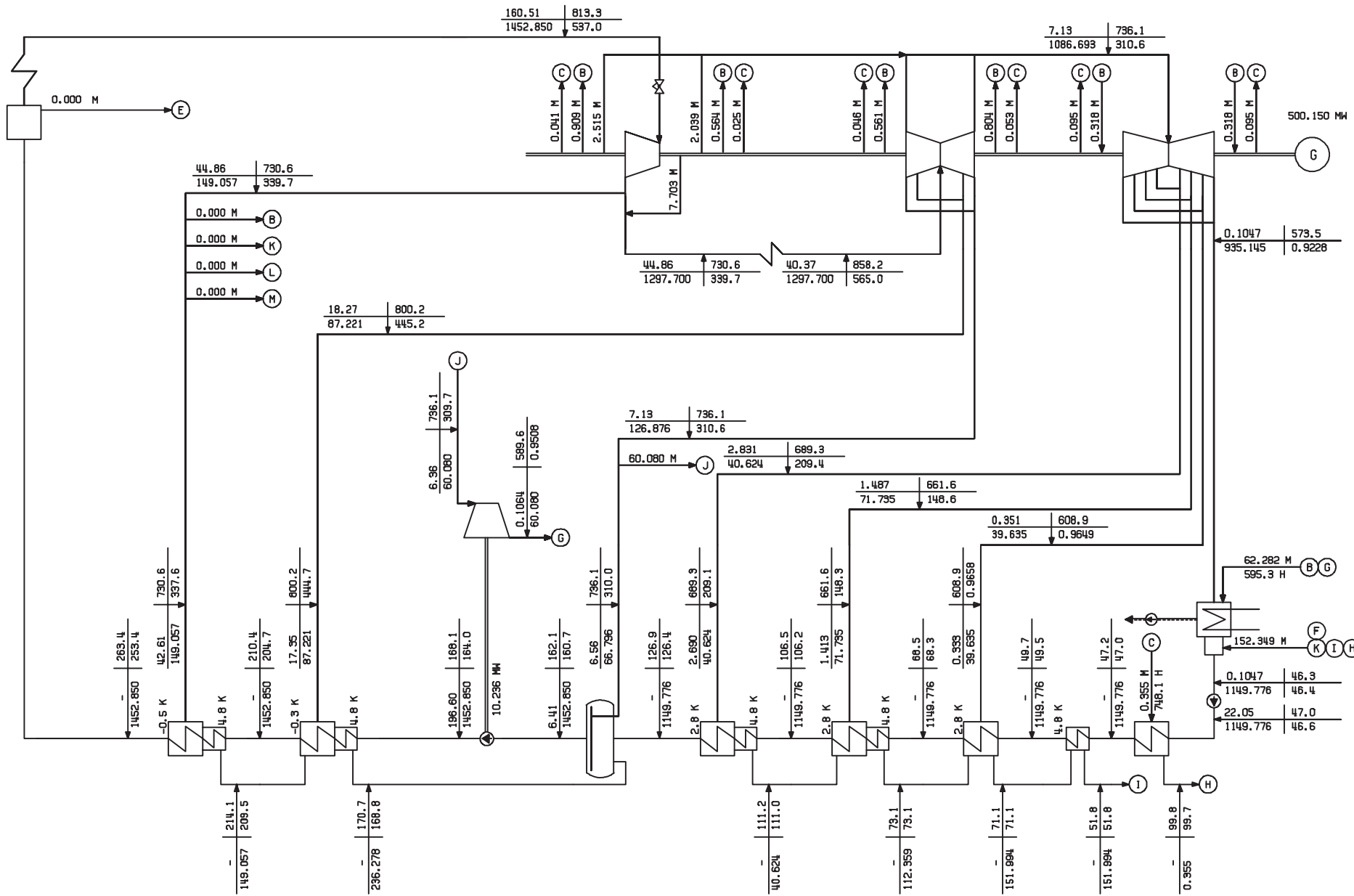


AT | KCAL/KG  
T/H | °C (X)

M. ... MASS FLOW... T/H  
H. ... ENTHALPY... KCAL/KG

PREP			
CHKD			
APPD		JOB NO 336	
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N179	REV 00

MAX OUTPUT 02MU 0.1210 ATA BACK PR  
ONE STRING OF HPH OUT OF SERVICE



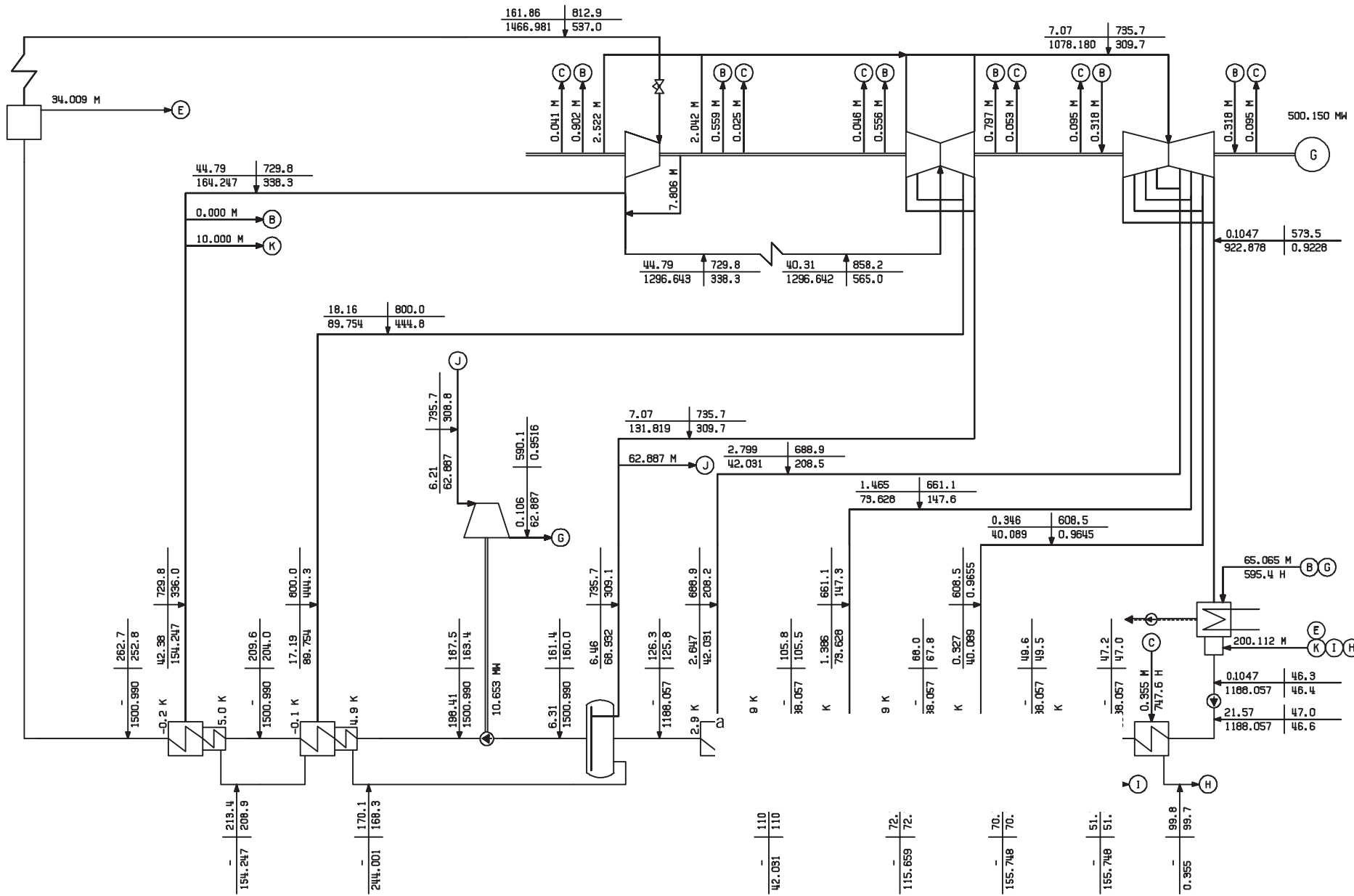
a

AT	KCAL/KG
T/H	*C (X)

M. . . . MASS FLOW. . . . T/H  
 H. . . . ENTHALPY. . . . KCAL/KG

PREP		500MW OZMU 0.1047 ATA BACK PR.
CHKD		SLIDING PR. OPERATION.
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N180 REV 00



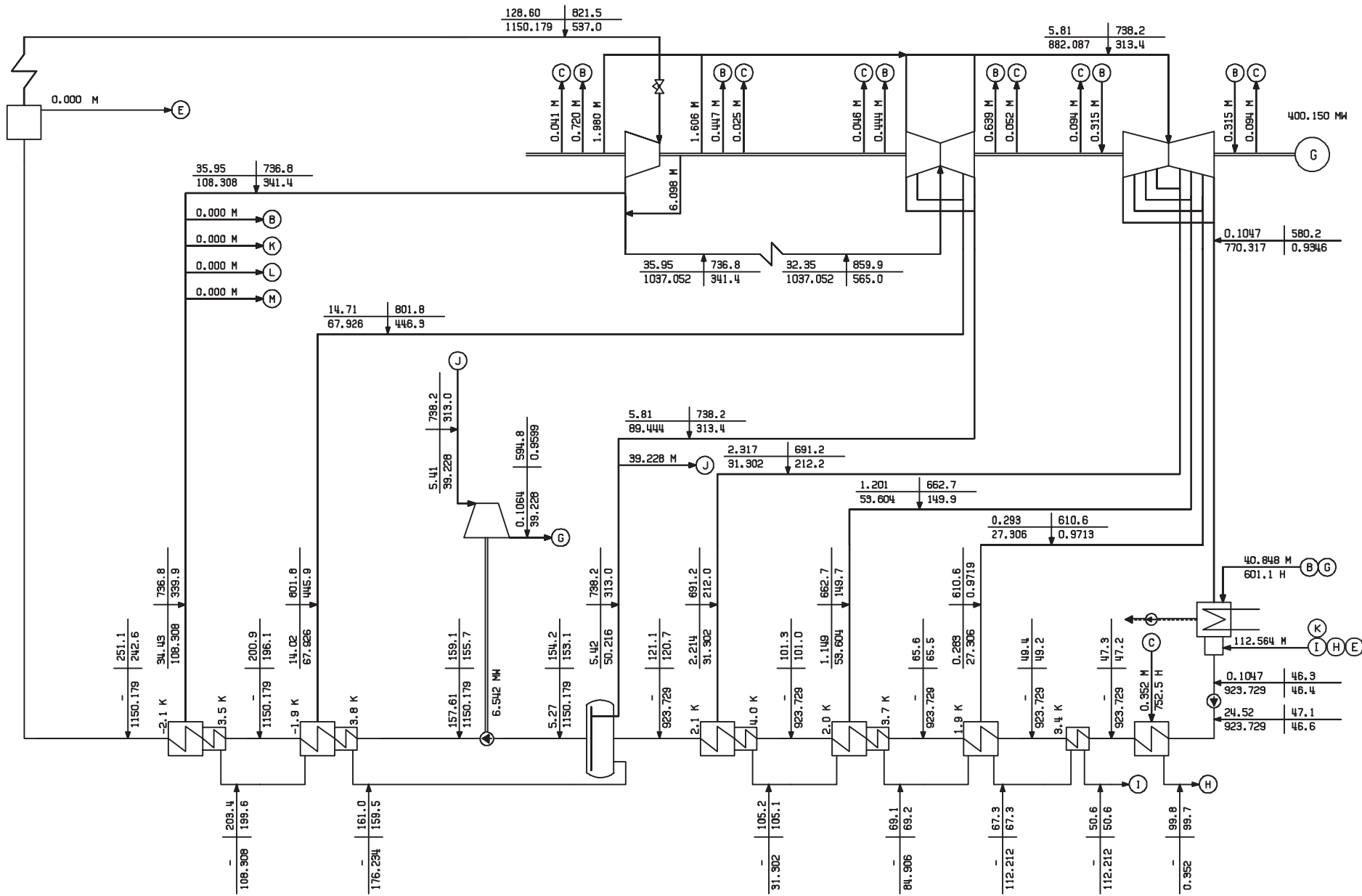


a

AT	KCAL/KG
T/H	*C (X)

M... MASS FLOW... T/H  
 H... ENTHALPY... KCAL/KG

PREP		500MW 3%MU 0.1047 ATA BACK PR.
CHKD		SLIDING PR. OPERATION.
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N181 REV 00

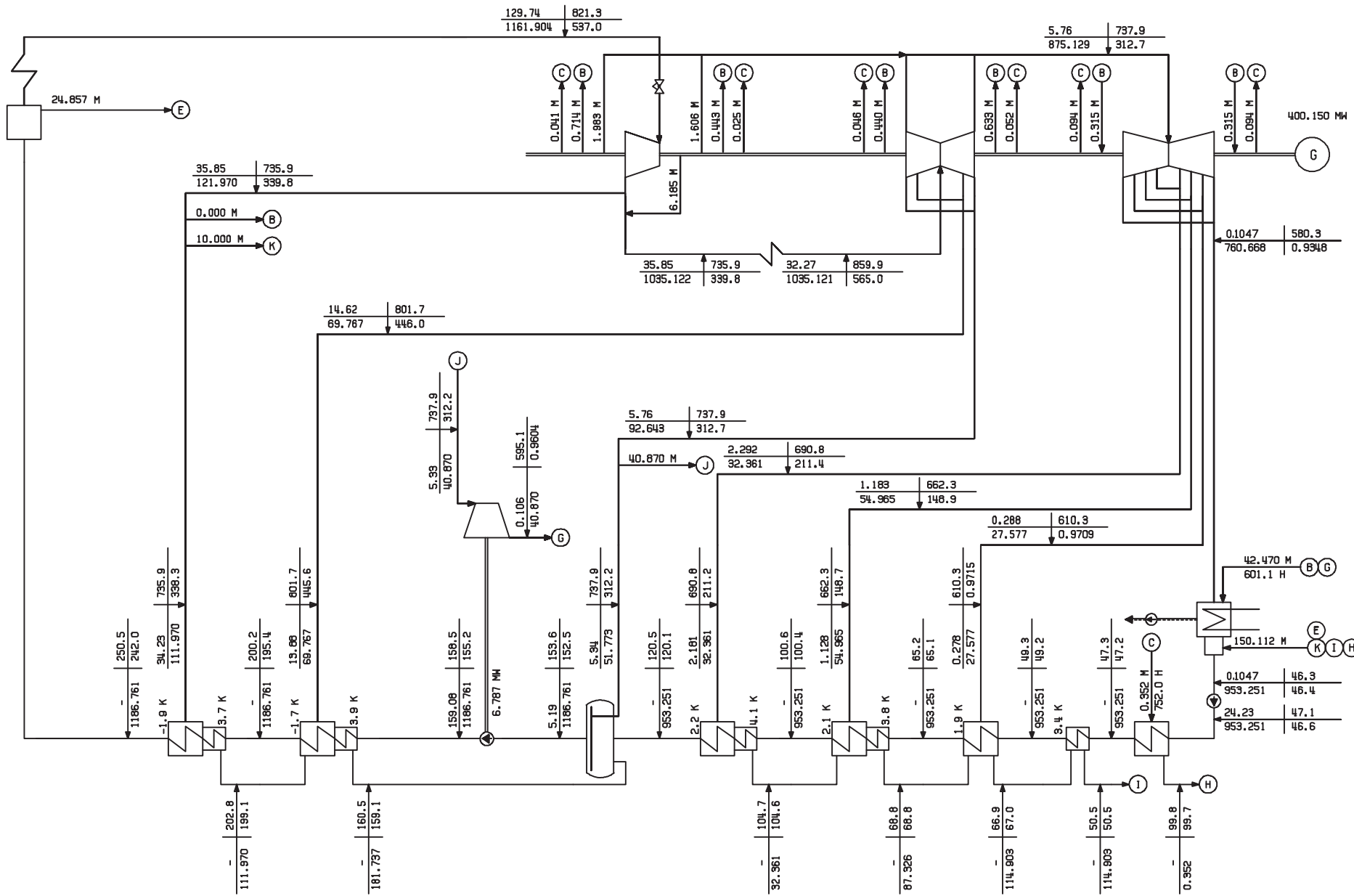


d

AT	KCAL/KG
T/H	*C (X)

M. ... MASS FLOW. ... T/H  
 H. ... ENTHALPY. ... KCAL/KG

PREP		400MW OZMU 0.1047 ATA BACK PR.
CHKD		SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N182 REV 00

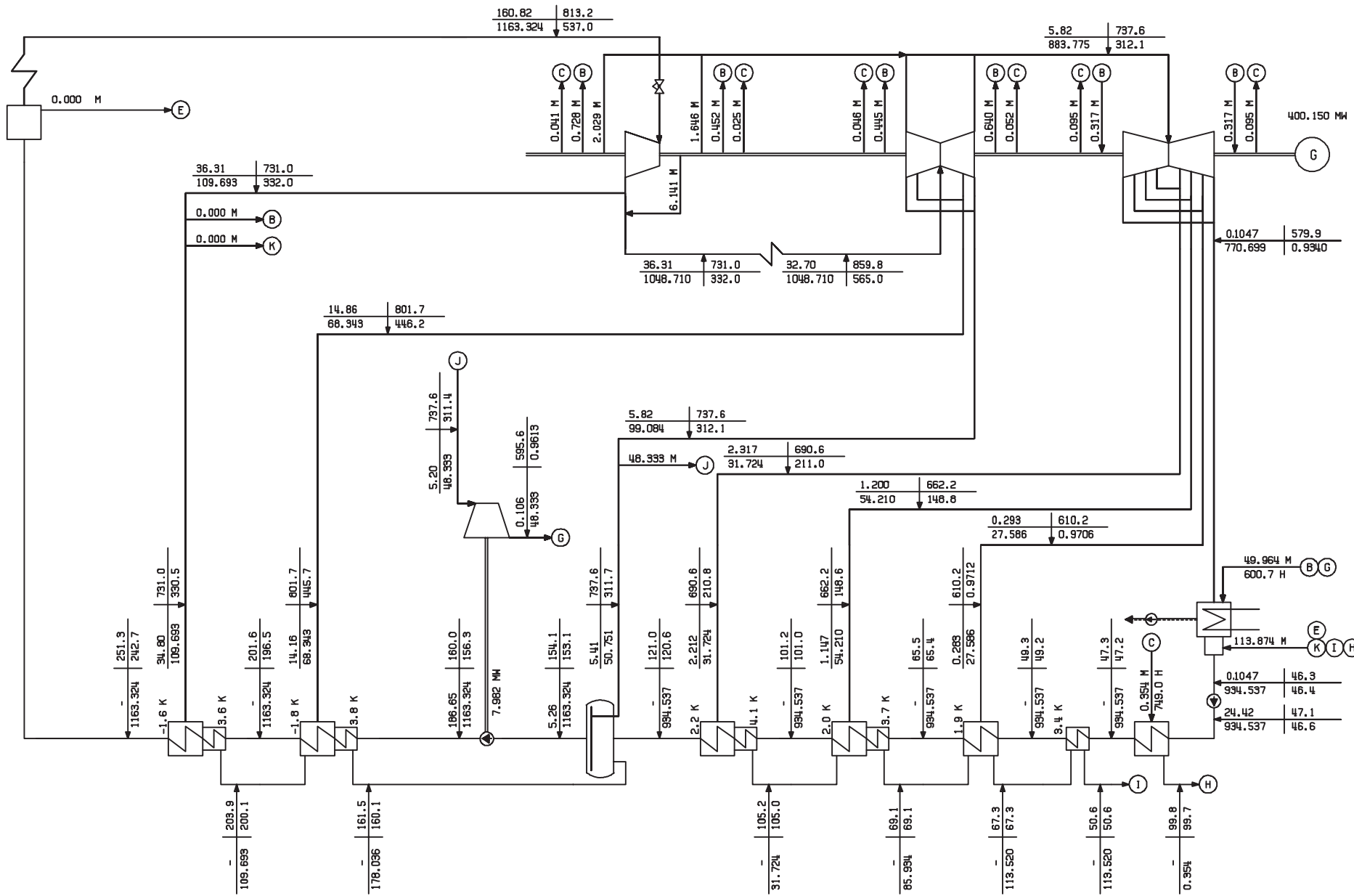


a

AT	KCAL/KG
T/H	*C (<X)

M. . . . MASS FLOW. . . . T/H  
 H. . . . ENTHALPY. . . . KCAL/KG

PREP		400MW 3%MU 0.1047 ATA BACK PR.
CHKD		SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N183 REV 00

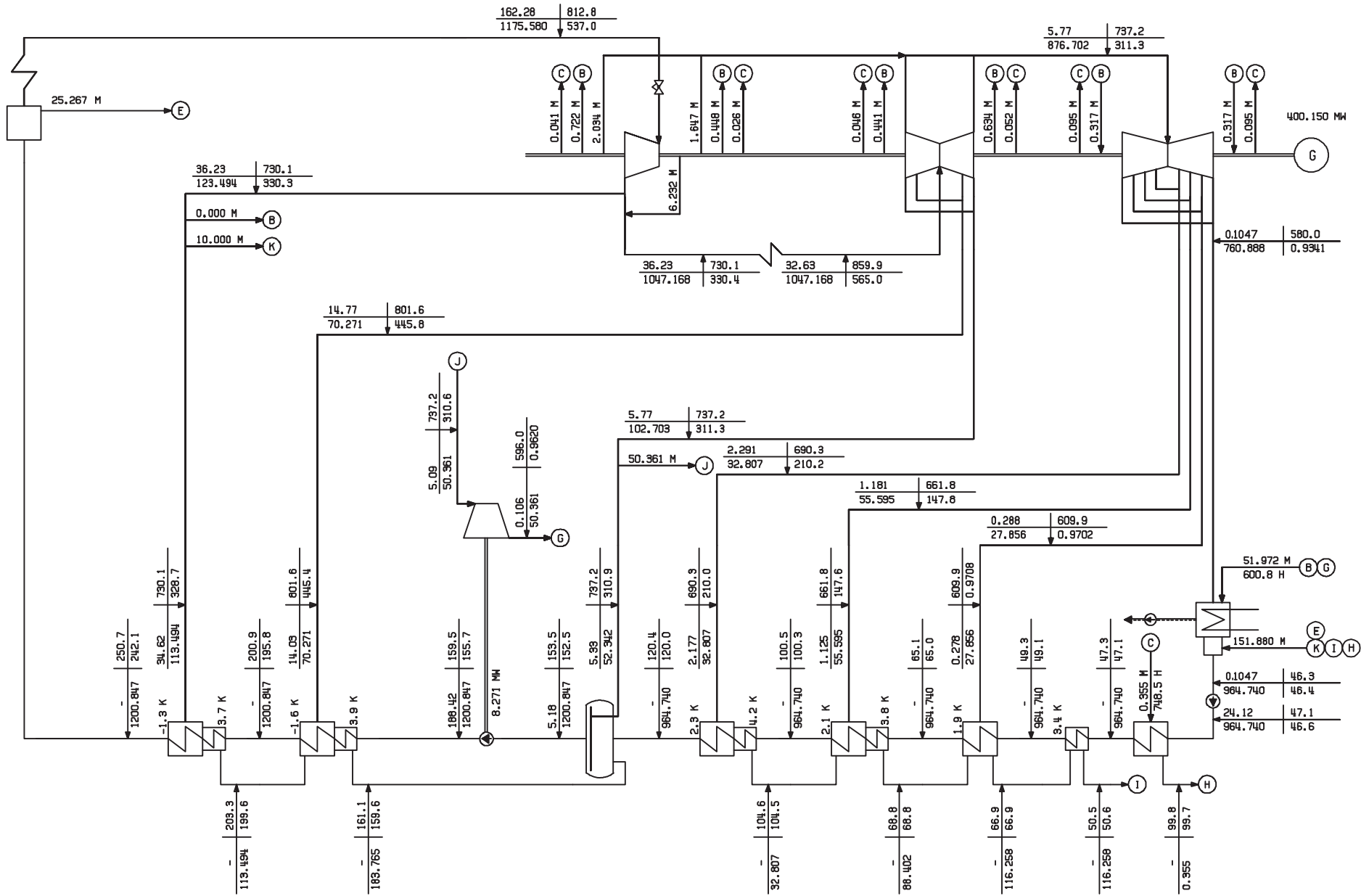


a

AT	KCAL/KG
T/H	*C (<X)

