

CI# 28098 TUC 6 Waste Heat Recovery Project
Authority to Overspend (ATO) (NSUARB P-128.07)
NSPI Responses to UARB Information Requests

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Request IR-1:

Reference Project Capital Costs.

- a) Please confirm, or state why NSPI cannot confirm, that the original estimate for this project, without duct firing, as filed in September 2007 was \$55.5 million and the present ATO request is for \$78.0 million, resulting in an increase of 40.5%.
- b) Please confirm, or state why NSPI cannot confirm, that the original estimate for this project, without duct firing, as filed in September 2007 was \$66.3 million and the present ATO request is for \$93.0 million, resulting in an increase of 40.3%.

Response IR-1:

- a-b) Confirmed. The table below illustrates the original application for the Tufts Cove 6 project in 2007, the approved filing for this project in 2008 and the impact of the 2010 ATO filing.

Application Date	Without Duct Firing \$M	Incremental Increase \$M	Incremental Increase %	With Duct Firing \$M	Incremental Increase \$M	Incremental Growth %
Sep-07	55.5	-	-	66.3	-	-
May-08	70.8	15.3	28	84.3	18	27
May-10	78.0	7.2	10	93.0	8.7	10

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Request IR-2:

Reference project economic analysis.

a) Please confirm, or state why NSPI cannot confirm, that the project economic analysis used for NSPI submissions in September 2007, May 2008, and the present ATO application all use the same Strategist assumptions, e.g. fuel costs, and as a result, the Strategist base case for all three sets of analyses shows the same annual operating costs.

b) Please confirm, or state why NSPI cannot confirm, that the Strategist assumptions referenced in part a are the same as those used in the 2007 Integrated Resources Plan report.

c) Please provide an updated project economic analysis, with and without duct firing, using the latest NSPI Strategist inputs (include any applicable benefits from the Hatch analysis).

Response IR-2:

a-b) NSPI confirms that all economic assumptions, other than the updated in-service date and increased capital costs, have not changed. As a result of the change in the in-service date, the operating costs presented in the May 2010 ATO application are different in the year 2010.

All other assumptions were kept the same to best demonstrate a direct comparison among each project application. These other assumptions are consistent with the 2007 Integrated Resource Plan Report.

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1 Additional operating benefits derived from these increases in cost are not reflected in the
2 variance analysis, or the project economics.
3

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Response IR-2: (cont'd)

c) TUC 6 Analysis – Summary of Results

	NPV Benefit TUC 6 without Duct-Firing Vs No TUC 6 (Strategist) \$M	NPV Benefit TUC 6 with Duct-Firing Vs TUC 6 without DF \$M	Total Project NPV Benefit \$M
May 2008 Filing	43.84	31.60	75.44
2010 Revision	37.70	29.49	67.19
Analysis using 2009 IRP Update Assumptions:			
Base Case Plan A with NPPH Biomass Project	(34.69)	32.84	(1.85)
High Load Plan E with NPPH Biomass Project	30.46	32.84	63.30

NSPI has completed an economic analysis of system costs with and without Tufts Cove 6, with duct-firing and without duct-firing. The analysis utilizes two cases, Port Hawkesbury (PH) Biomass Project Base Case Plan A and High Load Plan E (as filed with UARB in P- 128.10 April 9, 2010). These Plans are based on the 2009 IRP Update assumptions and analysis, modified to include the PH Biomass Project. The economic analyses include the benefits of duct-firing as originally developed by Hatch in 2008.

The results of the analysis are presented in the following table. Strategist output summaries are presented in the attachments. Comments on the analysis are provided below:

- The analysis shows that for Biomass Project Base Case Plan A, with the updated capital applied to the 2009 IRP Update assumptions, the net present value for the project with duct-firing remains positive. A significant change from the original

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1 filing is that the project economics are no longer driven primarily by the
2 combined cycle conversion.

3
4 This change is the result of the reduced load assumed in the Base Load World.
5 Under this assumption, Tufts Cove Units 4 and 5 have significantly reduced
6 forecast dispatch in the second decade compared to the original filing. The
7 reduced generation from the units provides less waste steam for combined cycle
8 operation. The effect of this is to produce a negative NPV for the combined cycle
9 conversion absent the addition of duct-firing.