M. . . . MASS FLOW. . . . T/H  
 H. . . . ENTHALPY. . . . KCAL/KG

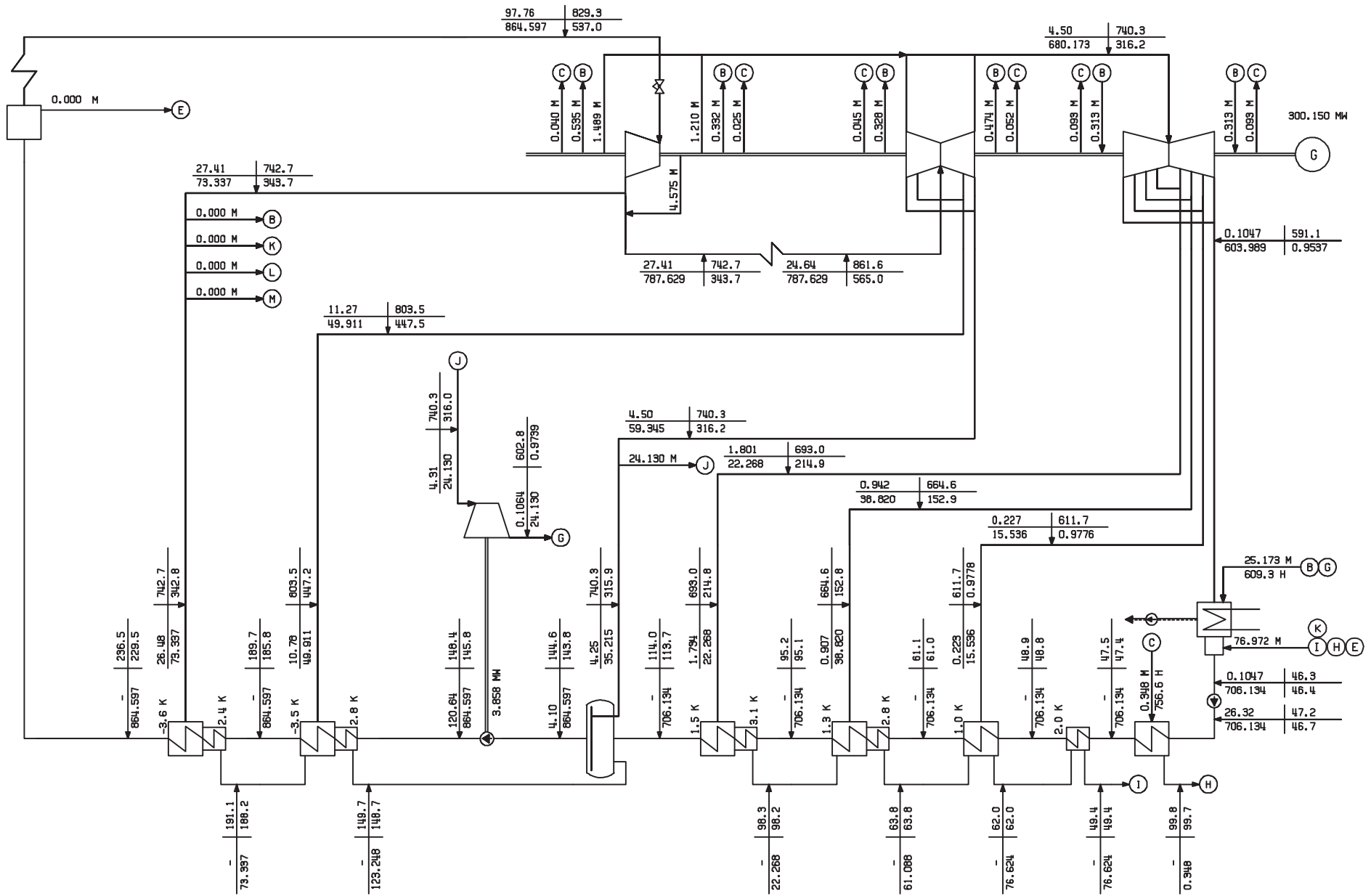
PREP		400MW 0.1047 ATA BACK PR.
CHKD		MOD. SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N184 REV 00



AT	KCAL/KG
T/H	*C (X)

M . . . MASS FLOW . . . T/H  
H . . . ENTHALPY . . . . . KCAL/KG

PREP		400MW 32MU 0.1047 ATA BACK PR.
CHKD		MOD. SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N185 REV 00

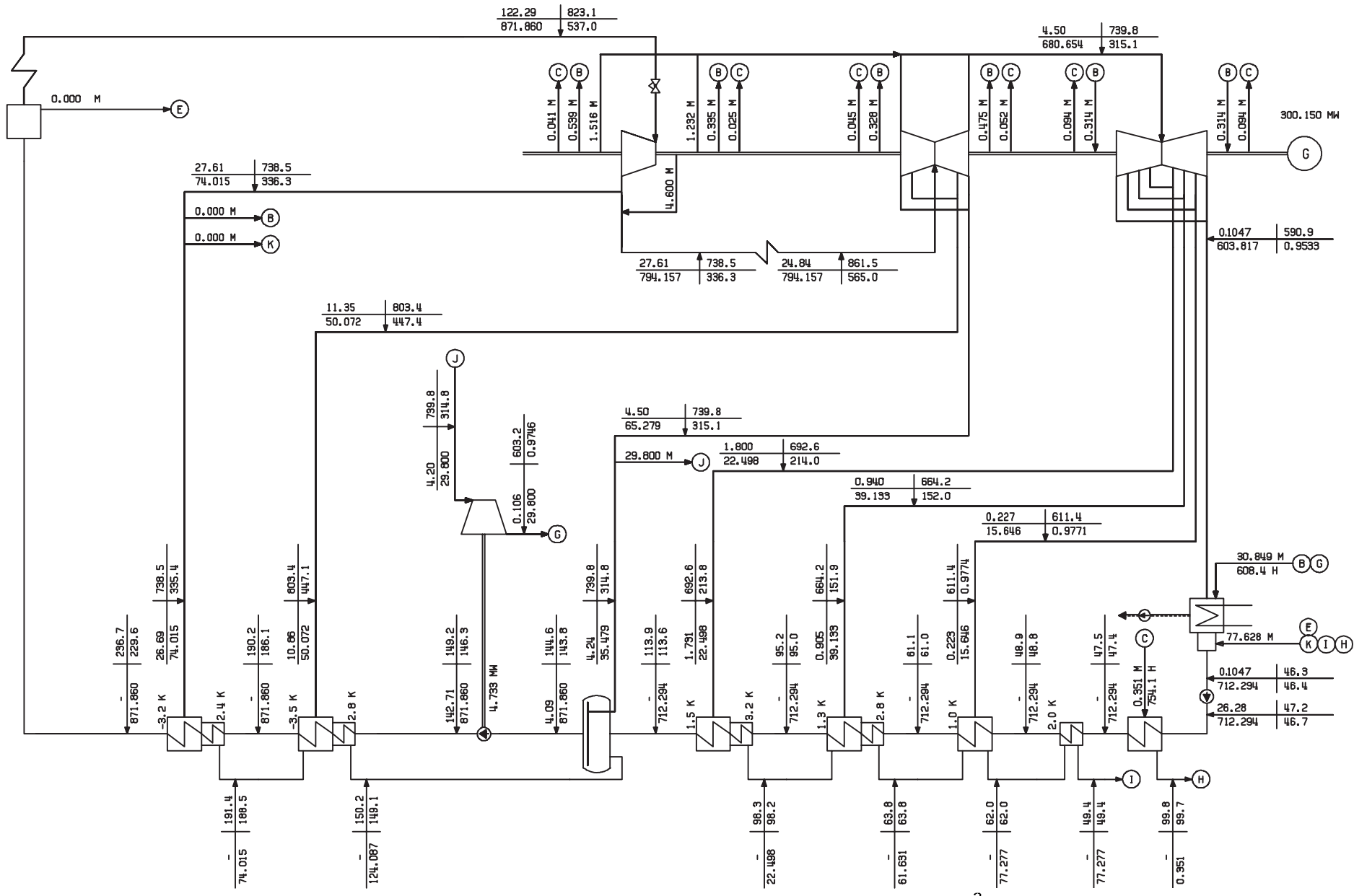


a

AT | KCAL/KG  
T/H | °C (X)

M. . . . MASS FLOW. . . . T/H  
H. . . . ENTHALPY. . . . KCAL/KG

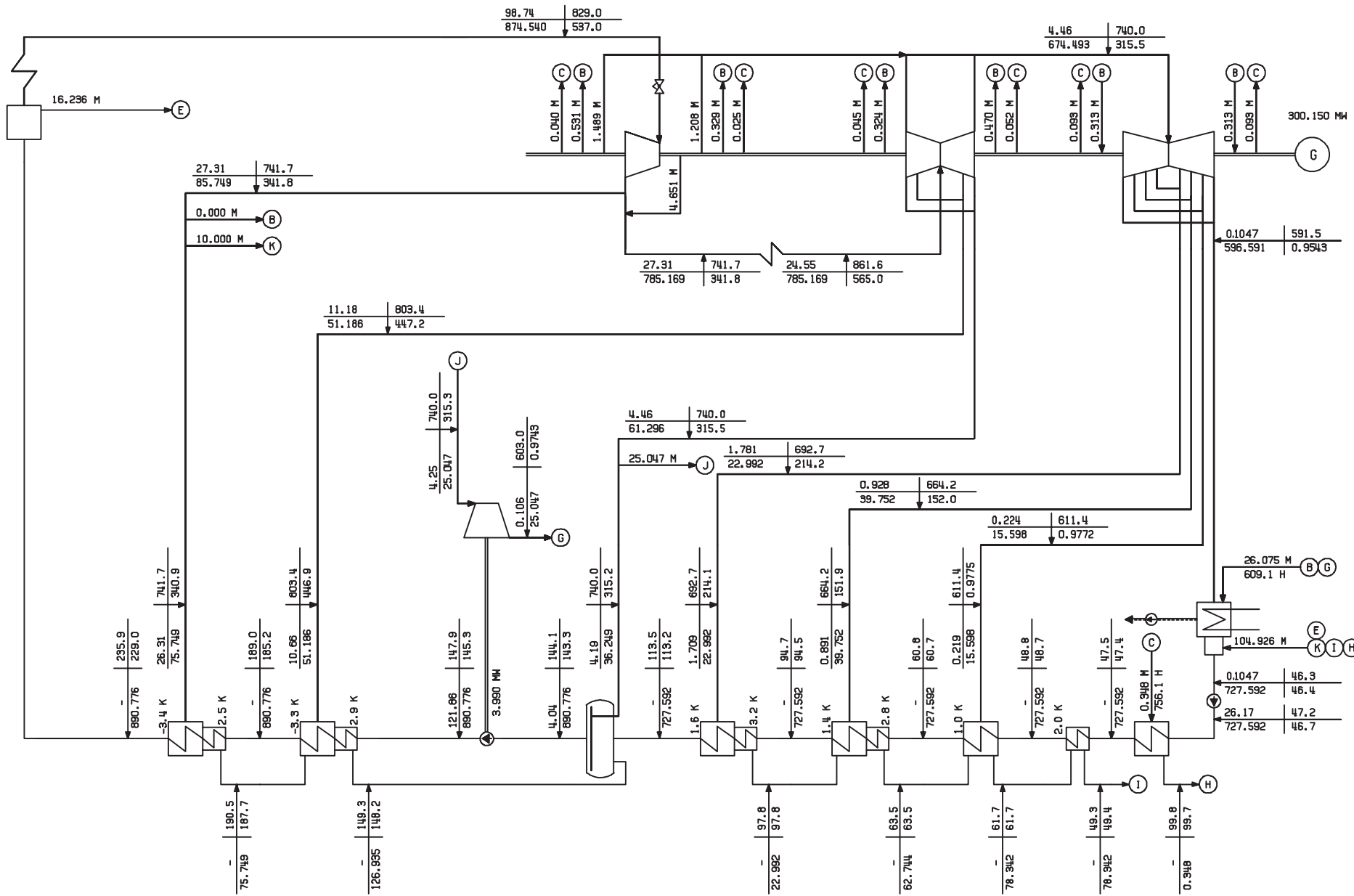
PREP		300MW 07MU 0.1047 ATB BACK PR.
CHKD		SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N186 REV 00



AT | KCAL/KG  
T/H | °C (X)

M ... MASS FLOW ... T/H  
H ... ENTHALPY ... KCAL/KG

PREP		300MW 02MU 0.1047 ATA BACK PR.
CHKD		MOD. SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N187 REV 00



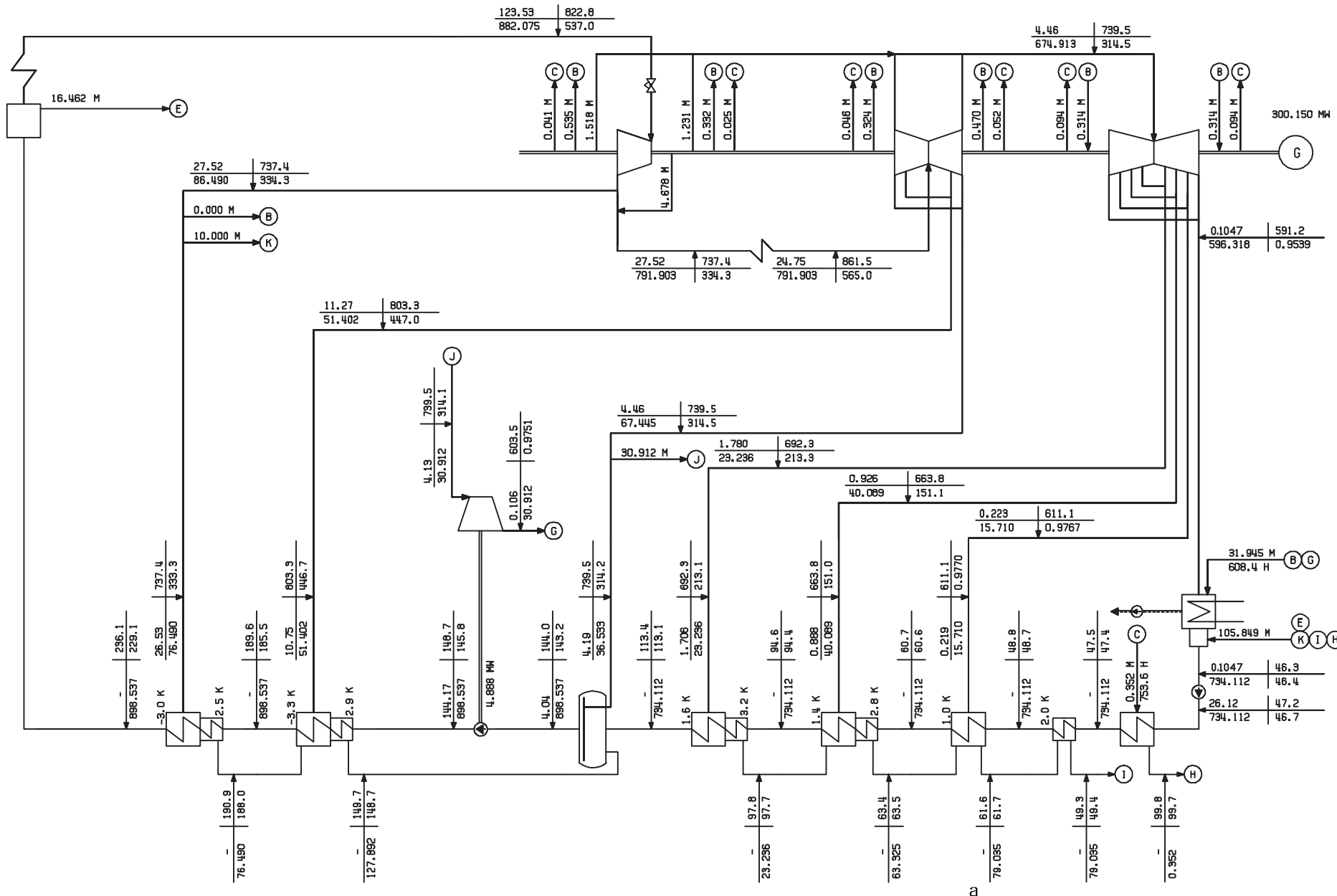
a

AT	KCAL/KG
T/H	*C (X)

M. . . . MASS FLOW. . . . T/H  
H. . . . ENTHALPY. . . . KCAL/KG

PREP		300MW 3%MU 0.1047 ATA BACK PR.
CHKD		SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336- 100-N188 REV 00

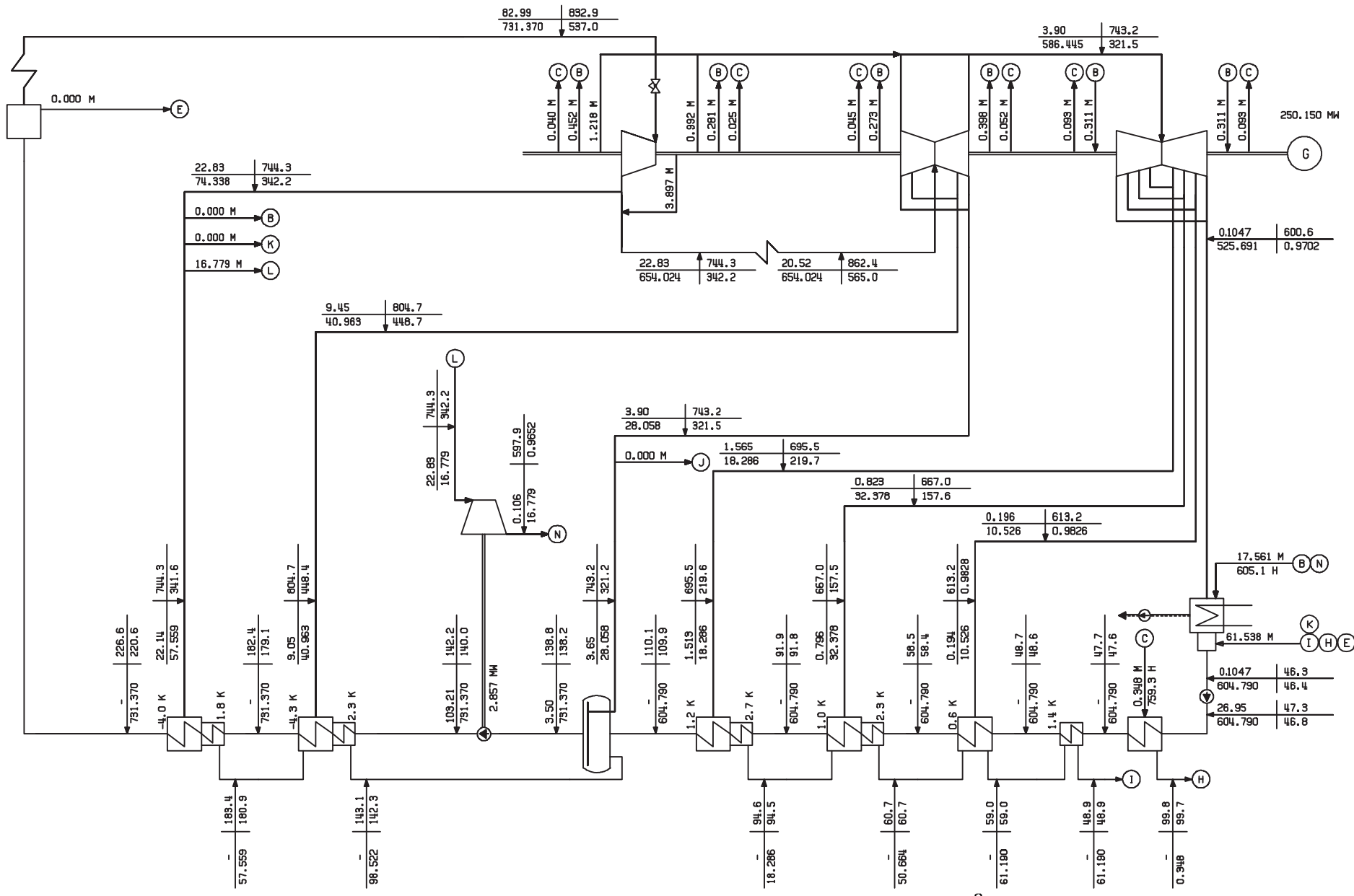




AT | KCAL/KG  
T/H | °C (X)

M ... MASS FLOW ... T/H  
H ... ENTHALPY ... KCAL/KG

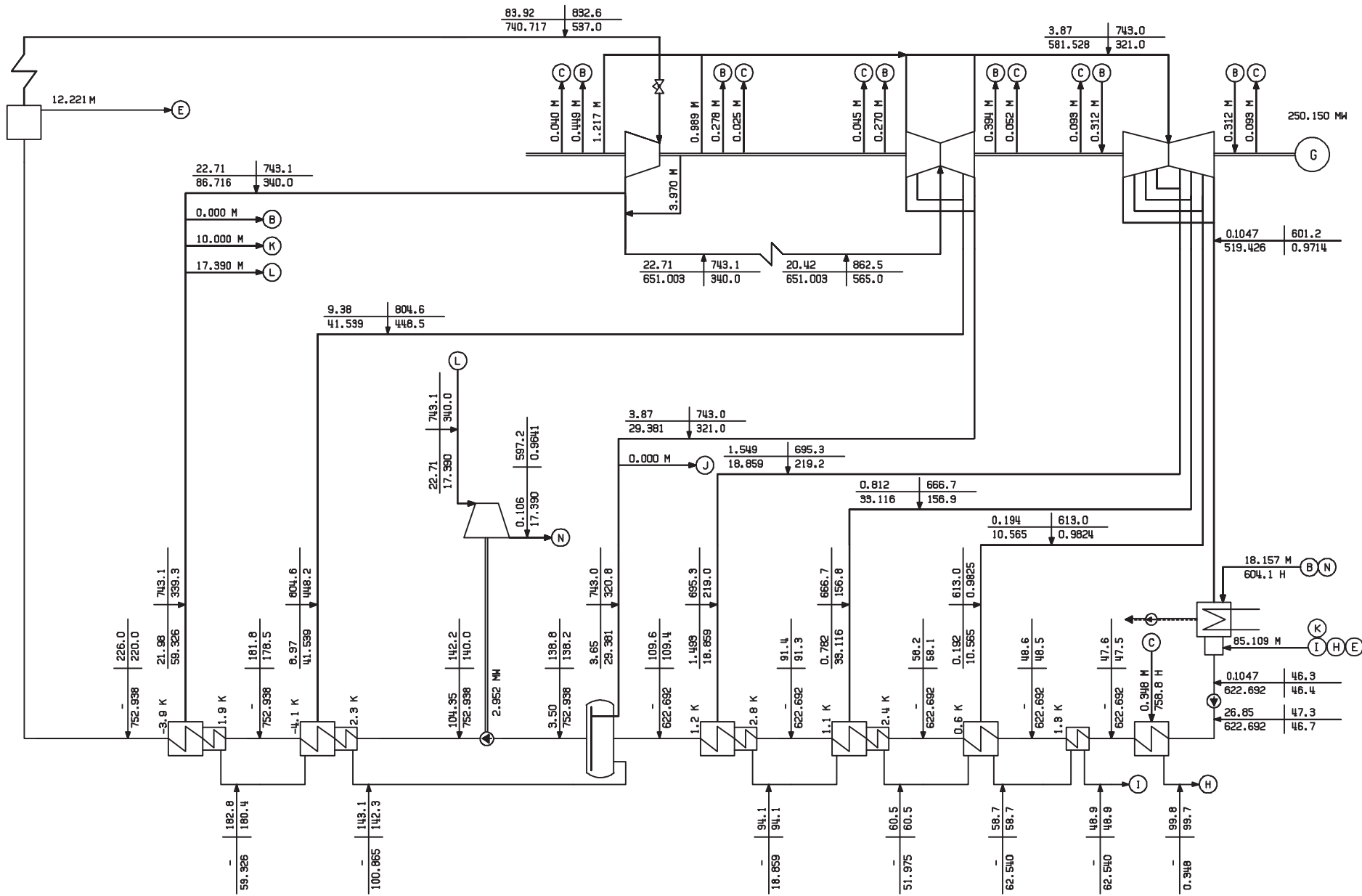
PREP		300MW 3ZMU 0.1047 ATA BACK PR.
CHKD		MOD. SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N189 REV 00



AT	KCAL/KG
T/H	*C (X)

M . . . MASS FLOW . . . T/H  
H . . . ENTHALPY . . . . . KCAL/KG

PREP		250MM OZMU 0.1047 ATA BACK PR.
CHKD		SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N190 REV 00

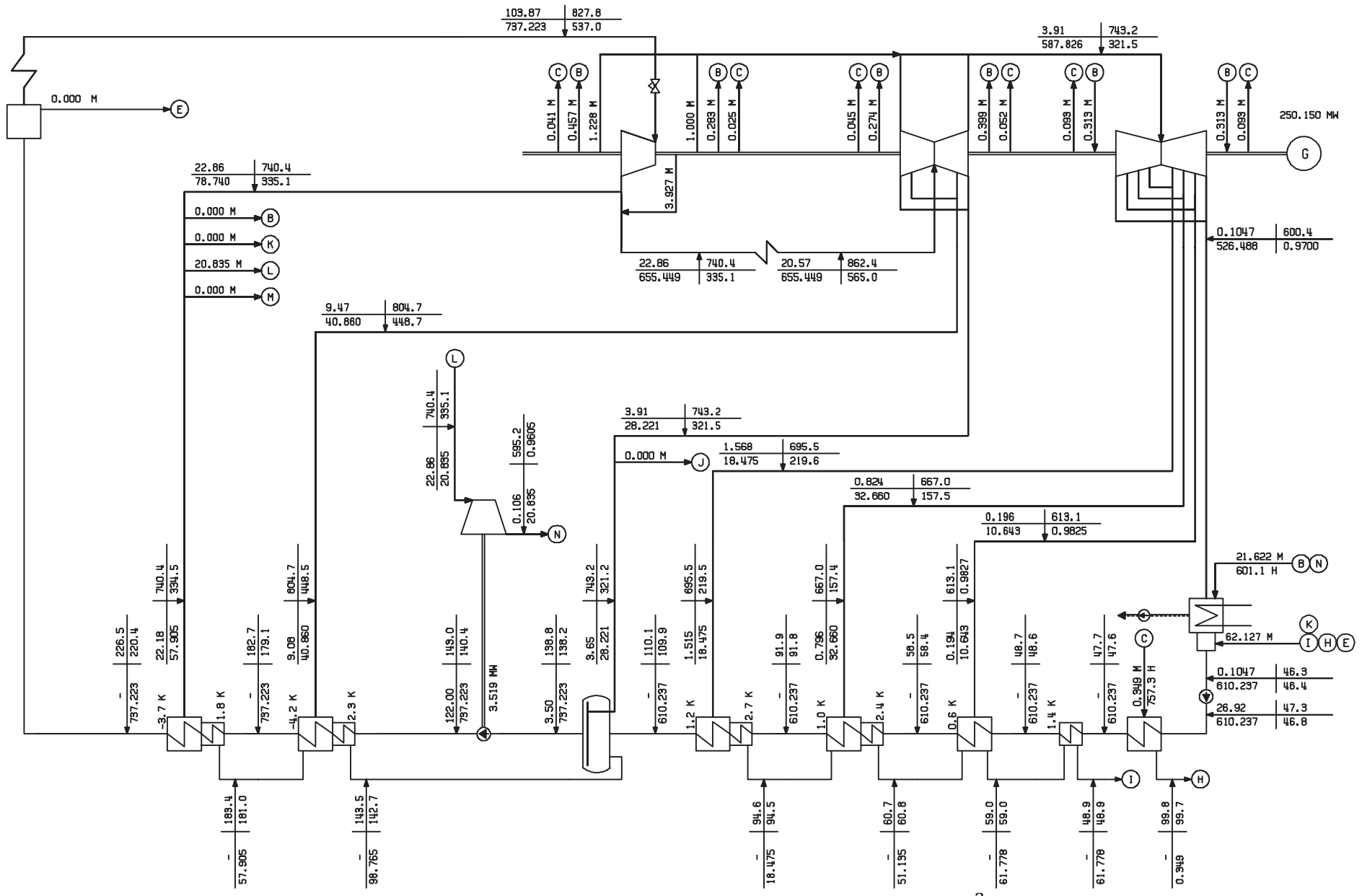


a

AT	KCAL/KG
T/H	*C (X)

M . . . MASS FLOW . . . T/H  
 H . . . ENTHALPY . . . . . KCAL/KG

PREP		250MW 3/MU 0.1047 ATA BACK PR.
CHKD		SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N191 REV 00

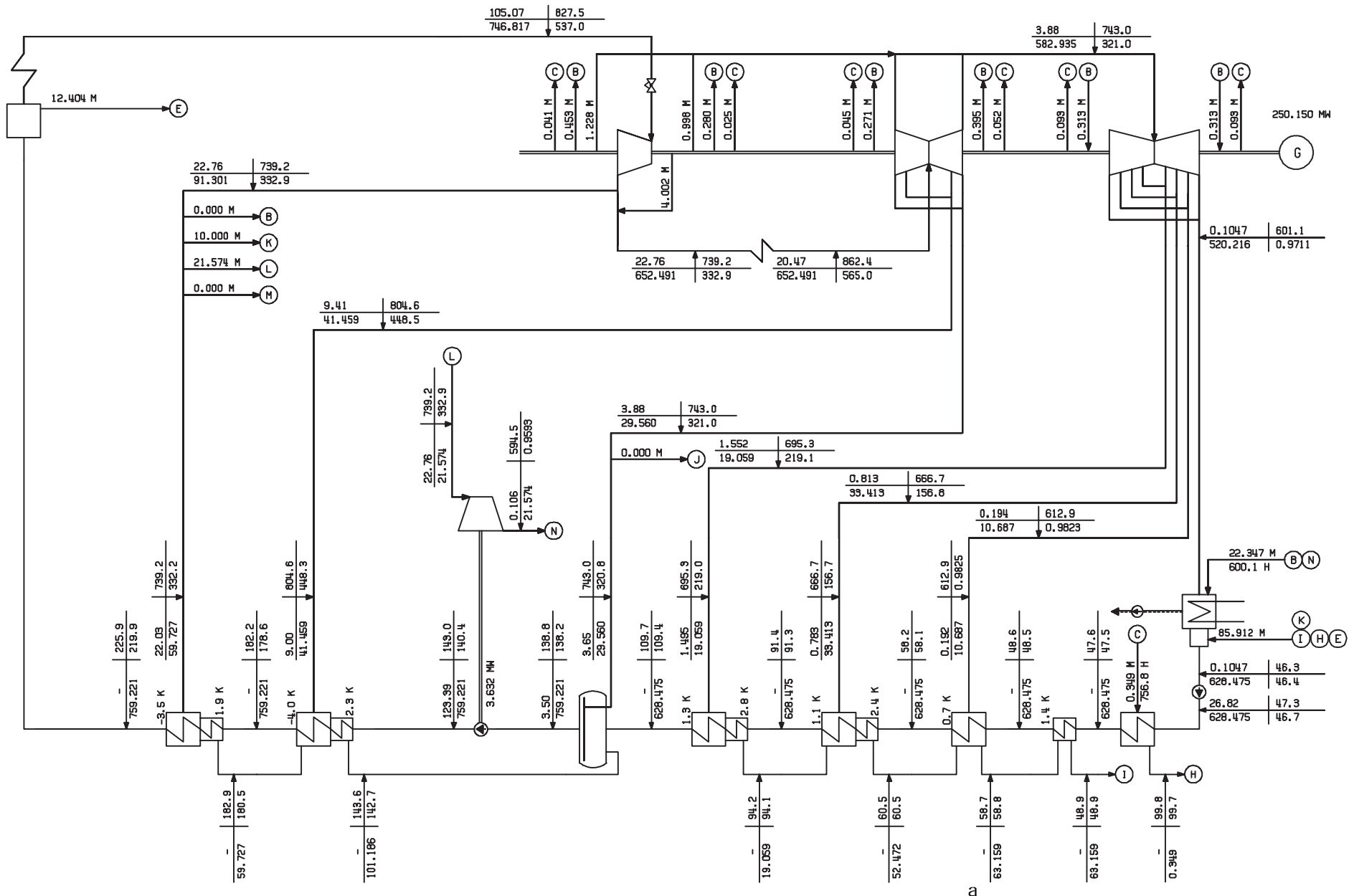


a

AT	KCAL/KG
T/H	*C (X)

M. . . . MASS FLOW. . . . T/H  
H. . . . ENTHALPY. . . . KCAL/KG

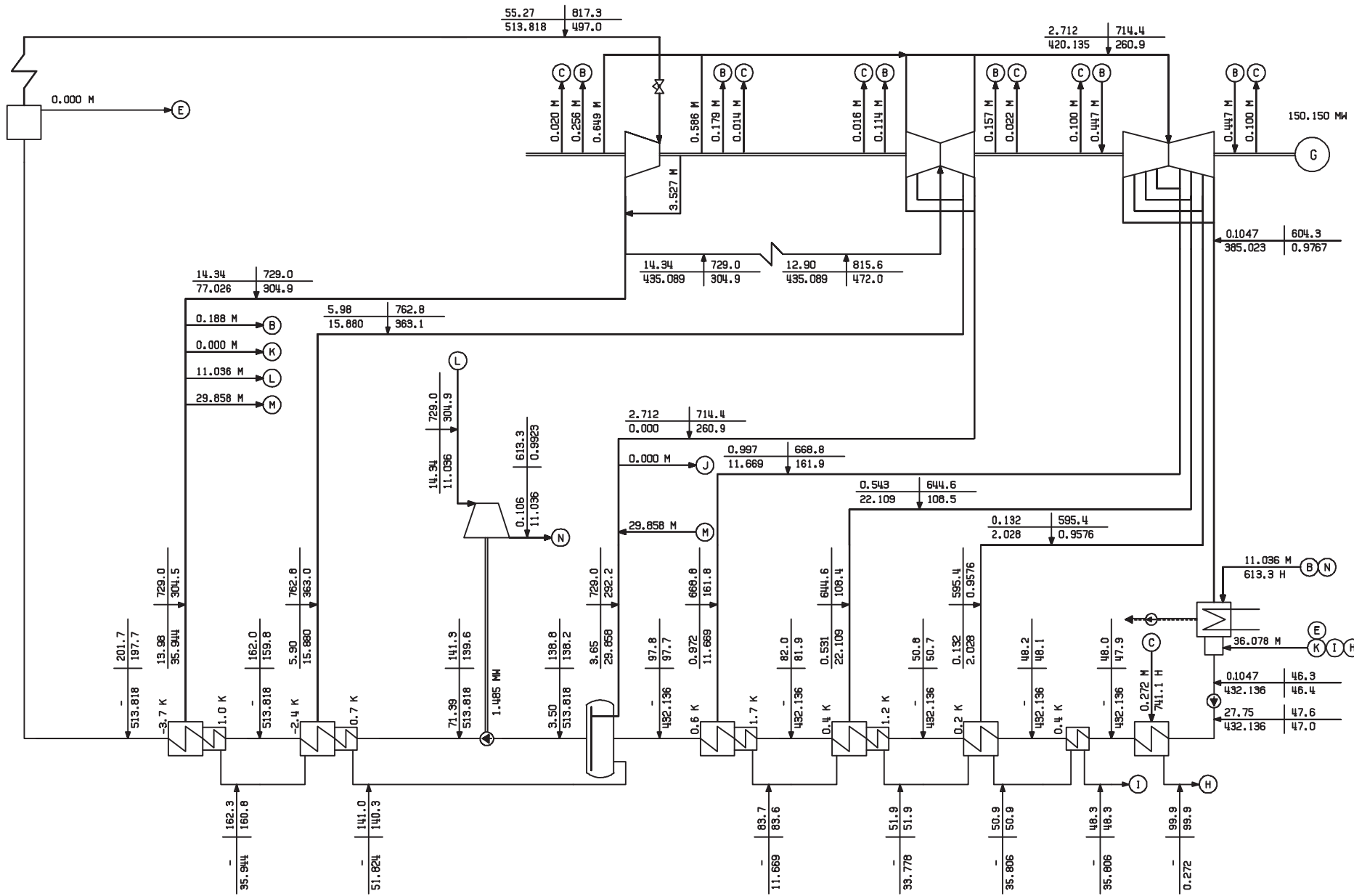
PREP		250MW OZMU 0.1047 ATA BACK PR.
CHKD		MOD. SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N192 REV 00



AT | KCAL/KG  
T/H | °C (X)

M ... MASS FLOW ... T/H  
H ... ENTHALPY ... KCAL/KG

PREP		250MW 37MU 0.1047 ATA BACK PR.
CHKD		MOD. SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N193 REV 00

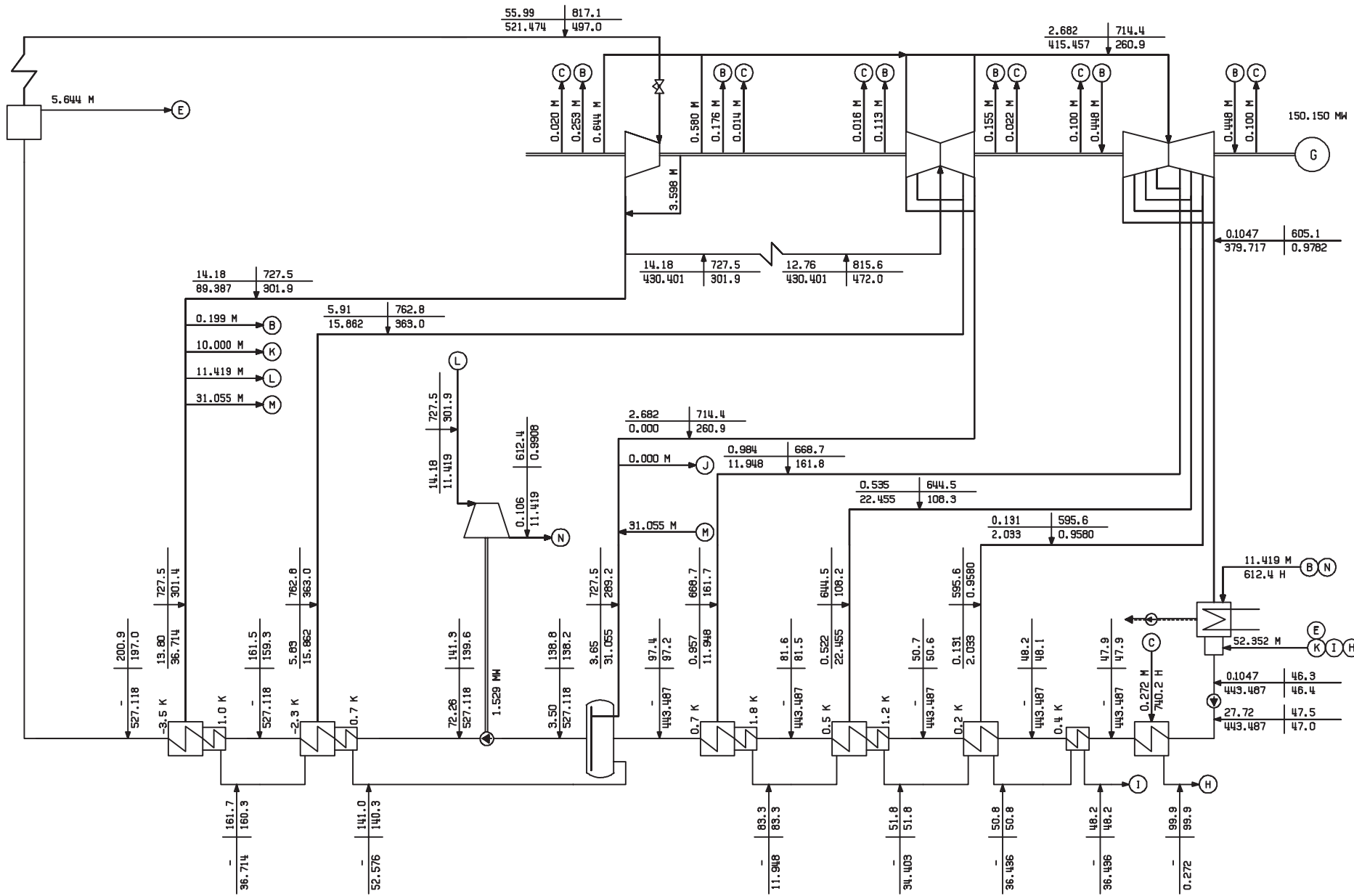


a

AT	KCAL/KG
T/H	*C (X)

M ... MASS FLOW ... T/H  
 H ... ENTHALPY ... KCAL/KG

PREP		150MM O2MU 0.1047 ATA BACK PR.
CHKD		SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N194 REV 00

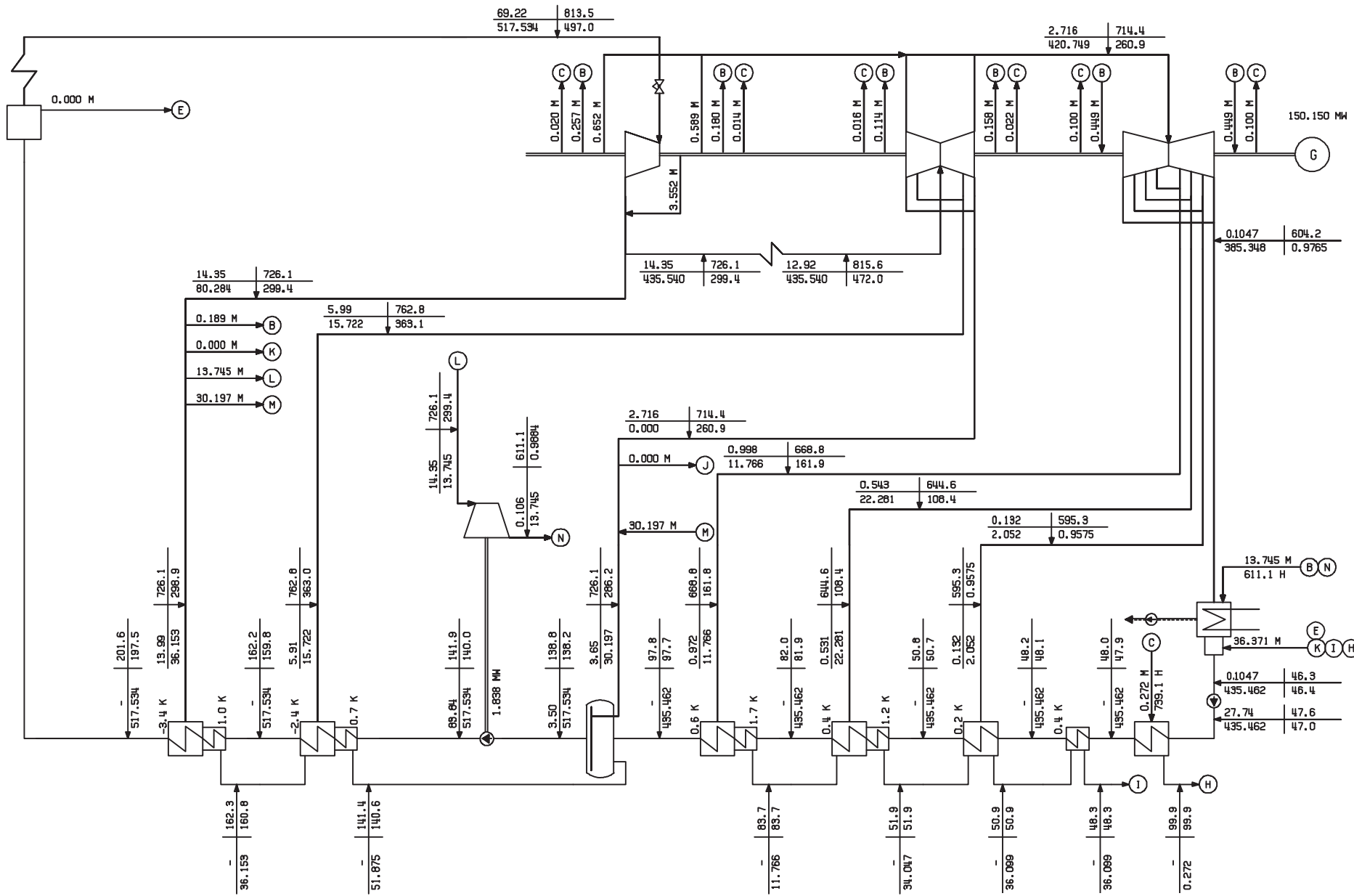


a

AT	KCAL/KG
T/H	*C (X)

M ... MASS FLOW ... T/H  
 H ... ENTHALPY ... KCAL/KG

PREP		150MW 3%MU 0.1047 ATA BACK PR.
CHKD		SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N195 REV 00

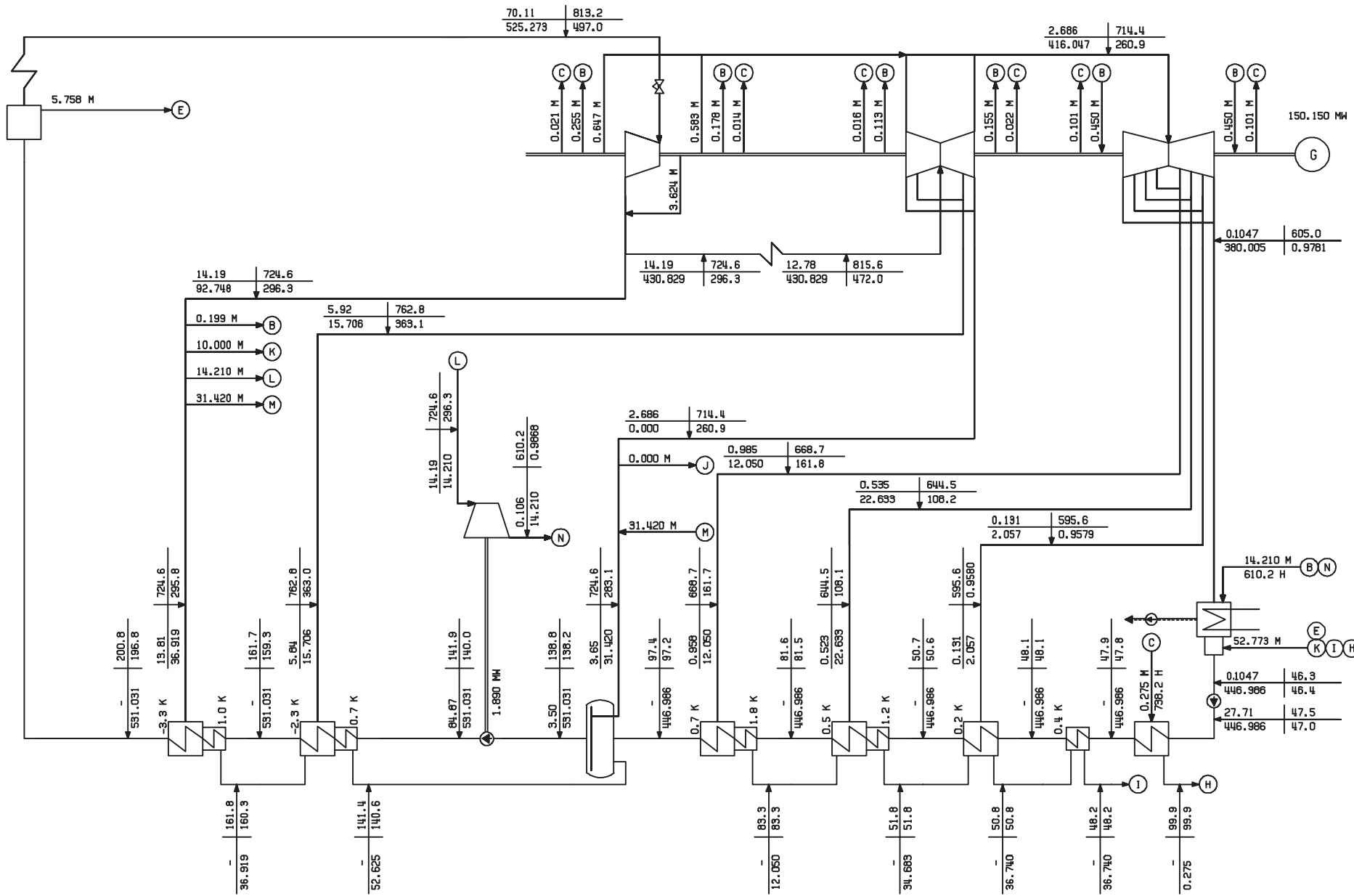


AT | KCAL/KG  
T/H | °C (X)

M. ... MASS FLOW. ... T/H  
H. ... ENTHALPY. ... KCAL/KG

PREP		150MM O2MU 0.1047 ATA BACK PR.
CHKD		MOD. SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N196 REV 00



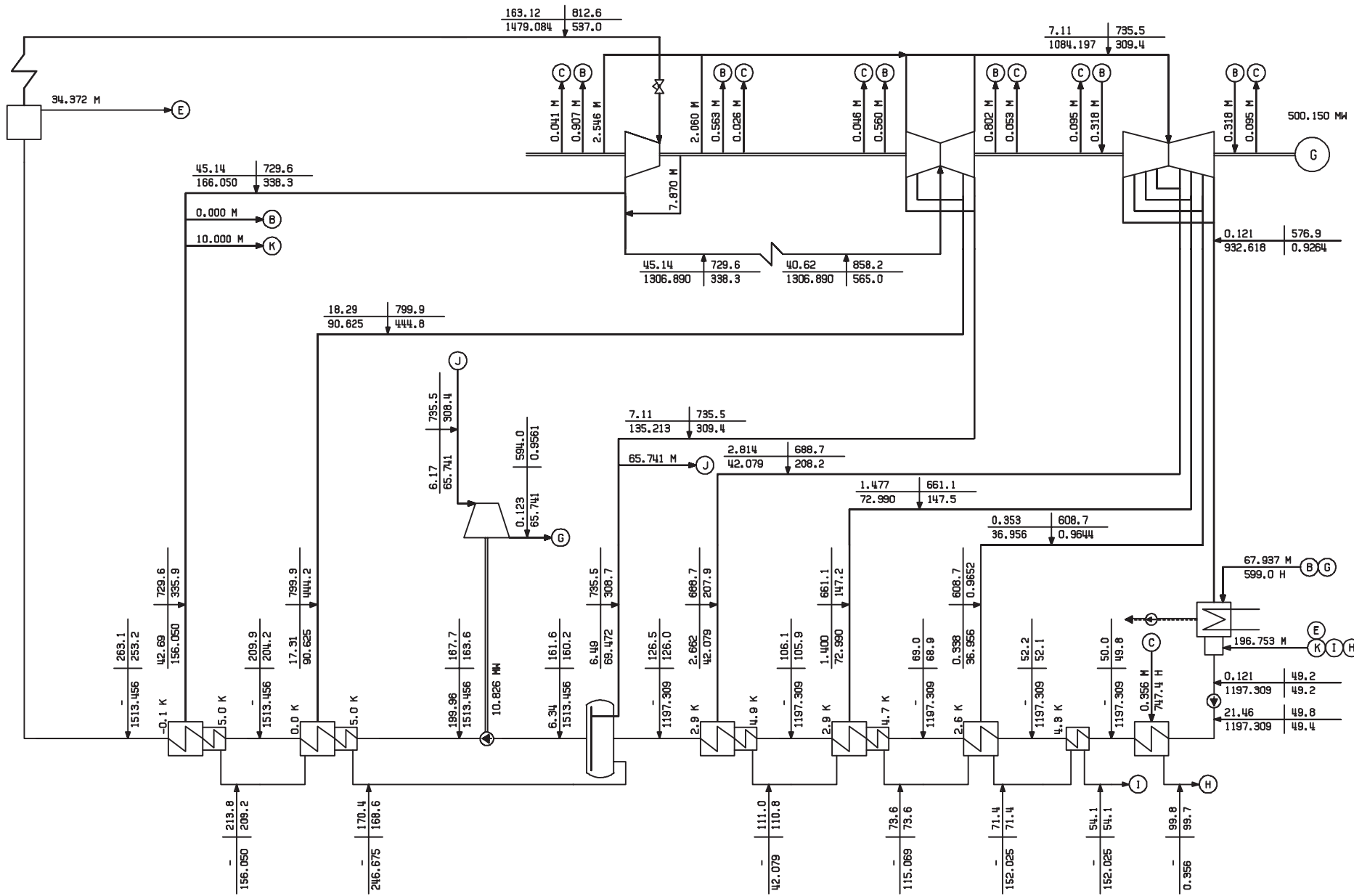


a

AT	KCAL/KG
T/H	*C (<X)