- 10
11 • The Biomass Project Plan E, High Load World, assumes load growth at
12 traditional NSPI levels. The Plan E World is comparable to the original
13 assumptions employed when the project was approved by the Board.

14
15 As would be expected the benefits of both the combined cycle conversion and the
16 duct-fired addition are maintained at levels originally forecast for the project. The
17 resultant NPVs are comparable to that presented in NSPI's Application to
18 Overspend for this project.

- 19
20 • It should be noted that the attached economic analysis has not been undertaken
21 with the same parameter sensitivities as incorporated into the 2009 IRP. Tufts
22 Cove 6 will be in service by late 2010. It has been included in all recent NSPI
23 generation modeling. Where the IRP runs were tested across various sensitivities,
24 including differing gas prices, the attached analysis has not. In particular, where
25 the IRP Update Action Plan made explicit note of the potential for lower natural
26 gas prices, the effect of this on the Tufts Cove 6 economic analysis has not been
27 reflected in this analysis. There is also a view that says the short term (1-5 year)
28 outlook is that gas prices could be lower due to increased availability of shale gas
29 onshore North America.

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The implications of this are that the analysis, in particular the Base Case analysis, is likely conservative (i.e. benefits are likely understated) for the following reasons:

- The Tufts Cove Units are marginal cost units and thus highly affected by changing fuel price and load assumptions. In an actual production mode, it is likely the Company would be able to extract additional value (e.g. exports) from reduced loading on these units.
- The change in forecast operating mode would likely increase the opportunity to use units 4 and 5 to support wind development over the second decade of operations, and potentially the first decade. This benefit has not been quantified and included in the analysis.
- The savings forecast by Hatch for the duct-firing component continue to be applied only for the first-decade of operations. It is likely these would continue and potentially be expanded over the second decade as the penetration of wind generation in our Province increases.

The difference in results between the Strategist runs highlight a key driver for the Board's original approval of this project; the flexibility provided by increased natural gas-fired generation at the Province's load center. At a time of changing environmental regulation and volatile fuel pricing, the addition of an asset with significant operating flexibility and a favourable emissions profile is particularly valuable. The increased forecast capital cost for this project does not change the fundamental merits of this project for our customers.

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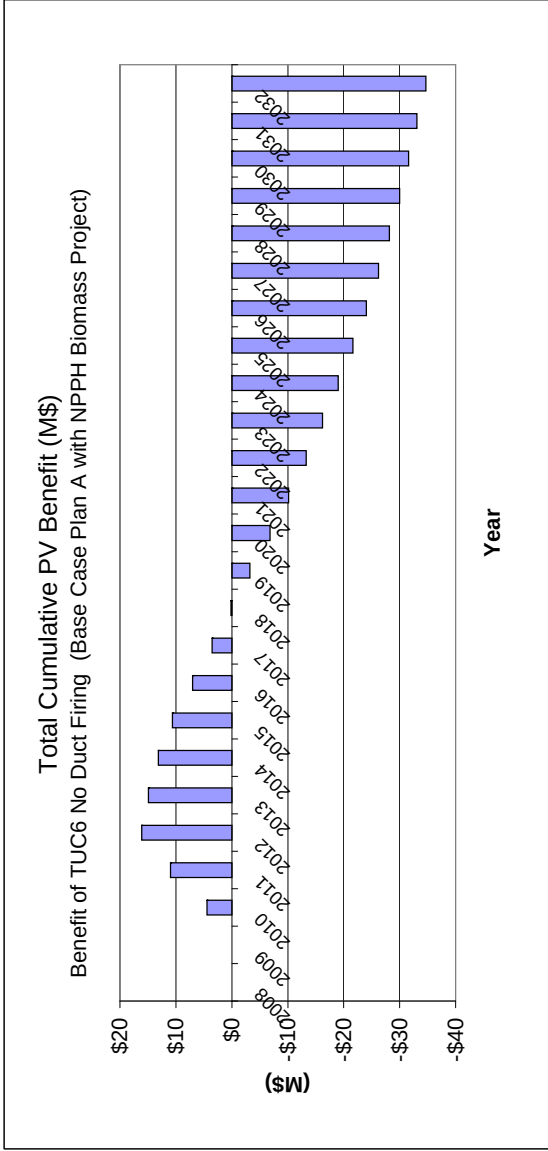
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1 Please refer to Attachment 1 for the detailed analysis results.