M. . . . MASS FLOW. . . . T/H  
 H. . . . ENTHALPY. . . . KCAL/KG

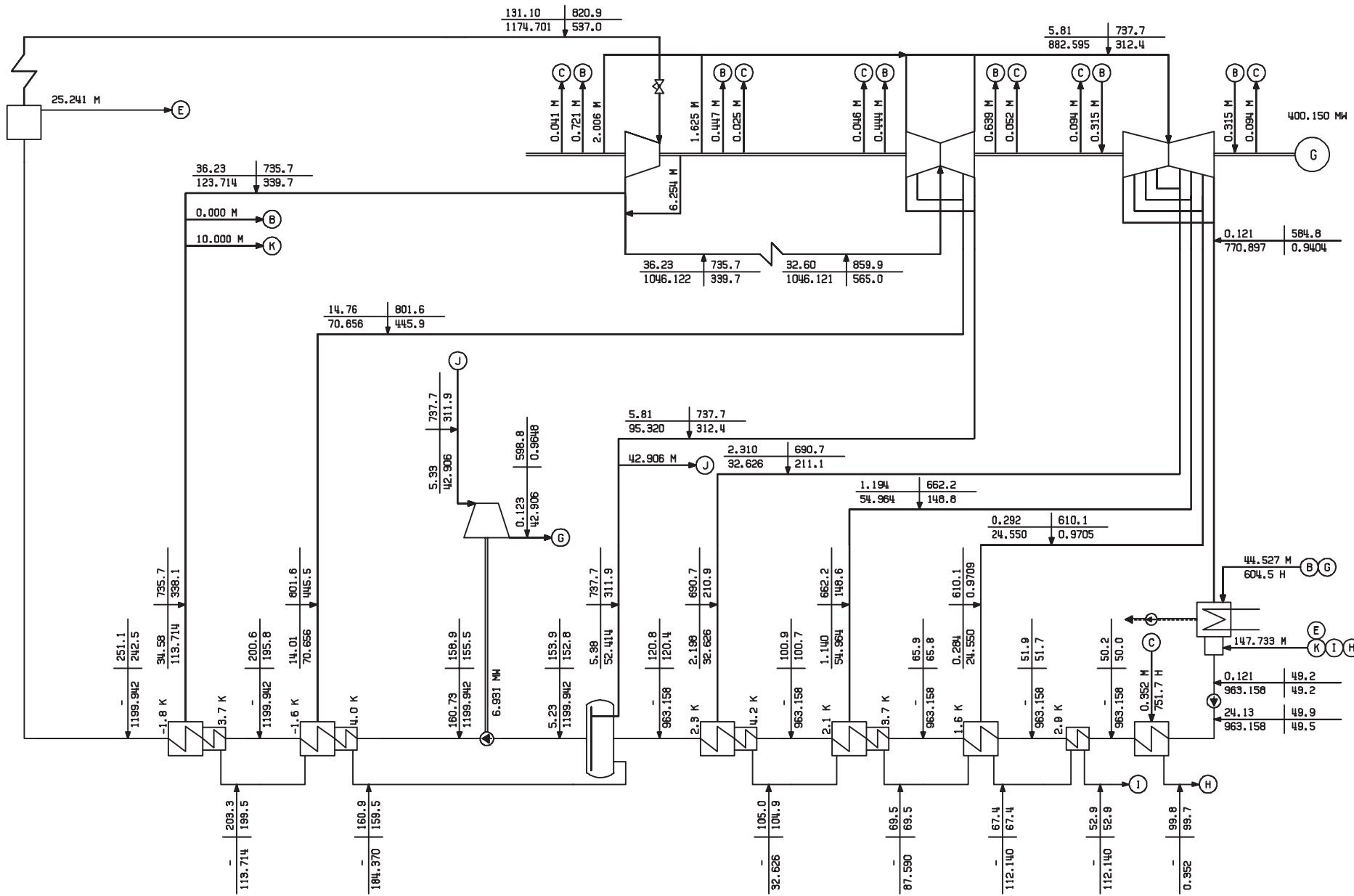
PREP		150MM 3%MU 0.1047 ATA BACK PR.
CHKD		MOD. SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N197 REV 00



AT	KCAL/KG
T/H	*C (X)

M . . . MASS FLOW . . . T/H  
H . . . ENTHALPY . . . . . KCAL/KG

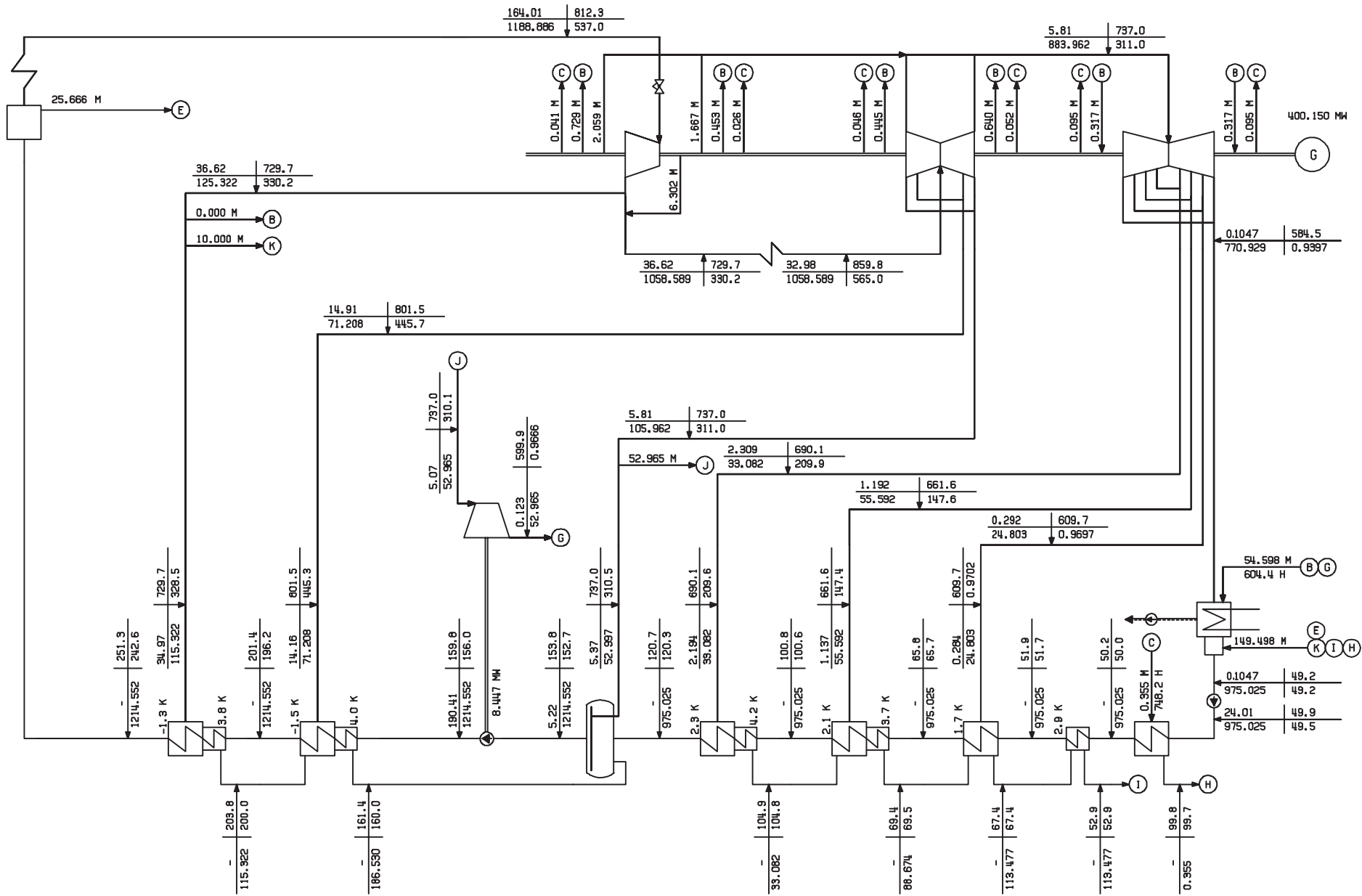
PREP		500MW 3%MU 0.1210 ATA BACK PR.
CHKD		SLIDING PR. OPERATION.
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N198 REV 00



AT	KCAL/KG
T/H	*C (X)

M. ... MASS FLOW. ... T/H  
H. ... ENTHALPY. .... KCAL/KG

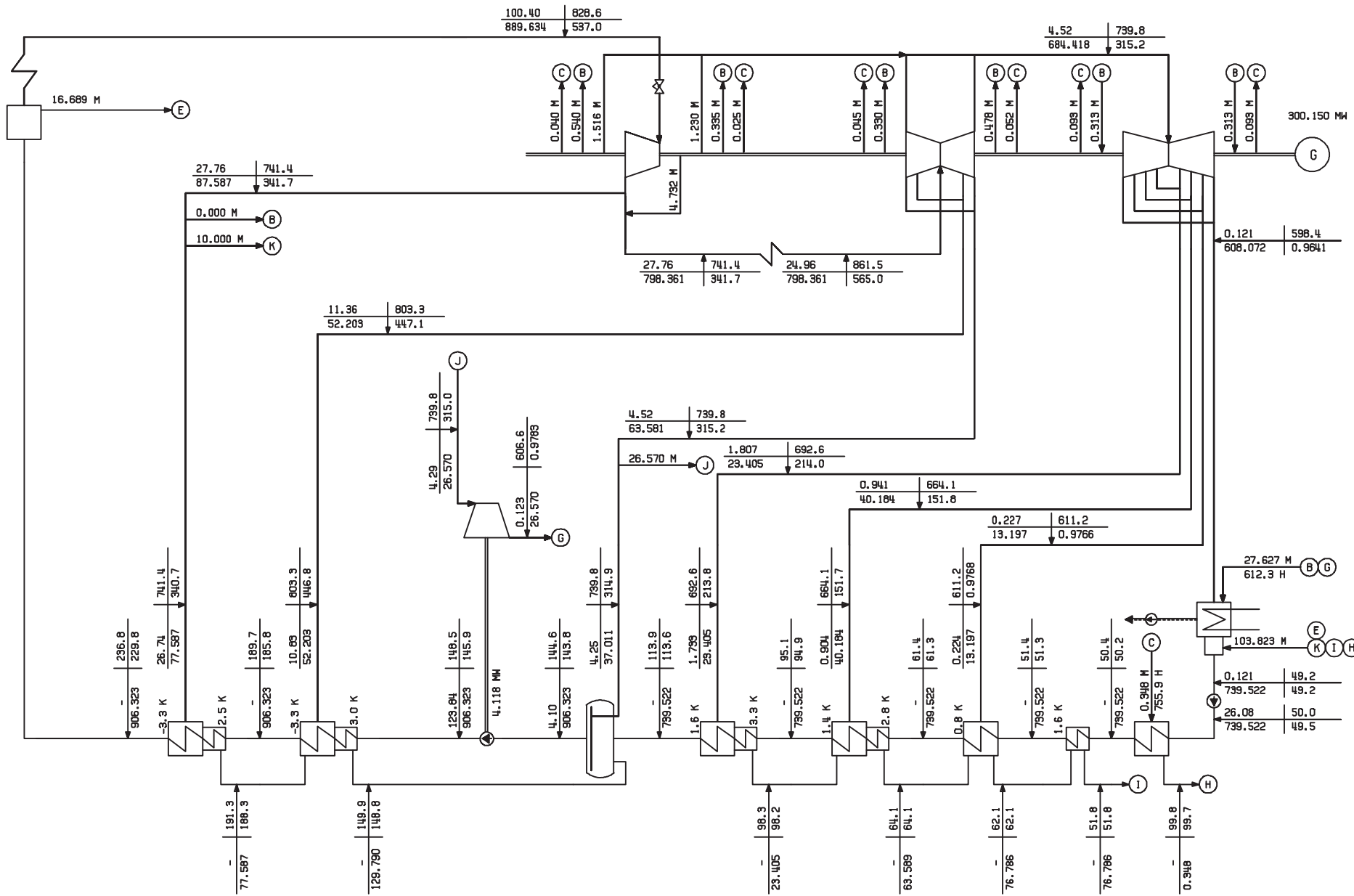
PREP		400MW 3/MU 0.1210 ATA BACK PR.
CHKD		SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N199 REV 00



AT	KCAL/KG
T/H	*C (<X>)

M . . . MASS FLOW . . . T/H  
H . . . ENTHALPY . . . . . KCAL/KG

PREP		400MW 3/MU 0.1210 ATA BACK PR.
CHKD		MOD. SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N200 REV 00

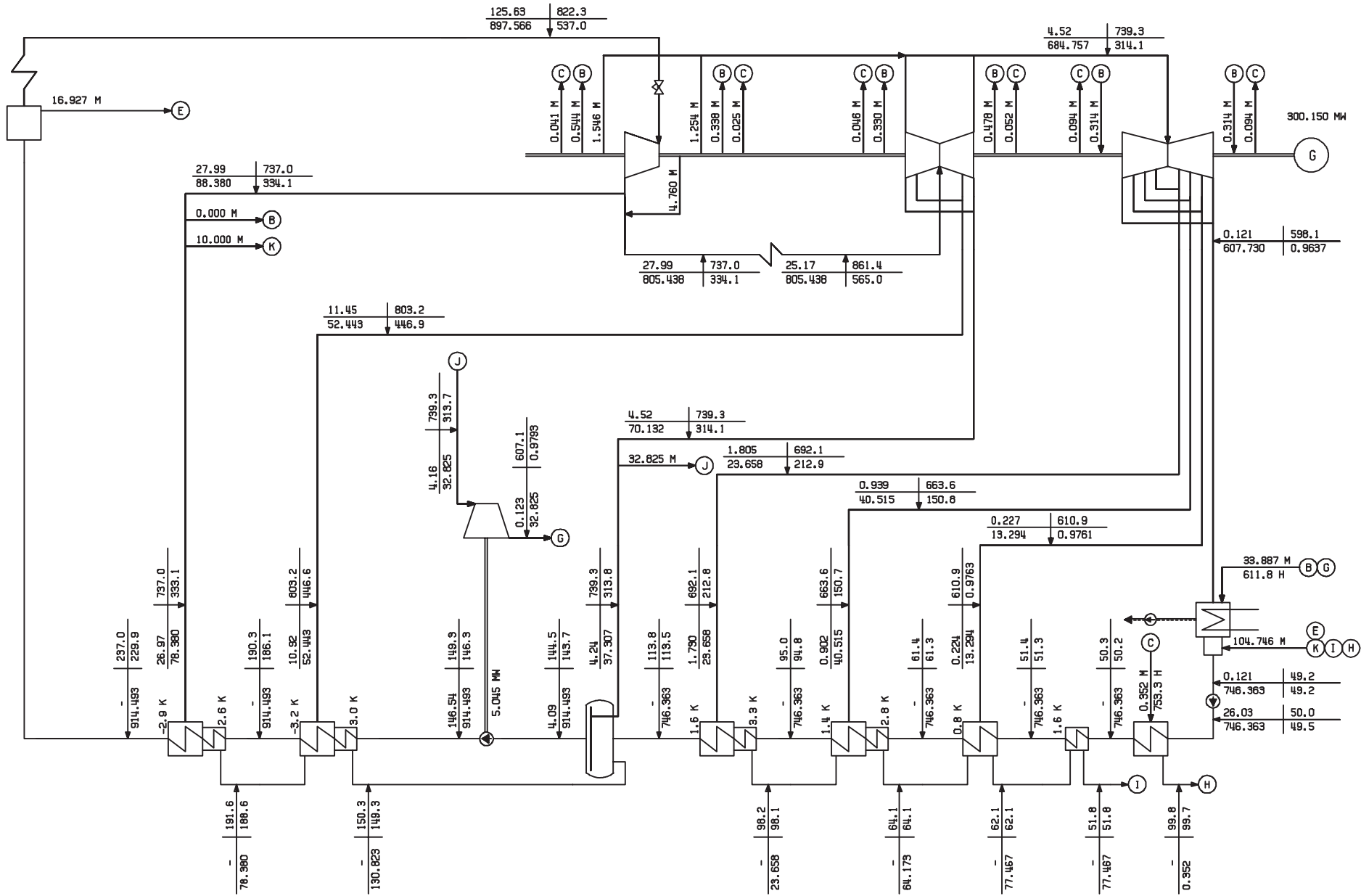


a

AT	KCAL/KG
T/H	*C (X)

M. . . . MASS FLOW. . . . T/H  
H. . . . ENTHALPY. . . . . KCAL/KG

PREP		300MW 3/2MU 0.1210 ATA BACK PR.
CHKD		SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N201 REV 00

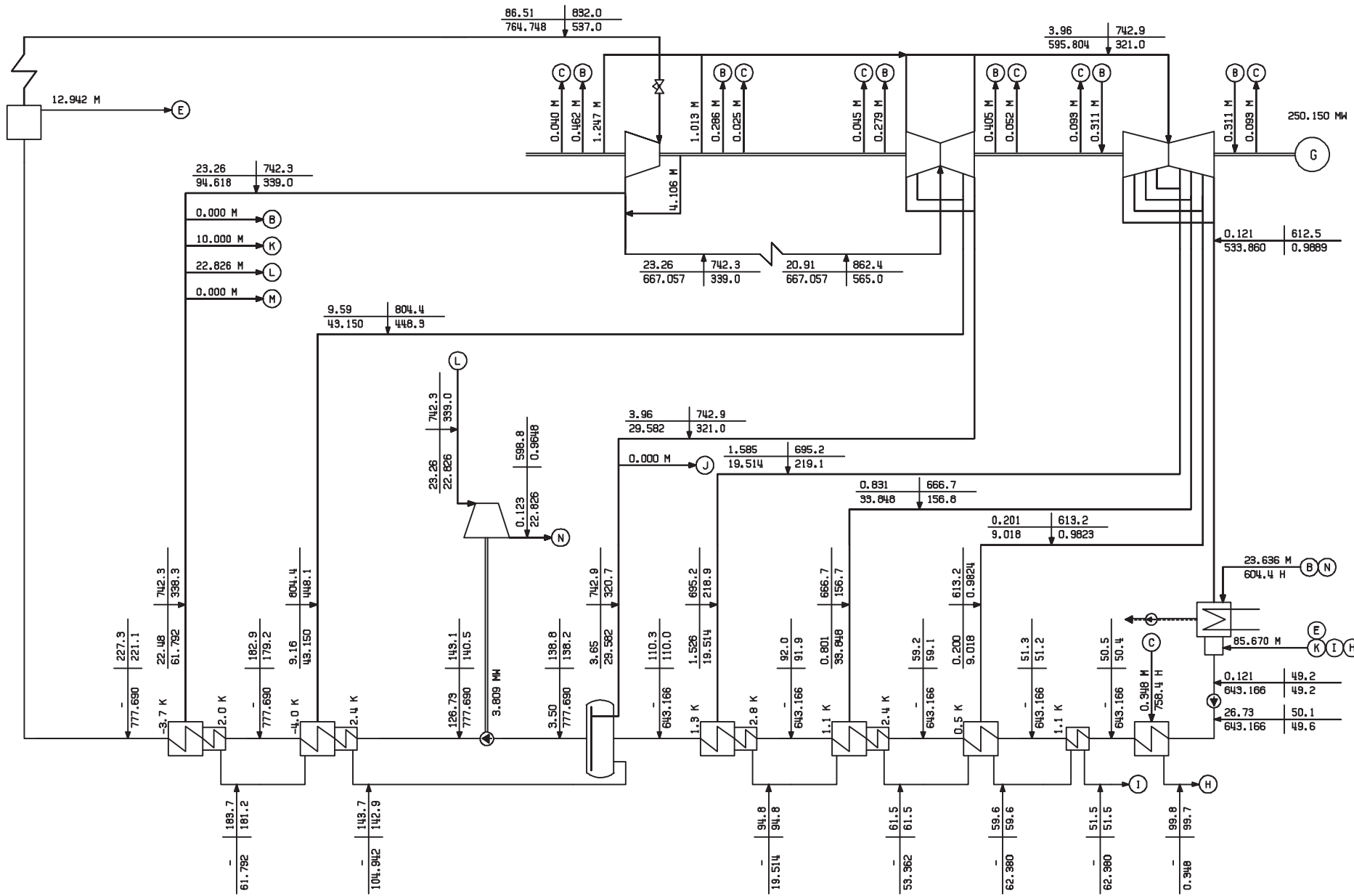


a

AT	KCAL/KG
T/H	*C (X)

M . . . MASS FLOW . . . T/H  
 H . . . ENTHALPY . . . KCAL/KG

PREP		300MW 3XUO 0.1210 ATA BACK PR.
CHKD		MOD. SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N202 REV 00

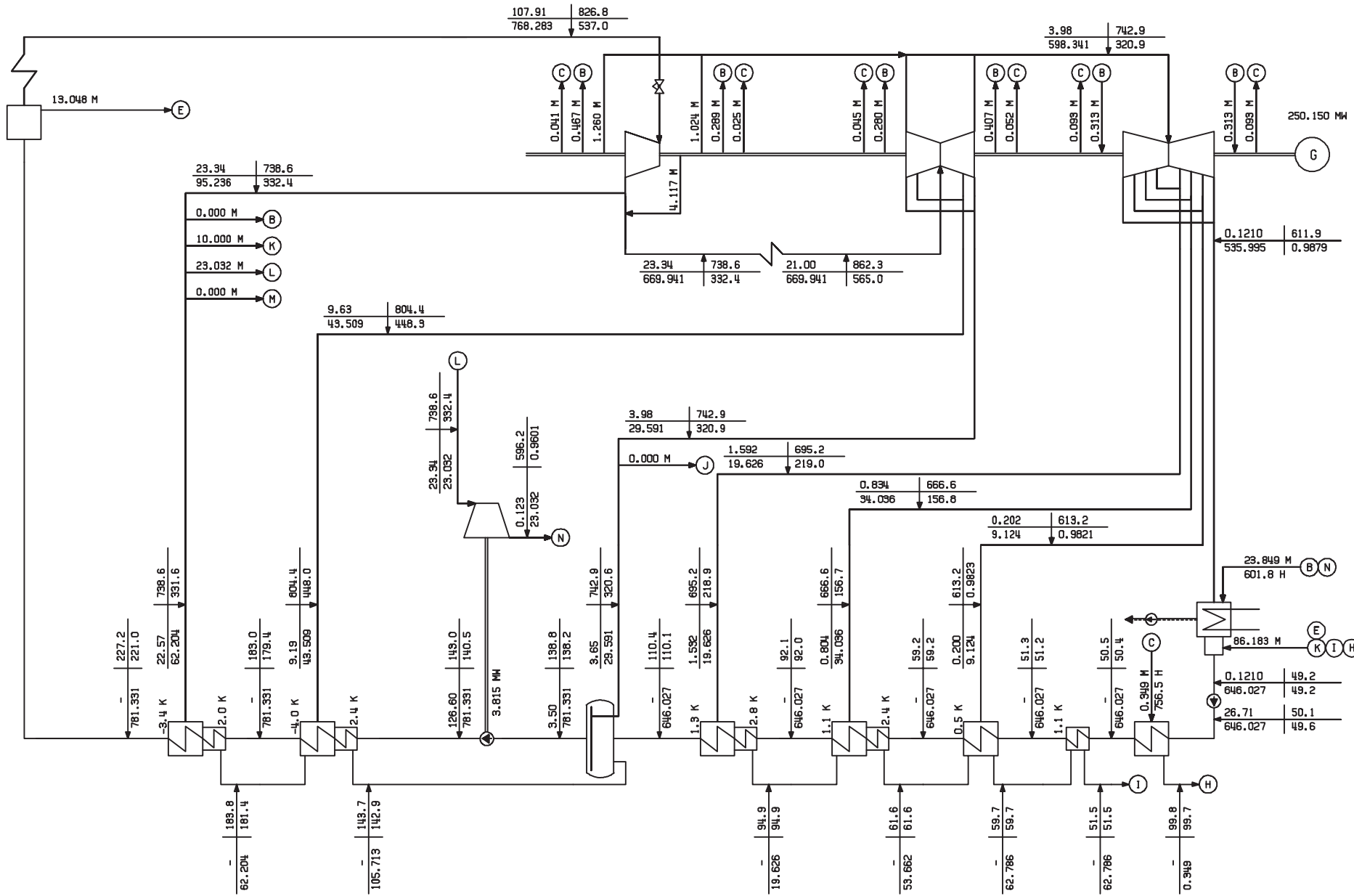


a

AT	KCAL/KG
T/H	*C (X)

M . . . MASS FLOW . . . T/H  
H . . . ENTHALPY . . . . . KCAL/KG

PREP		250MW 3%MU 0.1210 ATA BACK PR.
CHKD		SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N203 REV 00



a

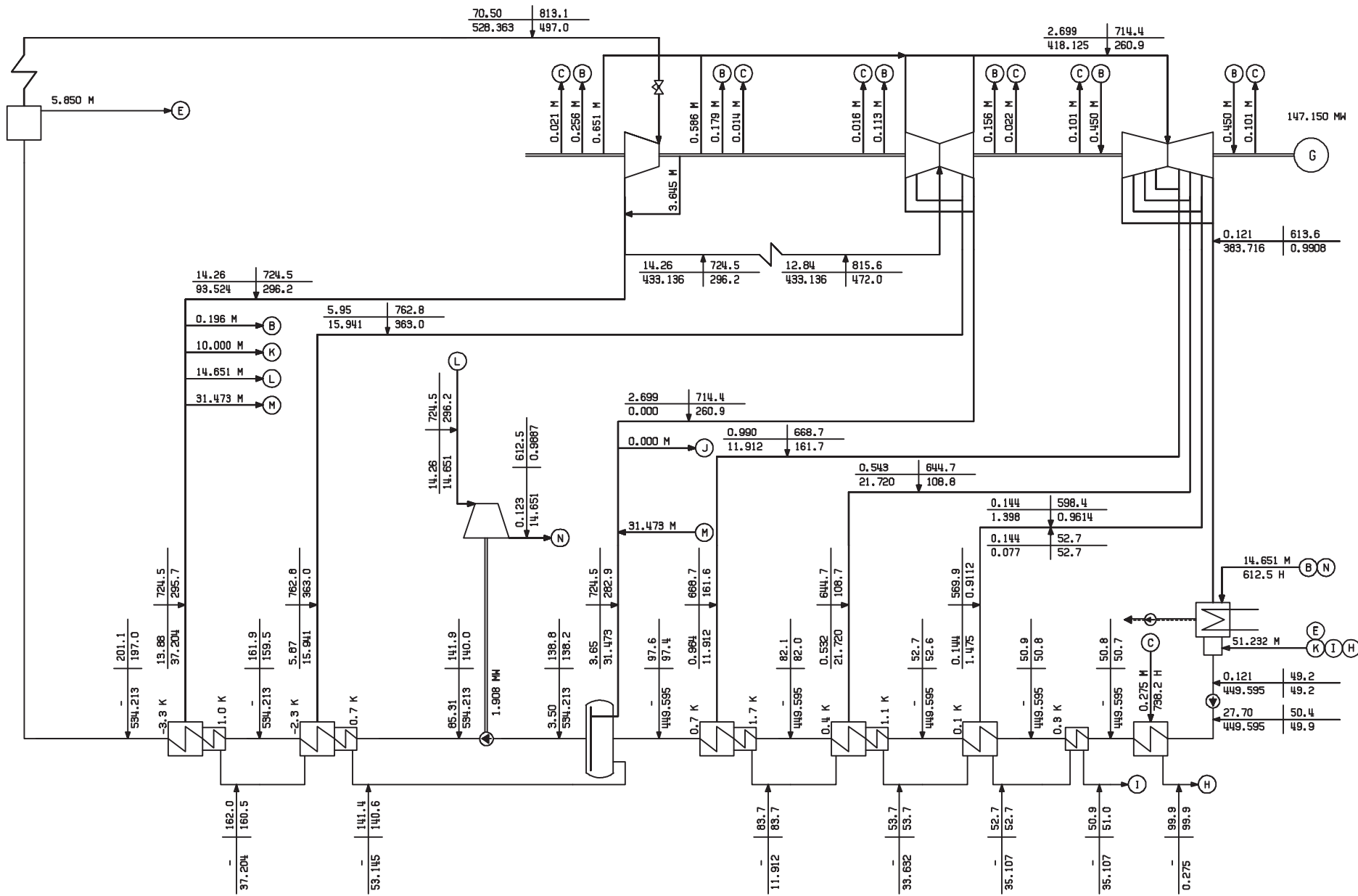
AT	KCAL/KG
T/H	*C (X)

M. ... MASS FLOW. ... T/H  
 H. ... ENTHALPY. ... KCAL/KG

PREP		250MW 37MU 0.1210 ATA BACK PR.
CHKD		MOD. SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N204 REV 00





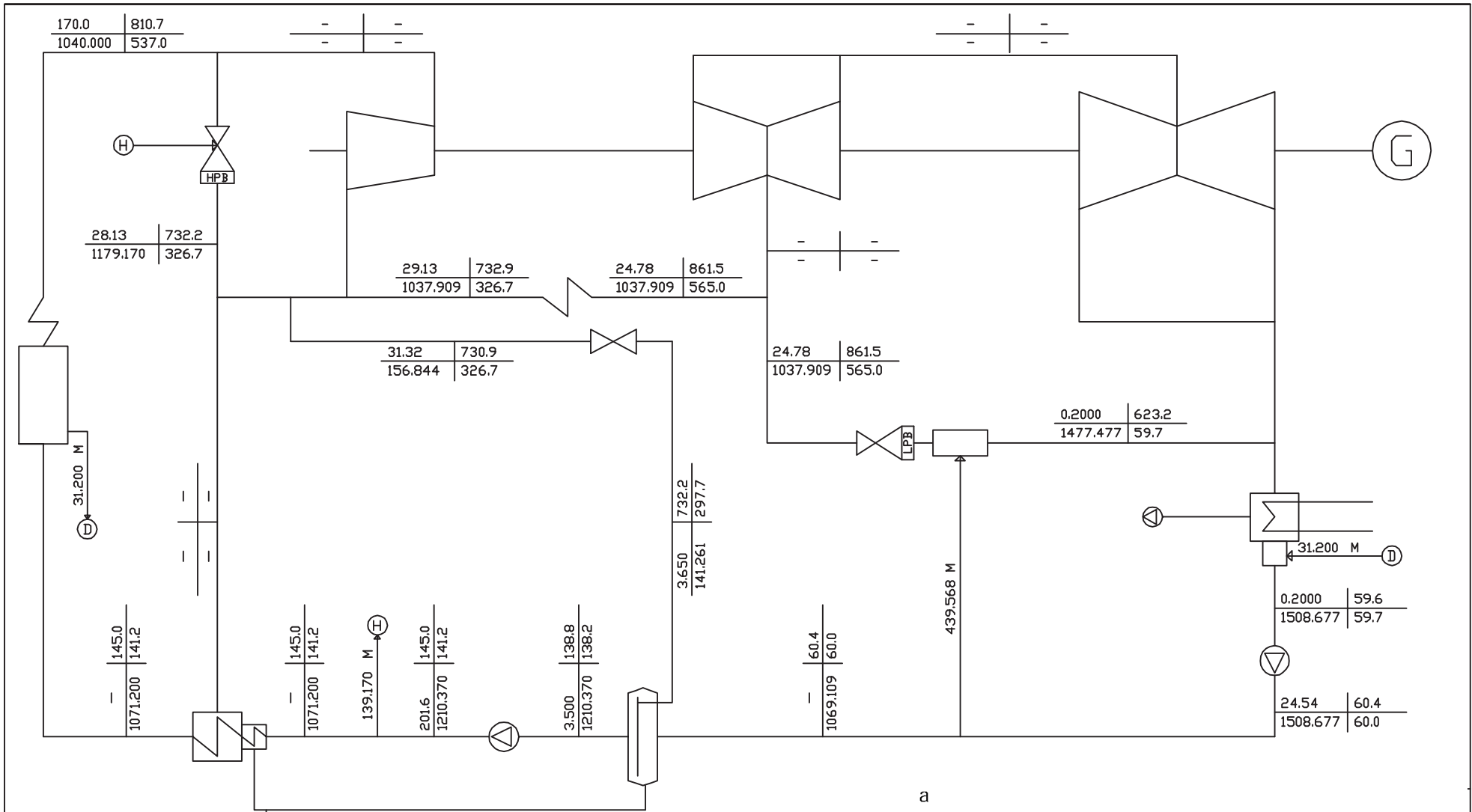


a

AT	KCAL/KG
T/H	*C (X)

M . . . MASS FLOW . . . T/H  
H . . . ENTHALPY . . . . . KCAL/KG

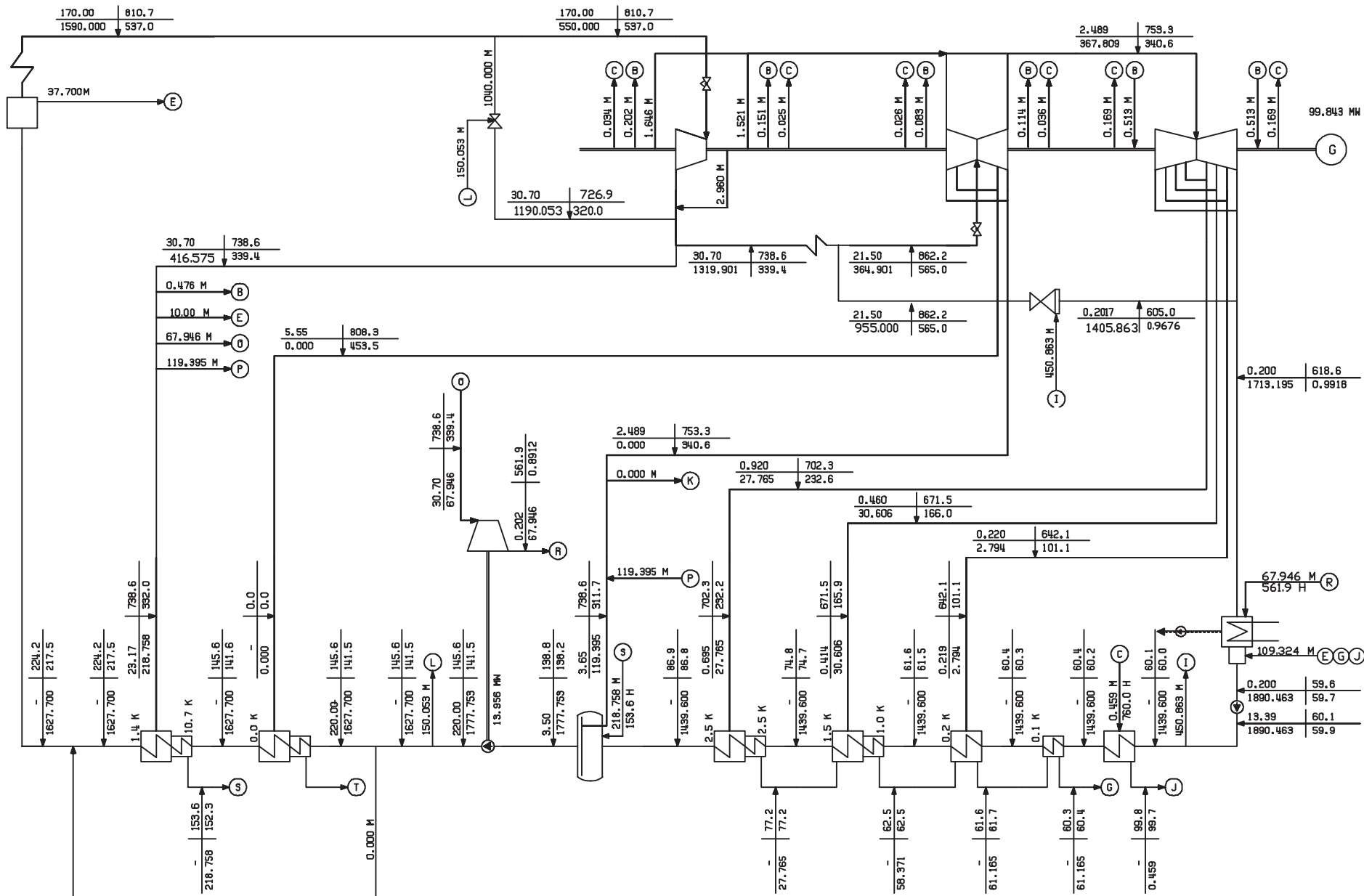
PREP		150MM 3%MU 0.1210 ATA BACK PR.
CHKD		MOD. SLIDING PR. OPERATION
APPD		JOB NO 336
DATE	18.04.09	DRG NO PE - DC - 336 - 100-N206 REV 00



AT | KCAL/KG  
T/H | °C (X)

M...MASS FLOW...T/H  
H...ENTHALPY.....KCAL/KG

PREP		1040 TPH HP/LP BYPASS	3%MU
CHKD		MOTOR DRIVEN BFP	TOP HEATER OUT
APPD	JOB NO	G46	
DATE	21.03.08	DRG NO	PE - DC - G46 - 100 - N207 REV 00

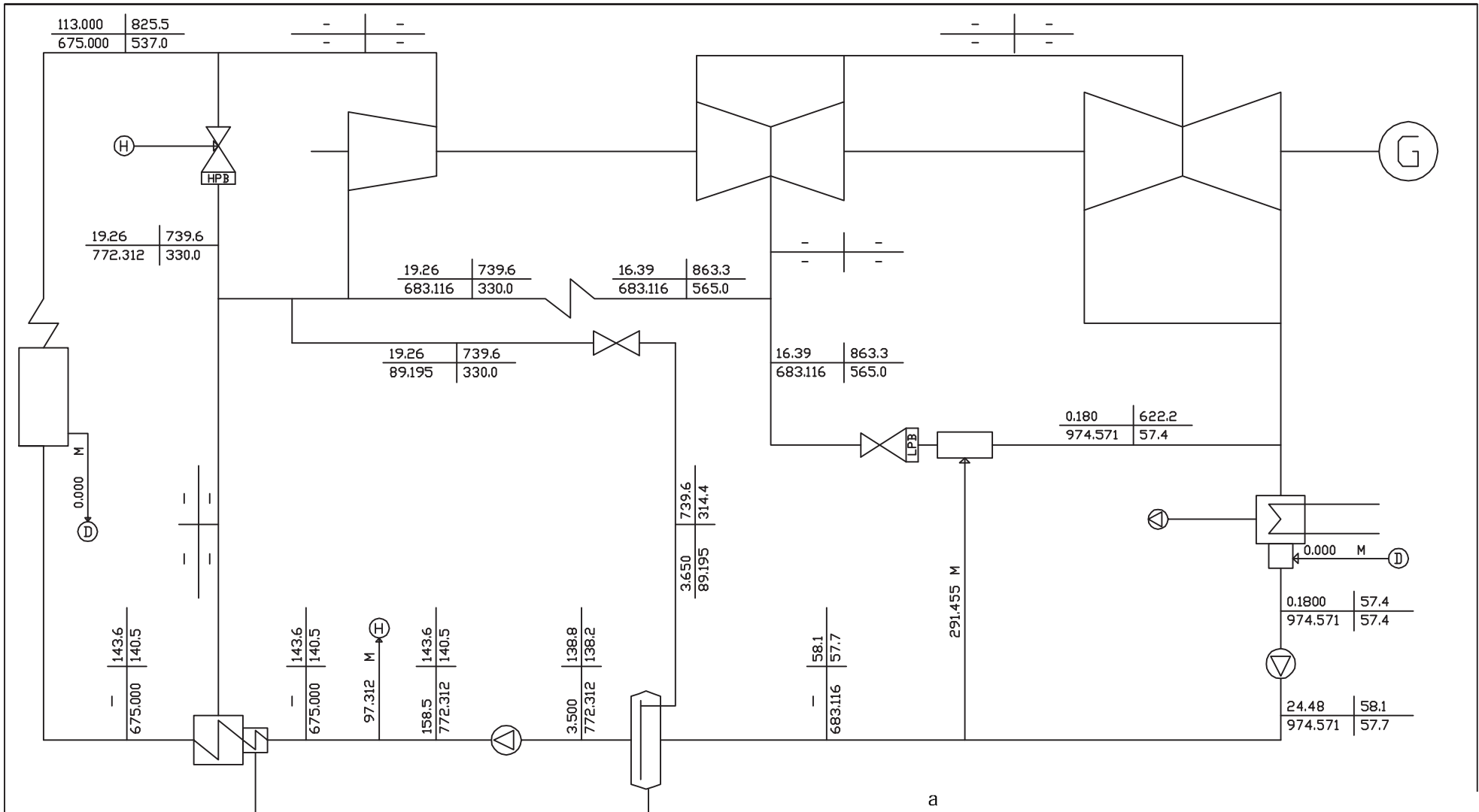


a

AT	KCAL/KG
T/H	*C (X)

M. . . . MASS FLOW. . . . T/H  
 H. . . . ENTHALPY. . . . KCAL/KG

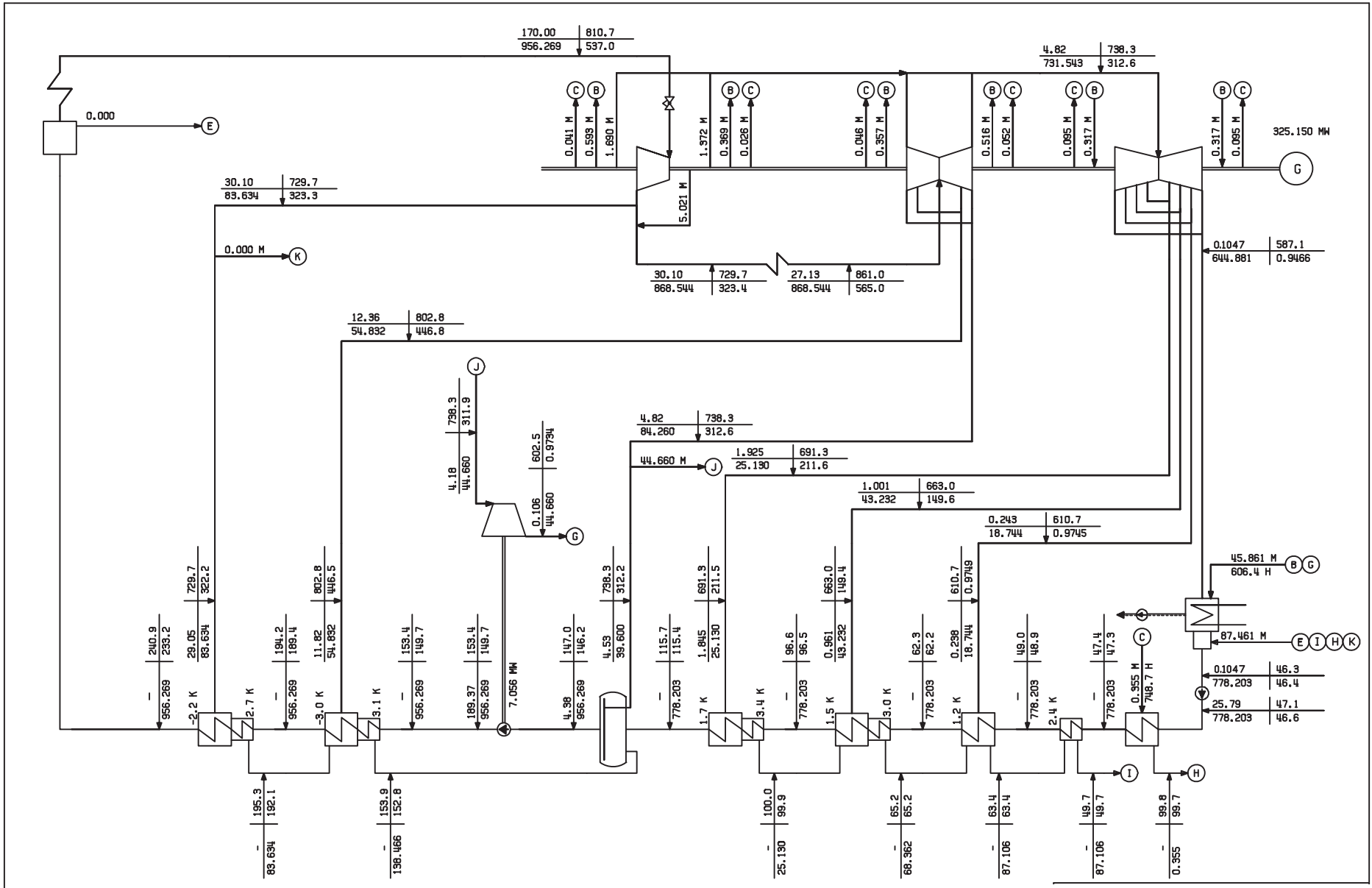
PREP	PARRALLEL OPERATION (1590 T/HR)
CHKD	BYPASS OPERATION
APPD	JOB NO G46
DATE	21.03.08 DRG NO PE - DC - G46 - 100-N208 REV 00



AT | KCAL/KG  
T/H | °C (X)

M...MASS FLOW...T/H  
H...ENTHALPY.....KCAL/KG

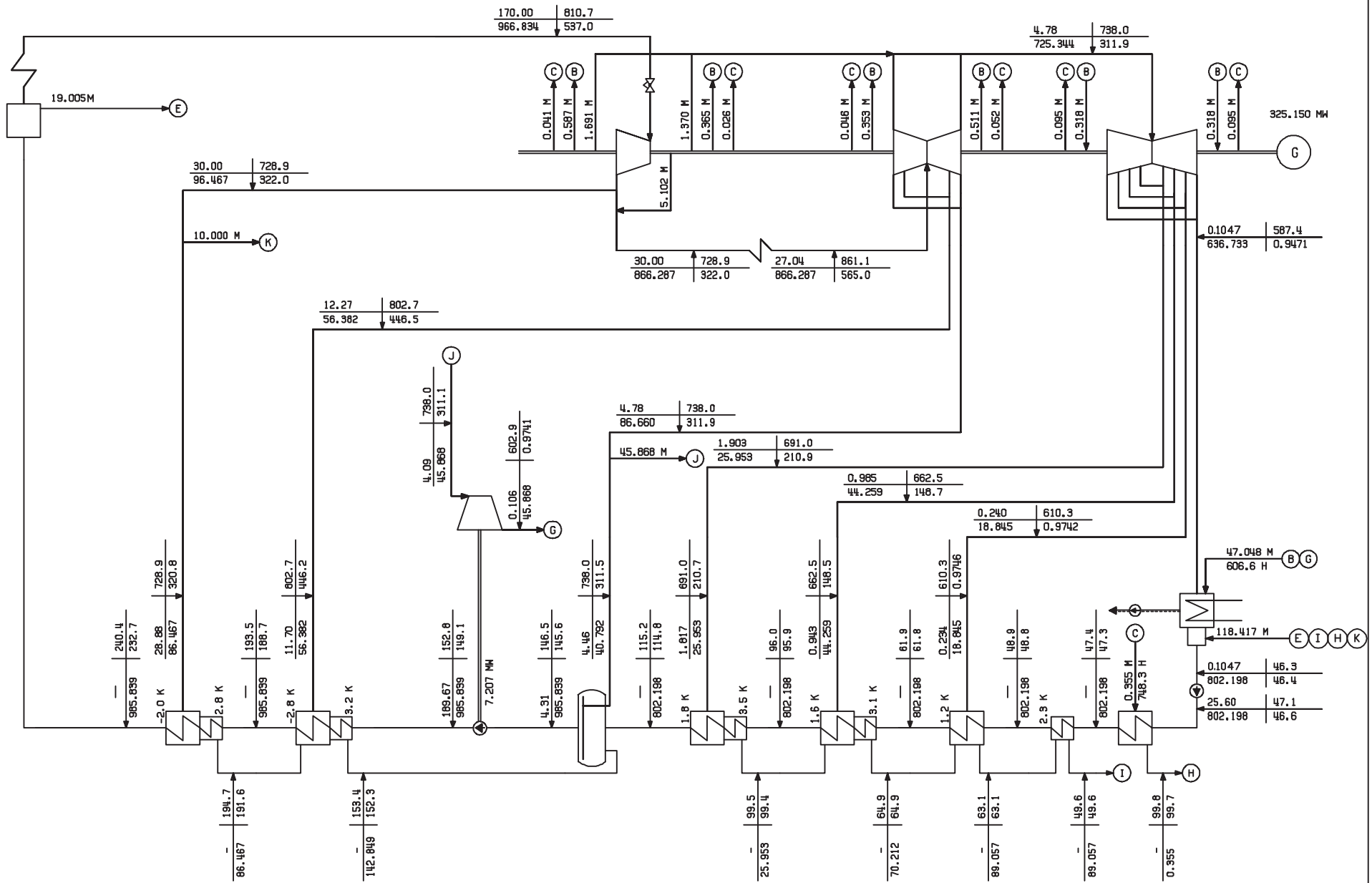
PREP		HP/LP BYPASS 0%MU SL. PR. OPERATION
CHKD		MOTOR DRIVEN BFP TOP HEATER OUT
APPD	JOB NO	G46
DATE	21.03.08	DRG NO PE - DC - G46 - 100 - N209 REV. 00



AT | KCAL/KG  
T/H | °C (X)

M ... MASS FLOW ... T/H  
H ... ENTHALPY ... KCAL/KG

PREP		325MW	0%MU	0.1047	ATA	BACK	PR.
CHKD							
APPD		JOB NO	336				
DATE	01.09.09	DRG NO	PE-DC-	336-	100-	N210	REV 00

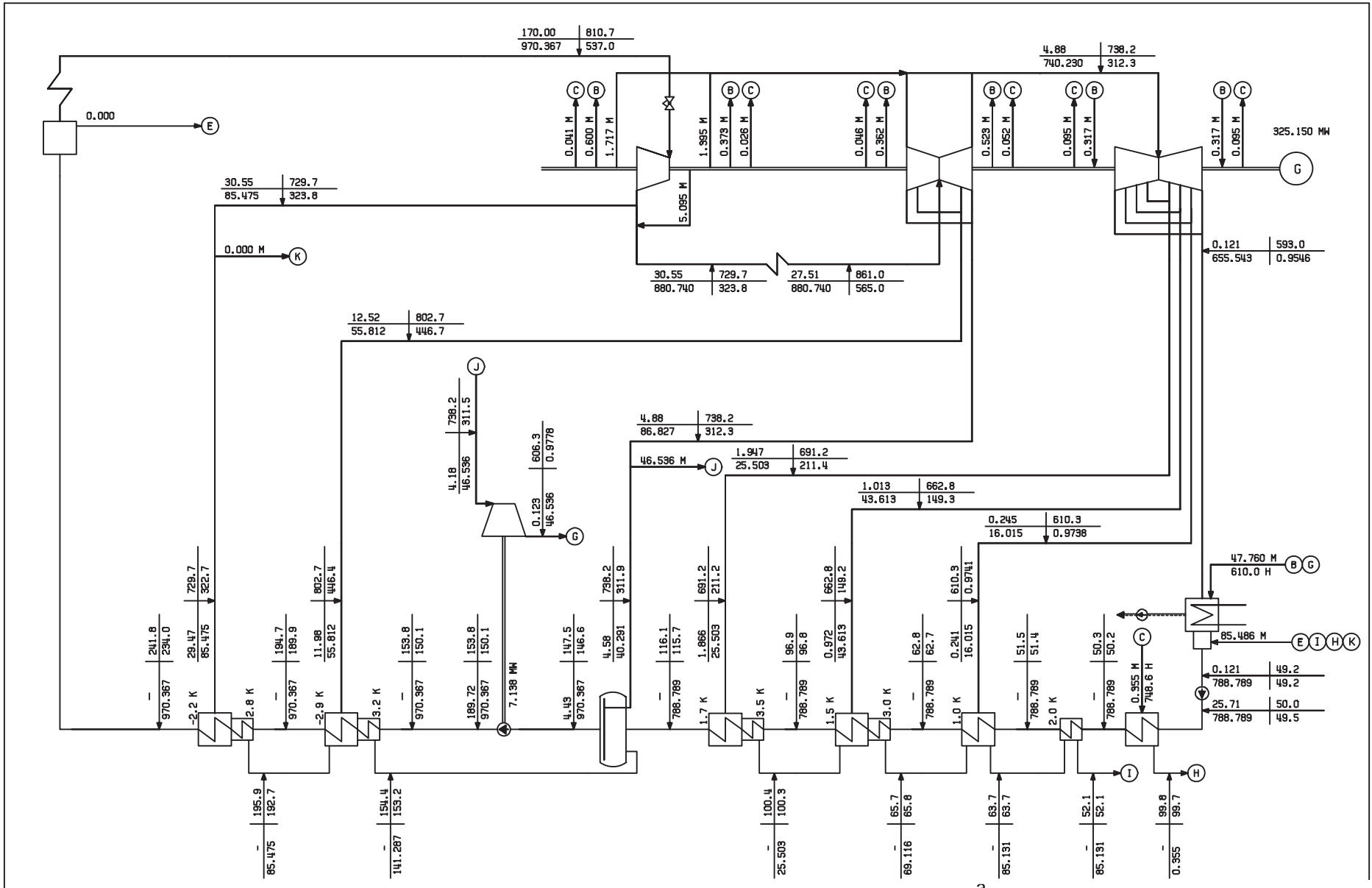


a

AT | KCAL/KG  
T/H | °C (X)

M... MASS FLOW... T/H  
H... ENTHALPY... KCAL/KG

PREP		325MW 3/2MU 0.1047 ATA BACK PR.
CHKD		
APPD		JOB NO. G46
DATE	21.03.08	DRG NO PE- DC- G46- 100- N215 REV 00

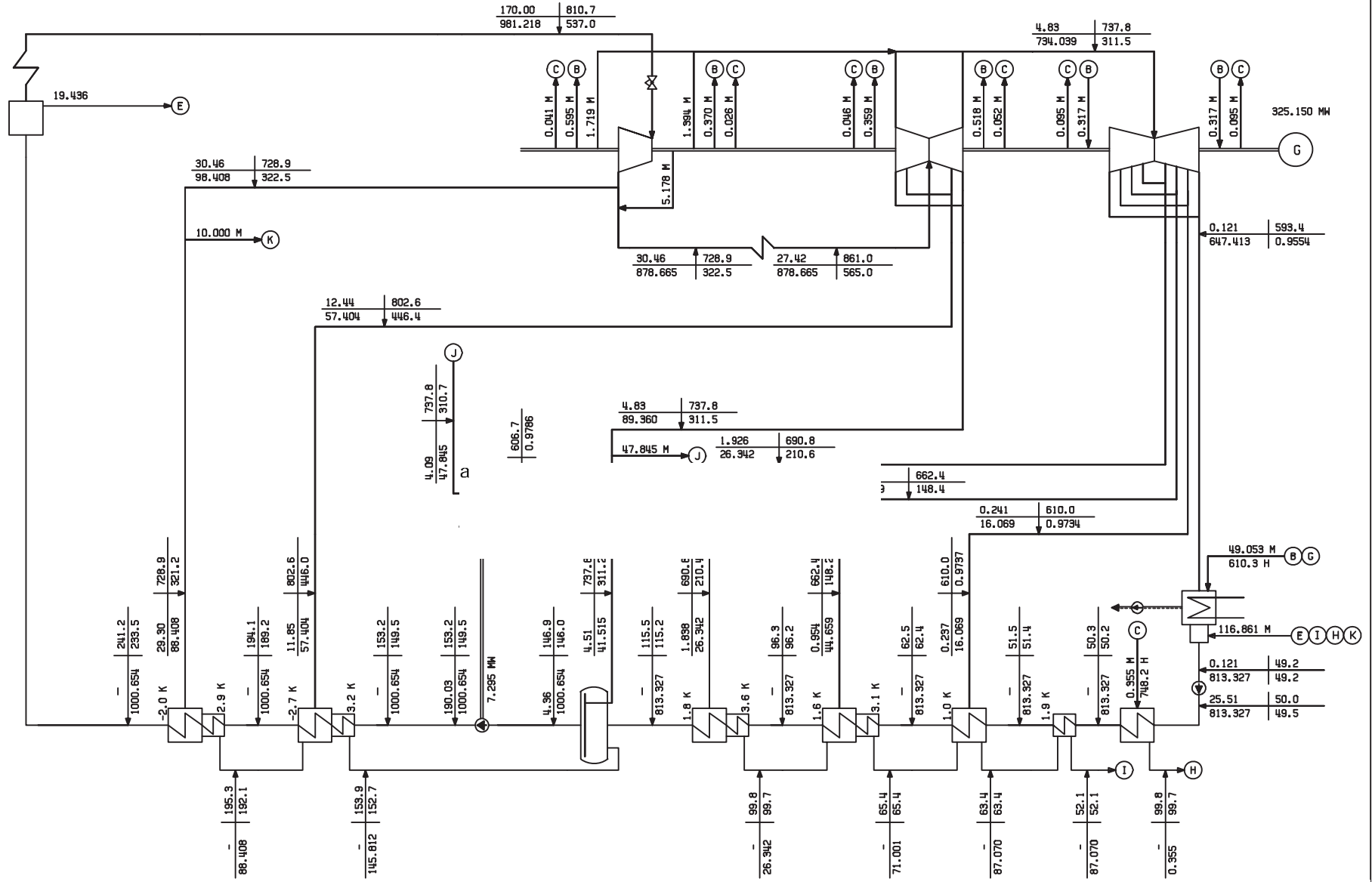


AT | KCAL/KG  
T/H | °C (X)

M ... MASS FLOW ... T/H  
H ... ENTHALPY ... KCAL/KG

PREP		325MW	0%MU	0.1210	ATA	BACK	PR.
CHKD							
APPD		JOB NO	336				
DATE	01.09.09	DRG NO	PE-DC-336-100-N216	REV	00		

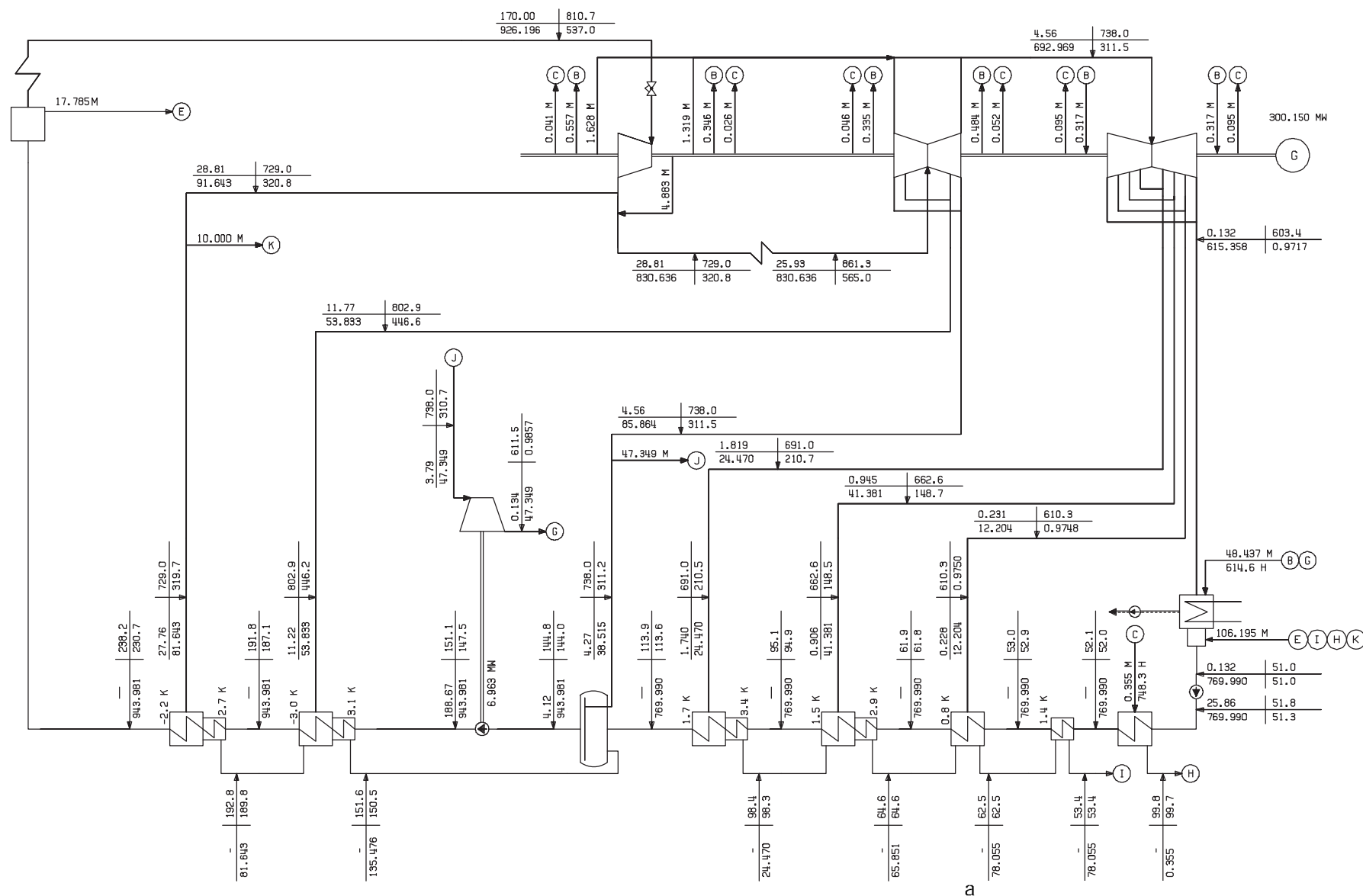




AT | KCAL/KG  
T/H | °C (X)

M ... MASS FLOW ... T/H  
H ... ENTHALPY ... KCAL/KG

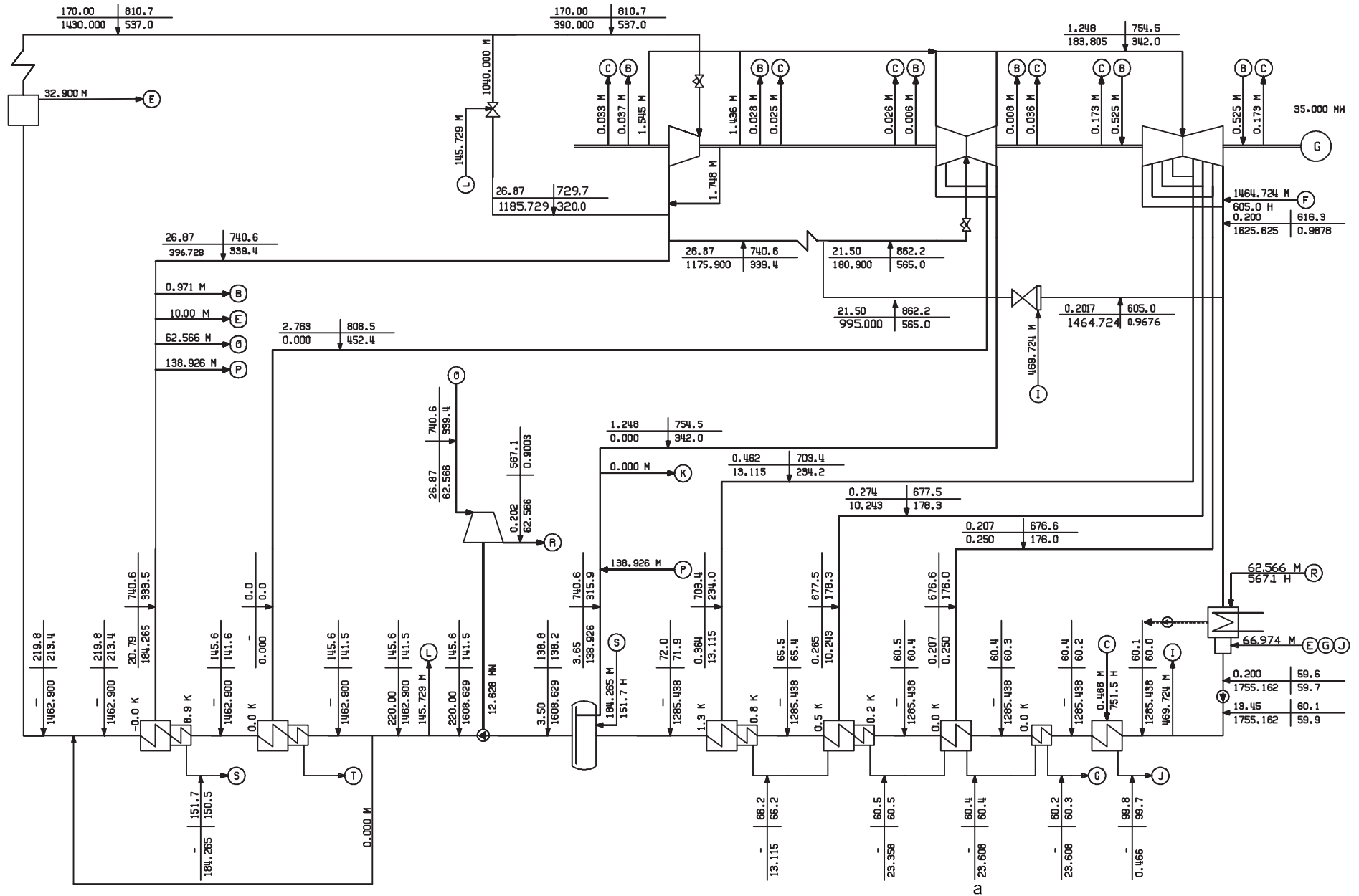
PREP		325MW	3%MU	0.1210	ATA	BACK	PR.
CHKD							
APPD		JOB NO	336				
DATE	01.09.09	DRG NO	PE-DC-336-100-N217	REV			00



AT | KCAL/KG  
 T/H | °C <X>

M... MASS FLOW... T/H  
 H... ENTHALPY... KCAL/KG

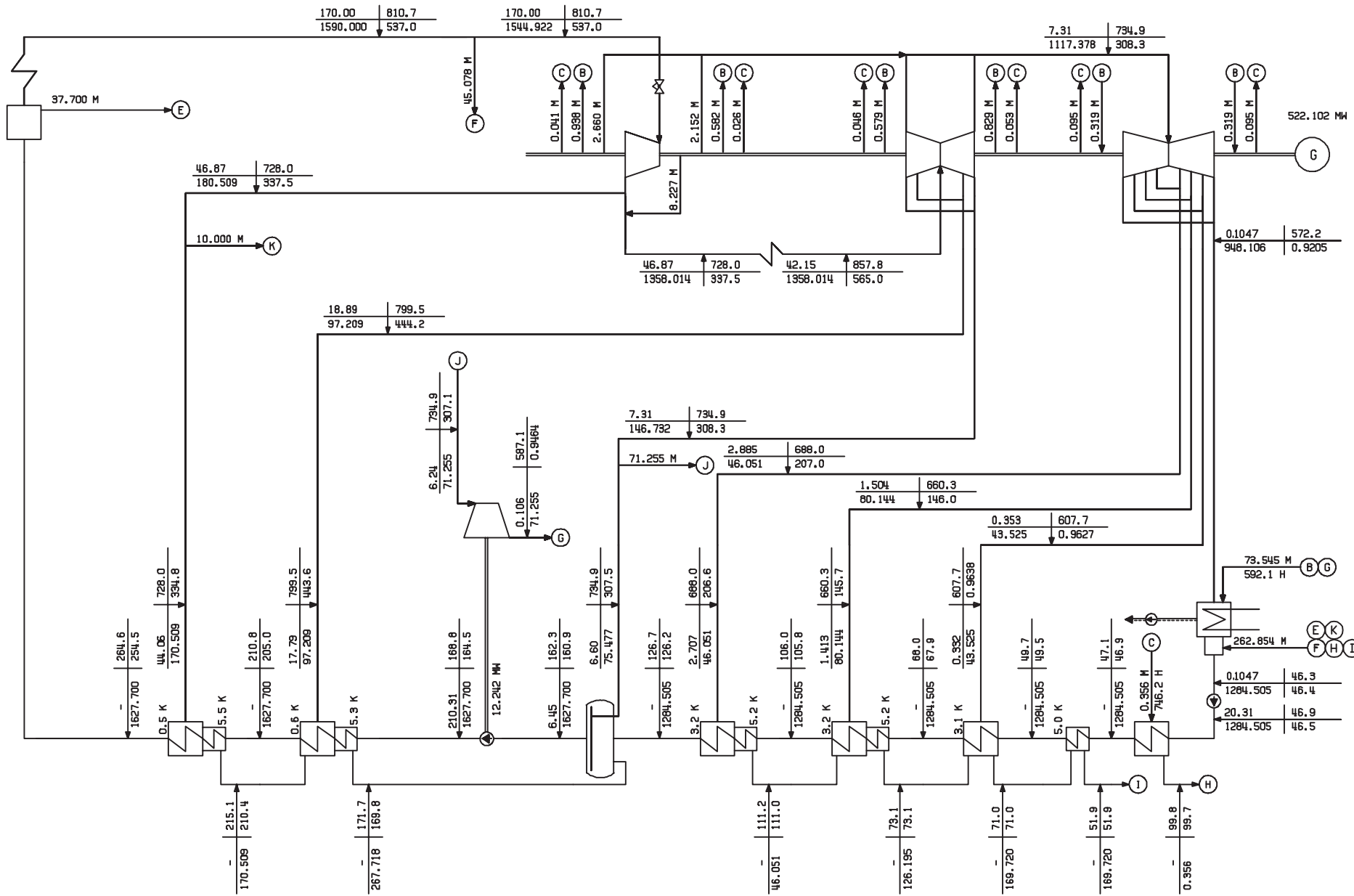
PREP		300MW 3/4MU 33 DEG. C CW TEMP.
CHKD		HALF CONDENSER OPERATION
APPD		JOB NO 336
DATE	01.09.09	DRG NO PE- DC- 336- 100- N219 REV 00



AT | KCAL/KG  
 T/H | °C (X)

M. ... MASS FLOW. ... T/H  
 H. ... ENTHALPY. .... KCAL/KG

PREP	HOUSE LOAD 35MW 3%MU
CHKD	BYPASS OPERATION
APPD	JOB NO G46
DATE	21.03.08 DRG NO PE - DC - G46 - 100-N220 REV 00



2

AT	KCAL/KG
T/H	*C (X)

M. . . . MASS FLOW. . . . T/H  
 H. . . . ENTHALPY. . . . . KCAL/KG

PREP				
CHKD				
APPD				
DATE	21.03.08	DRG NO	PE- DC- G46- 100- N249	REV 00

BMCR/VMO 32MU 0.1047 ATA BACK PR.

**NTPC LIMITED**

(A Govt. of India Enterprise)

**CORPORATE ENGINEERING**

**NOTICE FOR EXTENSION (II) OF EXPRESSION OF INTEREST (EOI) SUBMISSION DATE**

Ref No.: NTPC/PE/ET&PR/2220907/EXT/2

Date: 09.11.2022

This is in continuation to our notice inviting Expression of Interest (EOI) No.: NTPC/PE/ET&PR/2220907 Dated 07.09.2022 for setting up a pilot project for Thermal Energy Storage System (TESS) coupled with steam water cycle of one of the existing coal power plants of NTPC to augment its flexible operation to balance intermittency of renewable energy sources., uploaded on [www.ntpctender.com](http://www.ntpctender.com) website, having last extended date of EOI submission as 15.11.2022, the last date of submission stands extended to **15.01.2023**. This is the second extension of last date of EOI submission.

For detailed EOI and documents, please visit at [www.ntpctender.com](http://www.ntpctender.com) or may contact:

1. Sr. Manager (Energy Transition and Policy Research), Mob- +91-9650993162

E-mail: [ashwinikumarverma@ntpc.co.in](mailto:ashwinikumarverma@ntpc.co.in)

2. AGM (Energy Transition and Policy Research), Mob- +91-9163805655

E-mail: [dipankarhalder@ntpc.co.in](mailto:dipankarhalder@ntpc.co.in)

**Registered office:** NTPC Bhawan, SCOPE Complex, 7, Institutional Area, Lodi Road, New Delhi- 110003. CIN: **L40101DL1975GOI007966** Website: [www.ntpc.co.in](http://www.ntpc.co.in)



**TESS EOI Amendment-1**

**Date 09/11/2022**

Clause no.	Original Clause	Amended Clause				
<b>Section-II Clause 2.2</b>	<p>In view of above, NTPC intends to set up a pilot project for thermal energy storage system <b>(2-3MWH with discharge of 3-4 hours)</b> integrated with one of its existing coal power plants so that at low demand, the power plant's output can be curtailed by redirecting steam to heat storage media of thermal storage system. Further, when the power demand rises, the power plant's output could be readjusted by supplying additional heat from TESS in the form of steam. Therefore, with this philosophy, thermal powerplant can continuously operate above economic load and at the same time can meet the requirement of grid stabilization.</p>	<p>In view of above, NTPC intends to set up a pilot project for thermal energy storage system <b>either 10 MW/ 2 hrs. discharge duration OR 10MW/ 4 hours discharge duration based on techno-economic analysis of the submitted data in this EOI</b>, integrated with one of its existing coal power plant so that at low demand, the power plant's output can be curtailed by redirecting steam to heat storage media of thermal storage system. Further, when the power demand rises, the power plant's output could be readjusted by supplying additional heat from TESS in the form of steam. Therefore, with this philosophy, thermal powerplant can continuously operate above economic load and at the same time can meet the requirement of grid stabilization.</p>				
<b>Section-V Annexure-3 Clause 2.0</b>	<p>About Proposed Pilot Project</p>	<p><b>About Proposed Pilot Project (For both options: 10 MW/2h and 10 MW/4h)</b></p>				
<b>Section-V Annexure-3 Clause 3.1</b>	<p><b>Estimated total capital investment for the pilot project with cost breakup of all major components preferably as listed below:</b></p> <ul style="list-style-type: none"> <li>• Thermal Energy Storage System and associated equipment</li> <li>• Civil/Infrastructure requirement</li> <li>• Control System</li> <li>• Integrating with existing coal based thermal generating unit.</li> <li>• Installation and Commissioning</li> <li>• Miscellaneous Items</li> <li>• Package BOP (Transformer / Inverters/ control systems etc. as required for completion of the pilot project)</li> <li>• Safety and protection systems</li> </ul>	<p><b>Estimated total capital investment to be given for the pilot project of following capacity –</b></p> <table border="1" data-bbox="884 965 1406 1122"> <thead> <tr> <th data-bbox="884 965 1147 1021">Capacity Option 1</th> <th data-bbox="1147 965 1406 1021">Capacity Option 2</th> </tr> </thead> <tbody> <tr> <td data-bbox="884 1021 1147 1122"> <b>For 10 MW/ 4 Hrs. i.e., 40 MWh</b> </td> <td data-bbox="1147 1021 1406 1122"> <b>For 10 MW/ 2 Hrs. i.e., 20 MWh</b> </td> </tr> </tbody> </table> <p><b>Above estimate is to be given with cost break up under following heads:</b></p> <ul style="list-style-type: none"> <li>• Thermal Energy Storage System and associated equipment</li> <li>• Civil/Infrastructure requirement</li> <li>• Control System</li> <li>• Integrating with existing coal based thermal generating unit.</li> <li>• Installation and Commissioning</li> <li>• Miscellaneous Items</li> <li>• Package BOP (Transformer / Inverters/ control systems etc. as required for completion</li> <li>• of the pilot project)</li> <li>• Safety and protection systems</li> </ul>	Capacity Option 1	Capacity Option 2	<b>For 10 MW/ 4 Hrs. i.e., 40 MWh</b>	<b>For 10 MW/ 2 Hrs. i.e., 20 MWh</b>
Capacity Option 1	Capacity Option 2					
<b>For 10 MW/ 4 Hrs. i.e., 40 MWh</b>	<b>For 10 MW/ 2 Hrs. i.e., 20 MWh</b>					

# **NTPC Limited**

(A Government of India Enterprise)



Invites

Expression of Interest

(EOI)

For Setting Up

A Pilot Project for Thermal Energy Storage System (TESS) Coupled with Steam Water Cycle of One of the Existing Coal Power Plant of NTPC to Augment its Flexible Operation to Balance Intermittency of Renewable Energy Sources.

## DOCUMENTS OF EOI

This EOI document comprises of the following sections:

- (i) Section I : EOI Information
- (ii) Section II : Introduction
- (iii) Section III : Instructions to the Applicants
- (iv) Section IV : Consideration of Response
- (v) Section V : Application Form and Annexures



# **Section – I**

## **EOI Information**

**DETAILED NOTICE INVITING EXPRESSION OF INTEREST (EOI)****EOI No. NTPC/PE/ET&PR/2220907****Date: 07.09.2022**

NTPC is Inviting Expression of Interest from company for setting up a pilot project for Thermal Energy Storage System (TESS) coupled with steam water cycle of one of the existing coal power plants of NTPC to augment its flexible operation to balance intermittency of renewable energy sources.

**DOWNLOAD AND TIMELINES FOR SUBMISSION OF EOI**

- a. Interested APPLICANTs may download the documents of EOI free of cost from <https://ntpctender.ntpc.co.in>
- b. **Extended Last date for submission of EOI** : **15.01.2023**  
(Ext. Notice: Dated 09.11.2022, Ref No. NTPC/PE/ET&PR/2220907/EXT/2)
- c. **Last date for queries/ seeking clarifications** : **08.01.2023**
- d. **Response Validity** : **6 months  
from the last  
date for EOI  
Submission**

**1.0** For consideration of EOI, APPLICANTs are required to e-mail signed and scanned copy of EOI duly filled and completed in all respect, through e-mail mentioned hereunder.  
Email: [ashwinikumarverma@ntpc.co.in](mailto:ashwinikumarverma@ntpc.co.in) / [dipankarhalder@ntpc.co.in](mailto:dipankarhalder@ntpc.co.in)

**2.0** NTPC shall not be liable for any postal/ Mail delivery issue delays whatsoever in receipt of EOI documents and EOI received after the stipulated date and time shall not be entertained. EOIs submitted without supporting document will summarily rejected.

**3.0** NTPC reserves the right to reject or accept any or all applications, cancel/withdraw the EOI process without assigning any reason whatsoever and in such case, APPLICANT shall not have any claim arising out of such action. NTPC bears no responsibility or liability of any kind in reference to the EOI.

# **Section - II**

## **Introduction**

## INTRODUCTION

### 1.0 ABOUT NTPC

NTPC Limited ([www.ntpc.co.in](http://www.ntpc.co.in)) is a leading power generation company of India. It has been ranked No#2 Independent Power Producer (IPP) worldwide as per Platts (2019). The Company is listed on the Indian stock exchange with a market capitalization of INR 833.12 billion.

NTPC Limited produces around 361 billion units of electricity annually through its cluster of gas, coal, hydro and RE based power stations of more than 69 GW capacity spanning across the country. Further, NTPC plans a target capacity of 130 GW by 2032.

NTPC Limited has total income INR 1200 billion (16 billion USD). NTPC group achieved a net profit of INR 161.11 billion (2.15 billion USD) in the financial year 2021-22 and has been consistently paying dividends to its shareholders for the last 28 years.

### 2.0 INTENT OF THE EXPRESSION OF INTEREST (EOI)

**2.1** Flexibilization of thermal power plant is needed to manage grid integration challenge with rising share of variable solar and wind power generations. Further, Ministry of Power, Govt. of India, recently issued “Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected RE Power Projects for utilization under scheme for flexibility in Generation and Scheduling of Thermal/Hydro Power Stations through bundling with Renewable Energy and Storage Power”. This will require more flexibilization in thermal power station. However, in flexible operation, thermal power plants will face more frequent start-ups and shut-downs, load variation from high load to load far below design limit and faster ramping rates to balance the grid. This aggressive operation will originate larger and more periodic thermal and mechanical stresses in the equipment of thermal power plants, which may lead to irreversible damages if the maximum stress limits of the material are exceeded. Creep and fatigue are the main damage mechanism that grow cracks in highly loaded condition even if proper control strategies are followed, which ultimately leading to lack of reliability of the equipment and plant. Moreover, at low load, compliance of emission norms will be challenging considering inferior coal quality in Indian context.

Thermal energy storage system (TESS) integrated with thermal power plant will help to avoid operation of boiler below Technical Minimum load, frequent start stops and frequent wide variation of load in the flexibilization of thermal plant operation and will ensure safe, sustainable and efficient operation of existing thermal power plant.

**2.2** In view of above, NTPC intends to set up a pilot project for thermal energy storage system **either 10 MW/ 2 hrs. discharge duration OR 10MW/ 4 hours discharge duration based on techno-economic analysis of the submitted data in this EOI**, integrated with one of

its existing coal power plant so that at low demand, the power plant's output can be curtailed by redirecting steam to heat storage media of thermal storage system. Further, when the power demand rises, the power plant's output could be readjusted by supplying additional heat from TESS in the form of steam. Therefore, with this philosophy, thermal powerplant can continuously operate above economic load and at the same time can meet the requirement of grid stabilization.

**2.3** The initiative intends to incorporate demonstrating the capability of TESS, analyzing the techno-commercial feasibility, validating performance, and subsequently developing product/solutions which can be a pathway for Thermal Energy Storage System (TESS) for flexible operation of the coal based thermal power plants.

**2.4** The interested applicants will specify the technical specification, guarantee parameters, the total estimated project cost and shall propose the financial contribution to be shared by themselves and by NTPC.

**2.5** Based on techno-commercial analysis of the responses in the EOI and further discussions with interested parties, if it is found commercially feasible, NTPC may go for pilot installation at any of the existing NTPC Coal based thermal plants/ may not proceed with any project at this stage.

**2.6** NTPC reserves the right to implement the project either on nomination basis or through Request for Proposal (RFP) process amongst the shortlisted parties identified through this EOI Process.

**2.7** The intellectual property right (IPR) generated from the pilot project will be co-owned by NTPC and the applicant. NTPC shall not monetize the IPR (if any) developed through this pilot.

**2.8** The response(s) received in the EOI/ information received post feasibility study will be utilized by NTPC for:

a. Identification for suitable technologies which fits the intended use cases

AND/OR

b. Formulation of specifications for various systems/stages required for execution of demonstration/commercial project(s)

AND/OR

c. Shortlisting of parties for forthcoming Request for Proposals (RFP) / limited tenders by NTPC for undertaking demonstration/commercial project(s)

The Applicants may express their interest in respect of their offerings along with other inputs as indicated in relevant Annexures/formats.

### **3.0 Indicative Role and Responsibilities of Parties for Pilot Project**

Indicative roles and responsibilities of the parties for pilot project shall include but not limited to the following:

#### **3.1 NTPC's Role:**

- Land for installation and commissioning of the system within NTPC plant premises and provide necessary support during operation and maintenance (O&M) of the pilot project.
- NTPC shall facilitate support required from OEM of boiler/turbine.
- NTPC shall provide power supply feeder from the nearest available switchgear. However complete electrical system from terminal point (power supply feeder at switchgear) onward shall be in the scope of vendor.
- NTPC shall provide Instrument air (if require), Service Air (If require), service water/ cooling water (if require) and other utilities, from nearest available terminal points. However, piping and system from terminal points onward shall be in the scope of vendor.
- Facilitate the applicant in applying for statutory clearances for the project.
- Facilitate the installation and commissioning of the system.
- Support in Data collection and analyzing the performance of the system during testing and subsequent operation.

#### **3.2 Applicant's Role**

- Design, engineering, manufacture, supply, erection, commissioning, and testing of Thermal Energy Storage System (TESS) incorporation into existing coal based generating unit, along with all associated electrical, civil/ structural, control and instrumentation and other accessories required for completion of the pilot project.
- Integration of TESS to existing steam/feed water system.
- Routine maintenance of the systems for a period of 3 years from the date of commissioning
- Data collection and analyzing the performance of the system during testing and subsequent operation
- Getting required statutory clearances for installation and operation of the system
- Sharing the stack and system level information for comprehensive understanding of the system

\*\*\*\*

## **Section - III**

### **Instructions to the Applicant**

## INSTRUCTIONS TO THE APPLICANTS

### **1.0 The Applicants should note that:**

- a. Language of the responses to EOI or any query/clarifications/correspondences shall be in English only.
- b. For expression of interest, Application Form and Annexures given in Section-V shall be duly filled and sent to NTPC by the APPLICANT in soft copy.
- c. Applicants should go through Section-I and Section-II thoroughly before filling and submitting the application form and annexures in Section-V.
- d. Applicants shall mention the name and contact details of two persons, with complete address, phone number and email id.
- e. NTPC Ltd. may, at its sole discretion, ask for additional information/ documents and/ or seek clarifications from the Applicant(s) after the Deadline for submission of response, inter alia, for the purpose of removal of inconsistencies or infirmities in their responses.

### **2.0 Enquiries and clarifications**

Any clarifications on the EOI may be sought to the following via e-mail:

To: [ashwinikumarverma@ntpc.co.in](mailto:ashwinikumarverma@ntpc.co.in)

CC to: [dipankarhalder@ntpc.co.in](mailto:dipankarhalder@ntpc.co.in)

### **3.0 Corrigendum**

At any time before the last date of submission of EOIs, NTPC may, for any reason, whether at its own initiative or in response to a clarification requested by an Applicant, modify the EOI document. The amendment will be posted on the website and will be binding on the Applicants and the Applicant will give due consideration to the same, while they submit their EOIs, and would invariably enclose documents/ information, as required, on account of the amendment, as a part of the EOI. NTPC may, at its discretion, extend the deadline for the submission of EOIs.



#### 4.0 Preparation of the response to EOI

The application of EOI shall consist of Annexure-1, 2, 3 and 4 of Section-V.

#### 5.0 Validity of the responses

The Applicant shall submit the responses which shall remain valid up to six (6) months after the response Deadline ("Response Validity"). NTPC reserve the right to reject any response, which does not meet the above-mentioned validity requirement.

NTPC may solicit the Applicant's consent for an extension of the period of validity of the response. The request and the response in this regard shall be in writing. In the event any Applicant refuses to extend its response validity as requested by NTPC, NTPC shall terminate processing of such Applicant's responses. An Applicant accepting NTPC request for validity extension shall not be permitted to modify its response.

#### 6.0 Submission of the response to EOI

The responses to the EOI are to be submitted in soft copy via below e-mail format-

To: [ashwinikumarverma@ntpc.co.in](mailto:ashwinikumarverma@ntpc.co.in)

CC to: [dipankarhalder@ntpc.co.in](mailto:dipankarhalder@ntpc.co.in)

**Ref. EOI No.**

**Dated**

**Submitted to:**

*Name, designation & address of the concerned officer of NTPC*

**Submitted by:**

*Name, address & contact no. of the Applicant*

All the pages of the response should be duly stamped and signed by the authorized signatory. The responses to the EOI should be submitted within the deadline at the e-mail address provided in the Section-I of this EOI.

#### 7.0 Costs and expenses towards response to EOI

The Applicants shall be responsible for all the costs associated with the preparation of the response and participation in discussions and finalization & execution of the documents related with this EOI, NTPC shall not be responsible in any way for such costs, regardless of the conduct or outcome of this short-listing/ selection process.

## 8.0 Confidentiality

The Applicants undertake to hold in confidence this EOI and any document related or pursuant to this EOI and not to disclose the terms and conditions of the transaction contemplated hereby to third parties, except:

- (a) To their professional advisors.
- (b) To their officers, contractors, employees, agents or representatives, financiers, who need to have access to such information for the proper performance of their activities.
- (c) Disclosures required under applicable Law, without the prior written consent of the other parties of the concerned agreements.

Provided that the Applicant(s) agrees and acknowledges that NTPC may at any time, disclose the terms and conditions of this EOI and any document related or pursuant to this EOI to any person, to the extent stipulated under the applicable Law.

## 10. Disclaimer

This Expression of Interest (EOI) has been prepared by NTPC Ltd. For for response from Indian/Global Company/their Consortium/Affiliates/Representatives for setting up a Pilot Project for Thermal Energy Storage System (TESS) Coupled with Steam Water Cycle of One of the Existing Coal Power Plant of NTPC to Augment its Flexible Operation to Balance Intermittency of Renewable Energy Sources.

In submitting the response to the EOI, the Applicant certify that it understands, accepts, and agrees to the disclaimers on this page. Nothing contained in any other provision of the EOI nor any statements made orally or in writing by any person or party shall have the effect of negating or superseding any of the disclaimers set forth herewith.

\*\*\*

## **Section-IV**

### **Consideration of Response**

## CONSIDERATION OF RESPONSE

### **Responsiveness check**

The responses submitted by Applicants shall be scrutinized and may be rejected in following conditions-to establish interest in setting up Pilot Project for Thermal Energy Storage (TES) System, enabling flexible operation of Thermal Plants to balance. Responses shall be deemed non-responsive for following reasons:

- Responses that are incomplete, i.e., not accompanied by any of the applicable formats inter-alia covering letter power of attorney, applicable undertakings, provided in more details at annexure in Section-V.
- Responses not signed by authorized signatory and / or stamped in the manner indicated in this EOI.
- Material inconsistencies in the information/ documents submitted by the Applicant
- An Applicant submitting more than one response to this EOI either itself or through an affiliate or subsidiary company.
- Response validity being less than that required as per Clause 5 of section-III of this EOI.
- Response being conditional in nature.
- Response not received by the response Deadline.
- Response having Conflict of Interest.
- Applicant delaying in submission of additional information or clarifications sought by NTPC, as applicable.

All bids that shall meet the responsive check requirements set out above in this section of the EOI document shall be considered as responsive. In case of non-submission of relevant details as above, the responses may be considered as “**non-responsive**”, at the sole discretion of NTPC and will not be considered further.

\*\*\*\*

# **Section-V**

## **Application Form & Annexures**

**Annexure-1****FORMAT FOR COVERING LETTER CUM UNDERTAKING**

(The covering letter should be on the Letter Head of the Applicant)

Date : \_\_\_\_\_ Place : \_\_\_\_\_

To,

.....

**Sub.: (INVITATION FOR EXPRESSION OF INTEREST)**

**Ref.: EOI No. \_\_\_\_\_, dated \_\_\_\_\_ (the "EOI")**

Dear Sir,

We, the undersigned ..... [insert name of the "Applicant"] having read, examined, and understood in detail the **(INVITATION FOR EXPRESSION OF INTEREST)**.

We confirm that neither we nor any of our Parent Company/ Affiliate/ Ultimate Parent Company has submitted response other than this response directly or indirectly in response to the aforesaid EOI.

1. We give our unconditional acceptance to the EOI, issued by NTPC, as amended. In token of our acceptance to the EOI, the same have been signed & stamped by us and enclosed to the response. We hereby confirm that the provisions of the EOI shall be binding on us.
2. We have submitted our response strictly as per provisions and formats of the EOI, without any deviations, conditions and without mentioning any assumptions or notes.
3. We hereby unconditionally and irrevocably agree and accept that the decision made by NTPC in respect of any matter regarding or arising out of the EOI shall be binding on us. We hereby expressly waive any and all claims in respect of EOI process. We confirm that there are no litigations or disputes against us, which materially affect our ability to participate or function under the obligations with regard to EOI.

4. Details of the contact person are furnished as below:

Name:

Designation:

Address:

Contact numbers:

email id:

5. We are enclosing herewith the entire response containing duly signed formats in electronic format sent via email to: [ashwinikumarverma@ntpc.co.in](mailto:ashwinikumarverma@ntpc.co.in) as per the EOI for consideration.

6. It is confirmed that our response is consistent with all the requirements of submission as stated in the EOI and subsequent communications from NTPC, if any.

7. The information submitted in our response is complete, strictly as per the requirements stipulated in the EOI and is correct to the best of our knowledge and understanding. We would be solely responsible for any errors or omissions in our response.

We confirm that all the terms and conditions of our response are valid for acceptance for a period of six (6) months from the response Deadline.

8. We confirm that we have not taken any deviation so as to be deemed "**Non-Responsive**" as stipulated in Section-IV of this EOI.

9. We understand that you are not bound to accept any response you receive.

We remain,

Yours sincerely

(Name, Designation and Signature of Authorized Person)

**Annexure-2****APPLICANT'S ORGANIZATION DETAILS TO BE SUBMITTED BY APPLICANT**

**(Note: Documents in support of meeting the respective requirement shall be submitted by the Applicant.)**

- 1) Name of the Company
- 2) Legal status of the Company
- 3) Brief description of the Company including details of its business groups/subsidiaries/affiliates:
- 4) Existing Manufacturing facilities – Locations, Capacity
- 5) Date of Incorporation:
- 6) Date of Commencement of Business:
- 7) Full address including Telephone nos. / Fax nos.:
  - a. Registered Office:
  - b. Head Office:
  - c. Address for communication:
  - d. Contact Details:
  - e. Office Address in India, if any:
- 8) Collaborations/tie-ups with manufacturer (if applicable),
- 9) Details of Indian parties, if any, for installation, supply, services, and collaboration

\*\*\*\*\*



**Annexure-3****TECHNICAL INFORMATION TO BE SUBMITTED BY APPLICANT**

Applicant shall duly furnish following information.

**1.0 About Technology**

- Detailed Write up of thermal energy storage system indicating basic working principle of TES, major operating condition/ parameter, type (Sensible heat, latent heat and thermo-chemical), storage material and its property, heating capacity, design temperature and pressure, technology readiness level, input requirements (Power consumption, water quality and quantity, if any, service air/ instrument air requirement) etc.
- P&ID and GA of Thermal Energy Storage System
- P&ID of integrated system of Thermal Energy Storage with
- Merits and demerits of offered technology
- Reference list of plants presently running on proposed technology
- Module Size, module efficiency
- System life in Hrs. of operation
- Basic Process diagram
- Brief about the auxiliary system
- Parameters of thermal energy storage, maximum achievable parameters and limiting factors
- Charge and Discharge Rate Control mechanism
- Technical details of material used for thermal energy storage and criteria for material selection
- Round trip efficiency and factors and parameters affecting round trip efficiency
- Details of land footprint, energy density (kWh/M3), Capex, Opex, design life, scalability, modularity aspects, depth of discharge,
- Its comparison with other kinds of energy storage technologies on above parameters

**2.0 About Proposed Pilot Project (For both options: 10 MW/2h and 10 MW/4h)**

- Basis of Site and Size Selection, facilities required at site
- Selection of optimal integration points in steam water cycle
- Heat and Mass Energy Balance of the system
- Basic scheme and line diagram of complete system and auxiliaries
- Calculation of round-trip efficiency
- Details of land footprint, TESS dimensions, energy density (kWh/M3), design life
- Operation philosophy
- Components details and technical specification of components
- Details of control and instrumentation
- Details of civil infrastructure required

- Details of electrical system
- Project Layout
- Codes and standard details
- Safety Aspects
- O&M Aspects
- Spare and consumables
- Scope of Work
- Terminal points, Inclusion and Exclusions
- Execution Period from award of job till Commissioning and Guarantee Test Run
- Power & water required.
- Cooling Water requirement
- Plot size required for the project
- Utilities required for normal operation of the plant
- Effluent generation, if any.
- Guarantee / Warranty offered for the offered project
- Technical data sheet
- Previous experience, in implementing proposed Thermal Energy Storage System.
- Engineering strength of Applicant
- Any other technical detail which Applicant would like to highlight, about its technology for consideration of EOI.
- Technical data as per Annexure-4
- Environmental clearance required if any
- Input data required from NTPC. Information related to system integration / hook up with Coal fired Thermal plant w.r.t Mechanical, electrical, C&I etc. aspects.

### 3.0 Budgetary Cost:

Estimated total capital investment to be given for the pilot project of following capacity –

Capacity Option 1	Capacity Option 2
For 10 MW/ 4 Hrs. i.e., 40 MWh	For 10 MW/ 2 Hrs. i.e., 20 MWh

Above estimate is to be given with cost break up under following heads: -

- Thermal Energy Storage System and associated equipment
- Civil/Infrastructure requirement
- Control System
- Integrating with existing coal based thermal generating unit.
- Installation and Commissioning
- Miscellaneous Items
- Package BOP (Transformer / Inverters/ control systems etc. as required for completion of the pilot project)
- Safety and protection systems

**3.1 Estimated Operation & Maintenance cost for 3 years with spares and consumables.**

Note:

- Applicant shall separately mention taxes, duties, freight, insurance applicable for above items/project.
- Applicant shall mention budgetary cost equipment supply for Indian item and imported item separately.
- Financial contribution by the party/ proposed mode of project execution

**4.0 Project Timeline:**

Applicant shall mention project completion period from award of job till Commissioning and Guarantee Test Run with necessary details.

**5.0 Financial Turnover:**

Applicant is requested to submit Annual financial turnover during the last three (3) preceding financial year. Applicant to submit audited Balance Sheet and Profit & Loss account for the above three financial years.

**6.0 Declaration:**

Applicant is requested to provide declaration stating that their firm is neither put on Holiday or Black-listed by any Government / PSU / Private firm or Financial Institution. Applicant is requested to provide Self Declaration on Applicant's Letter Head.

**7.0 Validity:**

Applicant is requested to mention validity of the proposal submitted.

(Sign & Company Seal)

Authorized signatory

**Annexure-4**

(Technical Data)

Sl.No	Description	Applicant to fill	
		10MW/4 Hours	10MW/2 Hours
1.	<b>Type of Thermal Energy Storage technology proposed by Applicant</b>		
2.	<b>Whether Technology is owned by Applicant</b>	Yes/No	
a)	If no, Name of Technology owner/ developer/ IP Owner		
b)	Registered office of Technology owner/ developer/ IP Owner		
c)	Whether Applicant has technology tie up/ collaboration with Technology owner/developer/ IP Owner	Yes/No (Attached copy of Technology tie up/ collaboration agreement)	
d)	Validity period of agreement		
3.	<b>Details of reference pilot/commercial Installations</b>		
a)	Name of project where Applicant/ Its Collaborator/ associate installed / is installing TESS		
b)	Name and address of owner of plant		
c)	Scale of plant	(Commercial/ pilot plant)	
d)	Design capacity (Power rating and discharge period at rated power)		
e)	Type of application	Heat to heat/ Electricity to heat / Electricity to electricity	
f)	Date of award to applicant		
g)	Date of completion of plant		
h)	If installation not yet completed, Present status and date of expected completion		
i)	Scope of work of Applicant (Furnish copy of LOA)		
j)	Technical parameters (Storage media, maximum temperature of storage media, pressure and temperature and flow of working fluid)		

Details of Proposed Thermal Energy Storage System		
1.	Type of Thermal Energy Storage Technology	Sensible heat/ Latent Heat/ Chemical
2.	Rated power and discharge period	
3.	Type of storage media	
4.	Name of Manufacturer/source of material	
5.	Melting Point of material	
6.	Density of material	
7.	Latent Heat (KJ/Kg)	
8.	Storable thermal energy (latent heat) MJ/m <sup>3</sup>	
9.	Specific Heat (KJ/KgK)	
10.	Storable thermal energy (sensible heat) MJ/m <sup>3</sup> K	
11.	Heat Conductivity (W/mK)	
12.	Energy Storage Method	
13.	Duration of heat storage	
14.	Operating temperature of storage material	
15.	<b>Steam to storage material heat exchanger details</b>	
a)	Pressure, temperature, and flow of heating steam required	
b)	Outlet parameter of condensation	
c)	Type of Heat exchanger	
d)	Design capacity of Heat exchanger	
e)	Design pressure and temperature	
f)	Efficiency	
16.	<b>Storage media to Water/steam heat exchanger</b>	
a)	Inlet water/steam parameter required	
b)	Outlet parameter of steam	
c)	Type of Heat exchanger	
d)	Design capacity of Heat exchanger	
e)	Design pressure and temperature	
f)	Efficiency	
17.	<b>Effluent Generation data with Quality:</b> <ul style="list-style-type: none"> <li>- Solid (if any)</li> <li>- Liquid (if any)</li> <li>- Gaseous (if any)</li> </ul> In case of any effluent, include details of treatment required	
18.	Round Trip Efficiency	
19.	Expected life of entire project as a whole (Years)	
20.	Annual maintenance requirement Maintenance Activities with frequency.	
21.	No. of shutdown days per year	
22.	Capacity (MW-hrs)	

<b>Utility Requirement</b>		
23.	Total Power consumption and Installed load of Plant	
24.	Water (if required)	Clarified/ DM/ Service water
25.	Flow (m <sup>3</sup> /hr)	
26.	Pressure (kg/cm <sup>2</sup> )	
27.	Instrument Air (Nm <sup>3</sup> /hr)	
28.	Service Air (Nm <sup>3</sup> /hr)	
29.	Others, if any. Please specify	
30.	Land Area Required (m <sup>2</sup> )	
<b>Other Data</b>		
31.	% of Indian content of equipment supply	
32.	% of Imported content of equipment supply and source of country	
33.	Completion schedule of project (in month)	
34.	Financial contribution to be shared by Applicant (% of total Project cost)	
35.	In case Applicant has technology tie up/ collaboration with technology owner/ developer/IP Owner, detail scope of technology support from collaborator to be indicated	

<b>Financial data of Applicant</b>			
	<b>Financial year 2021-22</b>	<b>Financial year 2020-21</b>	<b>Financial year 2019-20</b>
<b>Turnover</b>			
<b>Net worth</b>			
<b>Profit</b>			

**NTPC LIMITED**

(A Govt. of India Enterprise)

**CORPORATE ENGINEERING**

**NOTICE FOR EXTENSION OF EXPRESSION OF INTEREST (EOI) SUBMISSION DATE**

Ref No.: NTPC/PE/ET&PR/2220907/EXT/1

Date: 14.10.2022

This is in continuation to our notice inviting Expression of Interest (EOI) No.: NTPC/PE/ET&PR/2220907 Dated 07.09.2022 for setting up a pilot project for Thermal Energy Storage System (TESS) coupled with steam water cycle of one of the existing coal power plants of NTPC to augment its flexible operation to balance intermittency of renewable energy sources., uploaded on [www.ntpctender.com](http://www.ntpctender.com) website, having original last date of EOI submission as 15.10.2022, the last date of submission stands extended to **15.11.2022**. This is the first extension of last date of EOI submission.

For detailed EOI and documents, please visit at [www.ntpctender.com](http://www.ntpctender.com) or may contact:

1. Sr. Manager (Energy Transition and Policy Research), Mob- +91-9650993162

E-mail: [ashwinikumarverma@ntpc.co.in](mailto:ashwinikumarverma@ntpc.co.in)

2. AGM (Energy Transition and Policy Research), Mob- +91-9163805655

E-mail: [dipankarhalder@ntpc.co.in](mailto:dipankarhalder@ntpc.co.in)

**Registered office:** NTPC Bhawan, SCOPE Complex, 7, Institutional Area, Lodi Road, New Delhi- 110003. CIN: **L40101DL1975GOI007966** Website: [www.ntpc.co.in](http://www.ntpc.co.in)



# NTPC Limited

(A Government of India Enterprise)



Invites

Expression of Interest

(EOI)

For Setting Up

A Pilot Project for Thermal Energy Storage System (TESS) Coupled with Steam Water Cycle of One of the Existing Coal Power Plant of NTPC to Augment its Flexible Operation to Balance Intermittency of Renewable Energy Sources.



## DOCUMENTS OF EOI

This EOI document comprises of the following sections:

- (i) Section I : EOI Information
- (ii) Section II : Introduction
- (iii) Section III : Instructions to the Applicants
- (iv) Section IV : Consideration of Response
- (v) Section V : Application Form and Annexures

# Section – I

## EOI Information

**DETAILED NOTICE INVITING EXPRESSION OF INTEREST (EOI)****EOI No. NTPC/PE/ET&PR/2220907****Date: 07.09.2022**

NTPC is Inviting Expression of Interest from company for setting up a pilot project for Thermal Energy Storage System (TESS) coupled with steam water cycle of one of the existing coal power plants of NTPC to augment its flexible operation to balance intermittency of renewable energy sources.

**DOWNLOAD AND TIMELINES FOR SUBMISSION OF EOI**

- a. Interested APPLICANTs may download the documents of EOI free of cost from <https://ntpctender.ntpc.co.in>
- b. **Extended Last date for submission of EOI** : **15.11.2022**  
(Ext. Notice: Dated 14.10.2022, Ref No. NTPC/PE/ET&PR/2220907/EXT/1)
- c. **Last date for queries/ seeking clarifications** : **08.11.2022**
- d. **Response Validity** : **6 months from the last date for EOI Submission**

**1.0** For consideration of EOI, APPLICANTs are required to e-mail signed and scanned copy of EOI duly filled and completed in all respect, through e-mail mentioned hereunder. Email: [ashwinikumarverma@ntpc.co.in](mailto:ashwinikumarverma@ntpc.co.in) / [dipankarhalder@ntpc.co.in](mailto:dipankarhalder@ntpc.co.in)

**2.0** NTPC shall not be liable for any postal/ Mail delivery issue delays whatsoever in receipt of EOI documents and EOI received after the stipulated date and time shall not be entertained. EOIs submitted without supporting document will summarily rejected.

**3.0** NTPC reserves the right to reject or accept any or all applications, cancel/withdraw the EOI process without assigning any reason whatsoever and in such case, APPLICANT shall not have any claim arising out of such action. NTPC bears no responsibility or liability of any kind in reference to the EOI.

# **Section - II**

## **Introduction**

## INTRODUCTION

### **1.0 ABOUT NTPC**

NTPC Limited ([www.ntpc.co.in](http://www.ntpc.co.in)) is a leading power generation company of India. It has been ranked No#2 Independent Power Producer (IPP) worldwide as per Platts (2019). The Company is listed on the Indian stock exchange with a market capitalization of INR 833.12 billion.

NTPC Limited produces around 361 billion units of electricity annually through its cluster of gas, coal, hydro and RE based power stations of more than 69 GW capacity spanning across the country. Further, NTPC plans a target capacity of 130 GW by 2032.

NTPC Limited has total income INR 1200 billion (16 billion USD). NTPC group achieved a net profit of INR 161.11 billion (2.15 billion USD) in the financial year 2021-22 and has been consistently paying dividends to its shareholders for the last 28 years.

### **2.0 INTENT OF THE EXPRESSION OF INTEREST (EOI)**

**2.1** Flexibilization of thermal power plant is needed to manage grid integration challenge with rising share of variable solar and wind power generations. Further, Ministry of Power, Govt. of India, recently issued “Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected RE Power Projects for utilization under scheme for flexibility in Generation and Scheduling of Thermal/Hydro Power Stations through bundling with Renewable Energy and Storage Power”. This will require more flexibilization in thermal power station. However, in flexible operation, thermal power plants will face more frequent start-ups and shut-downs, load variation from high load to load far below design limit and faster ramping rates to balance the grid. This aggressive operation will originate larger and more periodic thermal and mechanical stresses in the equipment of thermal power plants, which may lead to irreversible damages if the maximum stress limits of the material are exceeded. Creep and fatigue are the main damage mechanism that grow cracks in highly loaded condition even if proper control strategies are followed, which ultimately leading to lack of reliability of the equipment and plant. Moreover, at low load, compliance of emission norms will be challenging considering inferior coal quality in Indian context.

Thermal energy storage system (TESS) integrated with thermal power plant will help to avoid operation of boiler below Technical Minimum load, frequent start stops and frequent wide variation of load in the flexibilization of thermal plant operation and will ensure safe,

sustainable and efficient operation of existing thermal power plant.

- 2.2** In view of above, NTPC intends to set up a pilot project for thermal energy storage system (2-3MWH with discharge of 3-4 hours) integrated with one of its existing coal power plants so that at low demand, the power plant's output can be curtailed by redirecting steam to heat storage media of thermal storage system. Further, when the power demand rises, the power plant's output could be readjusted by supplying additional heat from TESS in the form of steam. Therefore, with this philosophy, thermal powerplant can continuously operate above economic load and at the same time can meet the requirement of grid stabilization.
- 2.3** The initiative intends to incorporate demonstrating the capability of TESS, analyzing the techno-commercial feasibility, validating performance, and subsequently developing product/solutions which can be a pathway for Thermal Energy Storage System (TESS) for flexible operation of the coal based thermal power plants.
- 2.4** The interested applicants will specify the technical specification, guarantee parameters, the total estimated project cost and shall propose the financial contribution to be shared by themselves and by NTPC.
- 2.5** Based on techno-commercial analysis of the responses in the EOI and further discussions with interested parties, if it is found commercially feasible, NTPC may go for pilot installation at any of the existing NTPC Coal based thermal plants/ may not proceed with any project at this stage.
- 2.6** NTPC reserves the right to implement the project either on nomination basis or through Request for Proposal (RFP) process amongst the shortlisted parties identified through this EOI Process.
- 2.7** The intellectual property right (IPR) generated from the pilot project will be co-owned by NTPC and the applicant. NTPC shall not monetize the IPR (if any) developed through this pilot.
- 2.8** The response(s) received in the EOI/ information received post feasibility study will be utilized by NTPC for:

**(GLOBAL INVITATION OF EXPRESSION OF INTEREST)**

- a. Identification for suitable technologies which fits the intended use cases  
AND/OR
- b. Formulation of specifications for various systems/stages required for execution of demonstration/commercial project(s)  
AND/OR
- c. Shortlisting of parties for forthcoming Request for Proposals (RFP) / limited tenders by NTPC for undertaking demonstration/commercial project(s)

The Applicants may express their interest in respect of their offerings along with other inputs as indicated in relevant Annexures/formats.

**3.0 Indicative Role and Responsibilities of Parties for Pilot Project**

Indicative roles and responsibilities of the parties for pilot project shall include but not limited to the following:

**3.1 NTPC's Role:**

- Land for installation and commissioning of the system within NTPC plant premises and provide necessary support during operation and maintenance (O&M) of the pilot project.
- NTPC shall facilitate support required from OEM of boiler/turbine.
- NTPC shall provide power supply feeder from the nearest available switchgear. However complete electrical system from terminal point (power supply feeder at switchgear) onward shall be in the scope of vendor.
- NTPC shall provide Instrument air (if require), Service Air (If require), service water/ cooling water (if require) and other utilities, from nearest available terminal points. However, piping and system from terminal points onward shall be in the scope of vendor.
- Facilitate the applicant in applying for statutory clearances for the project.
- Facilitate the installation and commissioning of the system.
- Support in Data collection and analyzing the performance of the system during testing and subsequent operation.

**3.2 Applicant's Role**

- Design, engineering, manufacture, supply, erection, commissioning, and testing of Thermal Energy Storage System (TESS) incorporation into existing coal based generating unit, along with all associated electrical, civil/ structural, control and instrumentation and other accessories required for completion of the pilot project.
- Integration of TESS to existing steam/feed water system.

**(GLOBAL INVITATION OF EXPRESSION OF INTEREST)**

- Routine maintenance of the systems for a period of 3 years from the date of commissioning
- Data collection and analyzing the performance of the system during testing and subsequent operation
- Getting required statutory clearances for installation and operation of the system
- Sharing the stack and system level information for comprehensive understanding of the system

\*\*\*\*



## **Section - III**

# **Instructions to the Applicants**

**INSTRUCTIONS TO THE APPLICANTS****1.0 The Applicants should note that:**

- a. Language of the responses to EOI or any query/clarifications/correspondences shall be in English only.
- b. For expression of interest, Application Form and Annexures given in Section-V shall be duly filled and sent to NTPC by the APPLICANT in soft copy.
- c. Applicants should go through Section-I and Section-II thoroughly before filling and submitting the application form and annexures in Section-V.
- d. Applicants shall mention the name and contact details of two persons, with complete address, phone number and email id.
- e. NTPC Ltd. may, at its sole discretion, ask for additional information/ documents and/ or seek clarifications from the Applicant(s) after the Deadline for submission of response, inter alia, for the purpose of removal of inconsistencies or infirmities in their responses.

**2.0 Enquiries and clarifications**

Any clarifications on the EOI may be sought to the following via e-mail:

To: [ashwinikumarverma@ntpc.co.in](mailto:ashwinikumarverma@ntpc.co.in)

CC to: [dipankarhalder@ntpc.co.in](mailto:dipankarhalder@ntpc.co.in)

**3.0 Corrigendum**

At any time before the last date of submission of EOIs, NTPC may, for any reason, whether at its own initiative or in response to a clarification requested by an Applicant, modify the EOI document. The amendment will be posted on the website and will be binding on the Applicants and the Applicant will give due consideration to the same, while they submit their EOIs, and would invariably enclose documents/ information, as required,

**(GLOBAL INVITATION OF EXPRESSION OF INTEREST)**

on account of the amendment, as a part of the EOI. NTPC may, at its discretion, extend the deadline for the submission of EOIs.

**4.0 Preparation of the response to EOI**

The application of EOI shall consist of Annexure-1, 2, 3 and 4 of Section-V.

**5.0 Validity of the responses**

The Applicant shall submit the responses which shall remain valid up to six (6) months after the response Deadline ("Response Validity"). NTPC reserve the right to reject any response, which does not meet the above-mentioned validity requirement.

NTPC may solicit the Applicant's consent for an extension of the period of validity of the response. The request and the response in this regard shall be in writing. In the event any Applicant refuses to extend its response validity as requested by NTPC, NTPC shall terminate processing of such Applicant's responses. An Applicant accepting NTPC request for validity extension shall not be permitted to modify its response.

**6.0 Submission of the response to EOI**

The responses to the EOI are to be submitted in soft copy via below e-mail format-

To: [ashwinikumarverma@ntpc.co.in](mailto:ashwinikumarverma@ntpc.co.in)

CC to: [dipankarhalder@ntpc.co.in](mailto:dipankarhalder@ntpc.co.in)

**Ref. EOI No.**

**Dated**

**Submitted to:**

*Name, designation & address of the concerned officer of NTPC*

**Submitted by:**

*Name, address & contact no. of the Applicant*

All the pages of the response should be duly stamped and signed by the authorized signatory. The responses to the EOI should be submitted within the deadline at the e-mail address provided in the Section-I of this EOI.

## 7.0 Costs and expenses towards response to EOI

The Applicants shall be responsible for all the costs associated with the preparation of the response and participation in discussions and finalization & execution of the documents related with this EOI, NTPC shall not be responsible in any way for such costs, regardless of the conduct or outcome of this short-listing/ selection process.

## 8.0 Confidentiality

The Applicants undertake to hold in confidence this EOI and any document related or pursuant to this EOI and not to disclose the terms and conditions of the transaction contemplated hereby to third parties, except:

- (a) To their professional advisors.
- (b) To their officers, contractors, employees, agents or representatives, financiers, who need to have access to such information for the proper performance of their activities.
- (c) Disclosures required under applicable Law, without the prior written consent of the other parties of the concerned agreements.

Provided that the Applicant(s) agrees and acknowledges that NTPC may at any time, disclose the terms and conditions of this EOI and any document related or pursuant to this EOI to any person, to the extent stipulated under the applicable Law.

## 10. Disclaimer

This Expression of Interest (EOI) has been prepared by NTPC Ltd. For for response from Indian/Global Company/their Consortium/Affiliates/Representatives for setting up a Pilot Project for Thermal Energy Storage System (TESS) Coupled with Steam Water Cycle of One of the Existing Coal Power Plant of NTPC to Augment its Flexible Operation to Balance Intermittency of Renewable Energy Sources.

In submitting the response to the EOI, the Applicant certify that it understands, accepts, and agrees to the disclaimers on this page. Nothing contained in any other provision of the EOI nor any statements made orally or in writing by any person or party shall have the effect of negating or superseding any of the disclaimers set forth herewith.

## **Section-IV**

### **Consideration of Response**

**CONSIDERATION OF RESPONSE****Responsiveness check**

The responses submitted by Applicants shall be scrutinized and may be rejected in following conditions-to establish interest in setting up Pilot Project for Thermal Energy Storage (TES) System, enabling flexible operation of Thermal Plants to balance. Responses shall be deemed non-responsive for following reasons:

- Responses that are incomplete, i.e., not accompanied by any of the applicable formats inter-alia covering letter power of attorney, applicable undertakings, provided in more details at annexure in Section-V.
- Responses not signed by authorized signatory and / or stamped in the manner indicated in this EOI.
- Material inconsistencies in the information/ documents submitted by the Applicant
- An Applicant submitting more than one response to this EOI either itself or through an affiliate or subsidiary company.
- Response validity being less than that required as per Clause 5 of section-III of this EOI.
- Response being conditional in nature.
- Response not received by the response Deadline.
- Response having Conflict of Interest.
- Applicant delaying in submission of additional information or clarifications sought by NTPC, as applicable.

All bids that shall meet the responsive check requirements set out above in this section of the EOI document shall be considered as responsive. In case of non-submission of relevant details as above, the responses may be considered as “**non-responsive**”, at the sole discretion of NTPC and will not be considered further.

\*\*\*\*

## **Section-V**

# **Application Form & Annexures**

**Annexure-1****FORMAT FOR COVERING LETTER CUM UNDERTAKING**

(The covering letter should be on the Letter Head of the Applicant)

Date : \_\_\_\_\_ Place : \_\_\_\_\_

To,

.....

**Sub.: (INVITATION FOR EXPRESSION OF INTEREST)**

Ref.: EOI No. \_\_\_\_\_, dated \_\_\_\_\_ (the "EOI")

Dear Sir,

We, the undersigned ..... [insert name of the "Applicant"] having read, examined, and understood in detail the **(INVITATION FOR EXPRESSION OF INTEREST)**.

We confirm that neither we nor any of our Parent Company/ Affiliate/ Ultimate Parent Company has submitted response other than this response directly or indirectly in response to the aforesaid EOI.

1. We give our unconditional acceptance to the EOI, issued by NTPC, as amended. In token of our acceptance to the EOI, the same have been signed & stamped by us and enclosed to the response. We hereby confirm that the provisions of the EOI shall be binding on us.
2. We have submitted our response strictly as per provisions and formats of the EOI, without any deviations, conditions and without mentioning any assumptions or notes.
3. We hereby unconditionally and irrevocably agree and accept that the decision made by NTPC in respect of any matter regarding or arising out of the EOI shall be binding on us. We hereby expressly waive any and all claims in respect of EOI process. We confirm that there are no litigations or disputes against us, which materially affect our ability to participate or function under the obligations with regard to EOI.



**(GLOBAL INVITATION OF EXPRESSION OF INTEREST)**

4. Details of the contact person are furnished as below:

Name:

Designation:

Address:

Contact numbers:

email id:

5. We are enclosing herewith the entire response containing duly signed formats in electronic format sent via email to: [ashwinikumarverma@ntpc.co.in](mailto:ashwinikumarverma@ntpc.co.in) as per the EOI for consideration.

6. It is confirmed that our response is consistent with all the requirements of submission as stated in the EOI and subsequent communications from NTPC, if any.

7. The information submitted in our response is complete, strictly as per the requirements stipulated in the EOI and is correct to the best of our knowledge and understanding. We would be solely responsible for any errors or omissions in our response.

We confirm that all the terms and conditions of our response are valid for acceptance for a period of six (6) months from the response Deadline.

8. We confirm that we have not taken any deviation so as to be deemed "**Non-Responsive**" as stipulated in Section-IV of this EOI.

9. We understand that you are not bound to accept any response you receive.

We remain,

Yours sincerely

(Name, Designation and Signature of Authorized Person)

**Annexure-2****APPLICANT'S ORGANIZATION DETAILS TO BE SUBMITTED BY APPLICANT**

**(Note: Documents in support of meeting the respective requirement shall be submitted by the Applicant.)**

- 1) Name of the Company
- 2) Legal status of the Company
- 3) Brief description of the Company including details of its business groups/subsidiaries/affiliates:
- 4) Existing Manufacturing facilities – Locations, Capacity
- 5) Date of Incorporation:
- 6) Date of Commencement of Business:
- 7) Full address including Telephone nos. / Fax nos.:
  - a. Registered Office:
  - b. Head Office:
  - c. Address for communication:
  - d. Contact Details:
  - e. Office Address in India, if any:
- 8) Collaborations/tie-ups with manufacturer (if applicable),
- 9) Details of Indian parties, if any, for installation, supply, services, and collaboration

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**Annexure-3****TECHNICAL INFORMATION TO BE SUBMITTED BY APPLICANT**

Applicant shall duly furnish following information.

**1.0 About Technology**

- Detailed Write up of thermal energy storage system indicating basic working principle of TES, major operating condition/ parameter, type (Sensible heat, latent heat and thermo-chemical), storage material and its property, heating capacity, design temperature and pressure, technology readiness level, input requirements (Power consumption, water quality and quantity, if any, service air/ instrument air requirement) etc.
- P&ID and GA of Thermal Energy Storage System
- P&ID of integrated system of Thermal Energy Storage with
- Merits and demerits of offered technology
- Reference list of plants presently running on proposed technology
- Module Size, module efficiency
- System life in Hrs. of operation
- Basic Process diagram
- Brief about the auxiliary system
- Parameters of thermal energy storage, maximum achievable parameters and limiting factors
- Charge and Discharge Rate Control mechanism
- Technical details of material used for thermal energy storage and criteria for material selection
- Round trip efficiency and factors and parameters affecting round trip efficiency
- Details of land footprint, energy density (kWh/M<sup>3</sup>), Capex, Opex, design life, scalability, modularity aspects, depth of discharge,
- Its comparison with other kinds of energy storage technologies on above parameters

**2.0 About Proposed Pilot Project**

- Basis of Site and Size Selection, facilities required at site
- Selection of optimal integration points in steam water cycle
- Heat and Mass Energy Balance of the system
- Basic scheme and line diagram of complete system and auxiliaries
- Calculation of round-trip efficiency

**(GLOBAL INVITATION OF EXPRESSION OF INTEREST)**

- Details of land footprint, TESS dimensions, energy density (kWh/M3), design life
- Operation philosophy
- Components details and technical specification of components
- Details of control and instrumentation
- Details of civil infrastructure required
- Details of electrical system
- Project Layout
- Codes and standard details
- Safety Aspects
- O&M Aspects
- Spare and consumables
- Scope of Work
- Terminal points, Inclusion and Exclusions
- Execution Period from award of job till Commissioning and Guarantee Test Run
- Power & water required.
- Cooling Water requirement
- Plot size required for the project
- Utilities required for normal operation of the plant
- Effluent generation, if any.
- Guarantee / Warranty offered for the offered project
- Technical data sheet
- Previous experience, in implementing proposed Thermal Energy Storage System.
- Engineering strength of Applicant
- Any other technical detail which Applicant would like to highlight, about its technology for consideration of EOI.
- Technical data as per Annexure-4
- Environmental clearance required if any
- Input data required from NTPC. Information related to system integration / hook up with Coal fired Thermal plant w.r.t Mechanical, electrical, C&I etc. aspects.

**3.0 Budgetary Cost:**

**3.1** Estimated total capital investment for the pilot project with cost breakup of all major components preferably as listed below:

- Thermal Energy Storage System and associated equipment

**(GLOBAL INVITATION OF EXPRESSION OF INTEREST)**

- Civil/Infrastructure requirement
- Control System
- Integrating with existing coal based thermal generating unit.
- Installation and Commissioning
- Miscellaneous Items
- Package BOP (Transformer / Inverters/ control systems etc. as required for completion of the pilot project)
- Safety and protection systems

**3.2 Estimated Operation & Maintenance cost for 3 years with spares and consumables.**

Note:

- Applicant shall separately mention taxes, duties, freight, insurance applicable for above items/project.
- Applicant shall mention budgetary cost equipment supply for Indian item and imported item separately.
- Financial contribution by the party/ proposed mode of project execution

**4.0 Project Timeline:**

Applicant shall mention project completion period from award of job till Commissioning and Guarantee Test Run with necessary details.

**5.0 Financial Turnover:**

Applicant is requested to submit Annual financial turnover during the last three (3) preceding financial year. Applicant to submit audited Balance Sheet and Profit & Loss account for the above three financial years.

**6.0 Declaration:**

Applicant is requested to provide declaration stating that their firm is neither put on Holiday or Black-listed by any Government / PSU / Private firm or Financial Institution. Applicant is requested to provide Self Declaration on Applicant's Letter Head.

**7.0 Validity:**

Applicant is requested to mention validity of the proposal submitted.

(Sign & Company Seal)

Authorized signatory

**Annexure-4****(Technical Data)**

SI.No.	Description	Applicant to fill
1.	<b>Type of Thermal Energy Storage technology proposed by Applicant</b>	
2.	<b>Whether Technology is owned by Applicant</b>	Yes/No
a)	If no, Name of Technology owner/ developer/ IP Owner	
b)	Registered office of Technology owner/ developer/ IP Owner	
c)	Whether Applicant has technology tie up/ collaboration with Technology owner/ developer/ IP Owner	Yes/No (Attached copy of Technology tie up/ collaboration agreement)
d)	Validity period of agreement	
3.	<b>Details of reference pilot/commercial Installations</b>	
a)	Name of project where Applicant/ Its Collaborator/ associate installed / is installing TESS	
b)	Name and address of owner of plant	
c)	Scale of plant	(Commercial/ pilot plant)
d)	Design capacity (Power rating and discharge period at rated power)	
e)	Type of application	Heat to heat/ Electricity to heat / Electricity to electricity
f)	Date of award to applicant	
g)	Date of completion of plant	
h)	If installation not yet completed, Present status and date of expected completion	
i)	Scope of work of Applicant (Furnish copy of LOA)	
j)	Technical parameters (Storage media, maximum temperature of storage media, pressure and temperature and flow of working fluid)	
<b>Details of Proposed Thermal Energy Storage System</b>		
1.	Type of Thermal Energy Storage Technology	Sensible heat/ Latent Heat/ Chemical
2.	Rated power and discharge period	
3.	Type of storage media	
4.	Name of Manufacturer/source of material	
5.	Melting Point of material	
6.	Density of material	
7.	Latent Heat (KJ/Kg)	

## (GLOBAL INVITATION OF EXPRESSION OF INTEREST)

8.	Storable thermal energy (latent heat) MJ/m <sup>3</sup>	
9.	Specific Heat (KJ/KgK)	
10.	Storable thermal energy (sensible heat) MJ/m <sup>3</sup> K	
11.	Heat Conductivity (W/mK)	
12.	Energy Storage Method	
13.	Duration of heat storage	
14.	Operating temperature of storage material	
15.	<b>Steam to storage material heat exchanger details</b>	
a)	Pressure, temperature, and flow of heating steam required	
b)	Outlet parameter of condensation	
c)	Type of Heat exchanger	
d)	Design capacity of Heat exchanger	
e)	Design pressure and temperature	
f)	Efficiency	
16.	<b>Storage media to Water/steam heat exchanger</b>	
a)	Inlet water/steam parameter required	
b)	Outlet parameter of steam	
c)	Type of Heat exchanger	
d)	Design capacity of Heat exchanger	
e)	Design pressure and temperature	
f)	Efficiency	
17.	<b>Effluent Generation data with Quality:</b> <ul style="list-style-type: none"> <li>- Solid (if any)</li> <li>- Liquid (if any)</li> <li>- Gaseous (if any)</li> </ul> In case of any effluent, include details of treatment required	
18.	Round Trip Efficiency	
19.	Expected life of entire project as a whole (Years)	
20.	Annual maintenance requirement Maintenance Activities with frequency.	
21.	No. of shutdown days per year	
22.	Capacity (MW-hrs)	
<b>Utility Requirement</b>		
23.	Total Power consumption and Installed load of Plant	
24.	Water (if required)	Clarified/ DM/ Service water
25.	Flow (m <sup>3</sup> /hr)	
26.	Pressure (kg/cm <sup>2</sup> )	

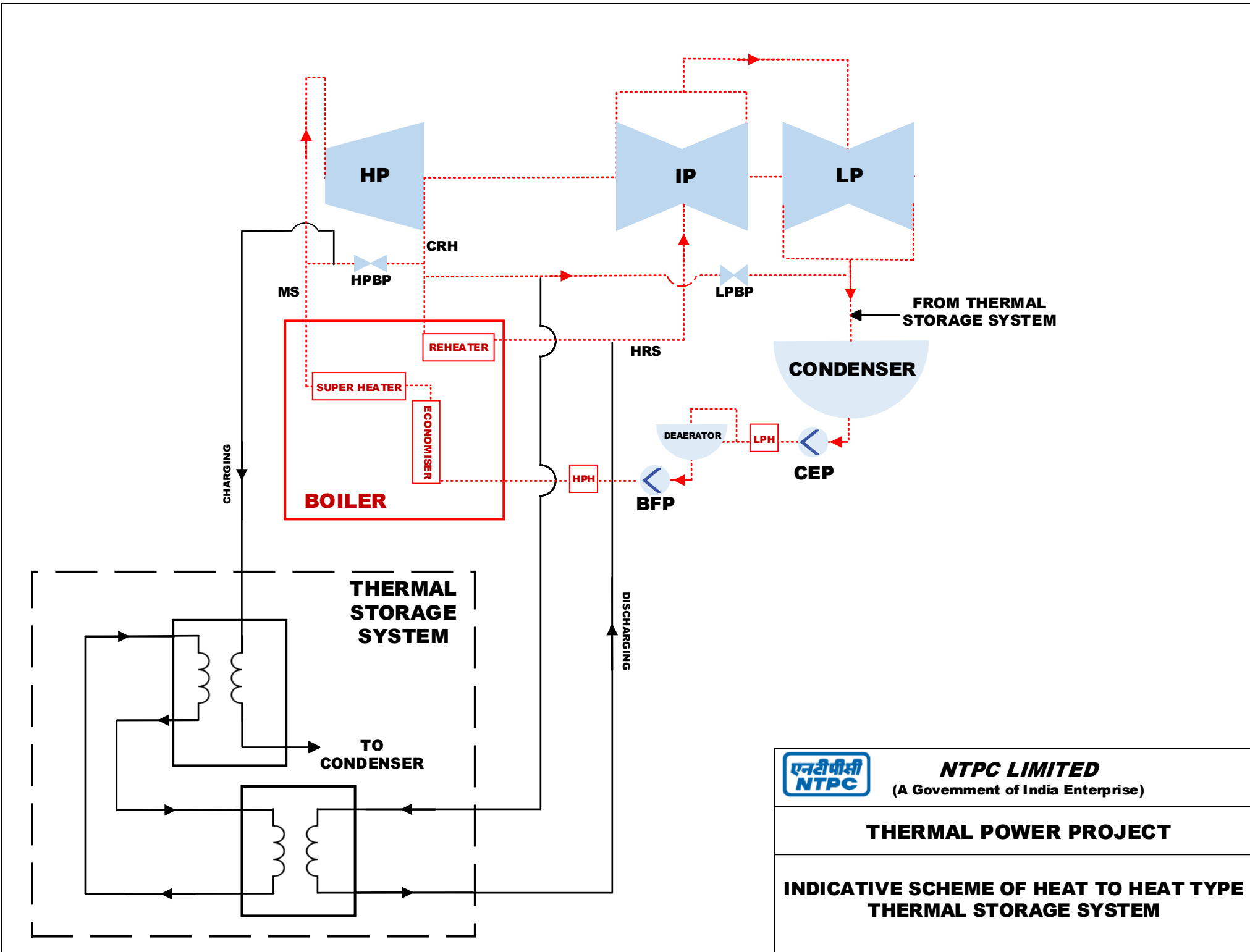
## (GLOBAL INVITATION OF EXPRESSION OF INTEREST)


27.	Instrument Air (Nm <sup>3</sup> /hr)	
28.	Service Air (Nm <sup>3</sup> /hr)	
29.	Others, if any. Please specify	
30.	Land Area Required (m2)	
<b>Other Data</b>		
31.	% of Indian content of equipment supply	
32.	% of Imported content of equipment supply and source of country	
33.	Completion schedule of project (in month)	
34.	Financial contribution to be shared by Applicant (% of total Project cost)	
35.	In case Applicant has technology tie up/ collaboration with technology owner/ developer/IP Owner, detail scope of technology support from collaborator to be indicated	

<b>Financial data of Applicant</b>				
		<b>Financial year 2021-22</b>	<b>Financial year 2020-21</b>	<b>Financial year 2019-20</b>
<b>1</b>	<b>Turnover</b>			
<b>2.</b>	<b>Net worth</b>			
<b>3.</b>	<b>Profit</b>			

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 <p><b>NTPC LIMITED</b> (A Government of India Enterprise)</p>
<p><b>THERMAL POWER PROJECT</b></p>
<p><b>INDICATIVE SCHEME OF HEAT TO HEAT TYPE THERMAL STORAGE SYSTEM</b></p>