NPV Benefit of TUC 6 No Duct Firing (Base Case Plan A with NPPH Biomass Project)

[illegible]

NOTE: NPPH Biomass Project - in-service Dec/2012.
Operating costs including fuel, purchased power and O&M.
Capital Costs are the annual charges for the combination of



Incremental NPV Benefit of TUC 6 Duct Fired - Operating Cost Benefits from Hatch Analysis
(Base Case Plan A with NPPH Biomass Project)

Year	Operating Benefits Hatch Analysis (K\$)	Operating Benefits Cumulative (K\$)	Year	Capital Cost = \$93M Base Case NPPH Biomass TUC6 Duct Fired In-service Dec/2010 (K\$)	Capital Cost = \$78M Base Case NPPH Biomass TUC6 no Duct Firing In-service Dec/2010 (K\$)	Capital Costs DF Portion (K\$)	Capital Costs Cumulative PV Costs (K\$)	Total Benefits Nominal \$ (K\$)	Total Benefits PV (K\$)	Total Benefits Cumulative PV (M\$)
2008	0	0	2008	0	110	0	0	0	0	0.0
2009	0	0	2009	1,726	1,726	0	0	0	0	0.0
2010	490	430	2010	8,764	9,361	597	523	1,087	953	1.0
2011	8,318	7,256	2011	26,025	23,880	-2,145	-1,237	6,173	5,066	6.0
2012	6,639	12,357	2012	12,257	10,209	-2,048	-2,811	4,591	3,527	9.5
2013	6,732	17,200	2013	50,424	48,456	-1,968	-4,226	4,764	3,427	13.0
2014	6,419	21,523	2014	52,880	50,964	-1,916	-5,516	4,503	3,033	16.0
2015	6,052	25,339	2015	53,639	51,765	-1,873	-6,697	4,179	2,635	18.6
2016	8,496	30,354	2016	53,689	51,869	-1,821	-7,772	6,675	3,940	22.6
2017	7,971	34,760	2017	53,546	51,778	-1,768	-8,750	6,203	3,428	26.0
2018	8,785	39,306	2018	88,571	86,848	-1,723	-9,641	7,062	3,655	29.7
2019	9,402	43,861	2019	100,291	98,620	-1,670	-10,450	7,732	3,746	33.4
2020	10,919	48,813	2020	98,608	96,900	-1,618	-11,184	9,301	4,219	37.6
2021	0	48,813	2021	98,602	97,037	-1,565	-11,849	-1,565	-665	37.0
2022	0	48,813	2022	96,368	94,855	-1,513	-12,450	-1,513	-602	36.4
2023	0	48,813	2023	93,754	92,294	-1,461	-12,994	-1,461	-544	35.8
2024	0	48,813	2024	91,002	89,594	-1,408	-13,485	-1,408	-491	35.3
2025	0	48,813	2025	88,252	86,896	-1,356	-13,927	-1,356	-442	34.9
2026	0	48,813	2026	85,618	84,315	-1,303	-14,326	-1,303	-398	34.5
2027	0	48,813	2027	83,167	81,916	-1,251	-14,683	-1,251	-358	34.1
2028	0	48,813	2028	80,242	79,050	-1,192	-15,003	-1,192	-319	33.8
2029	0	48,813	2029	68,490	67,350	-1,140	-15,288	-1,140	-286	33.5
2030	0	48,813	2030	71,644	70,557	-1,088	-15,544	-1,088	-255	33.3
2031	0	48,813	2031	66,349	65,314	-1,035	-15,771	-1,035	-227	33.0
2032	0	48,813	2032	65,557	64,581	-976	-15,972	-976	-201	32.8

48,813.4 (Discount Rate is 6.81%)

NPV (Jan. '08 K\$) -15,972.0

(Discount Rate is 6.81%)

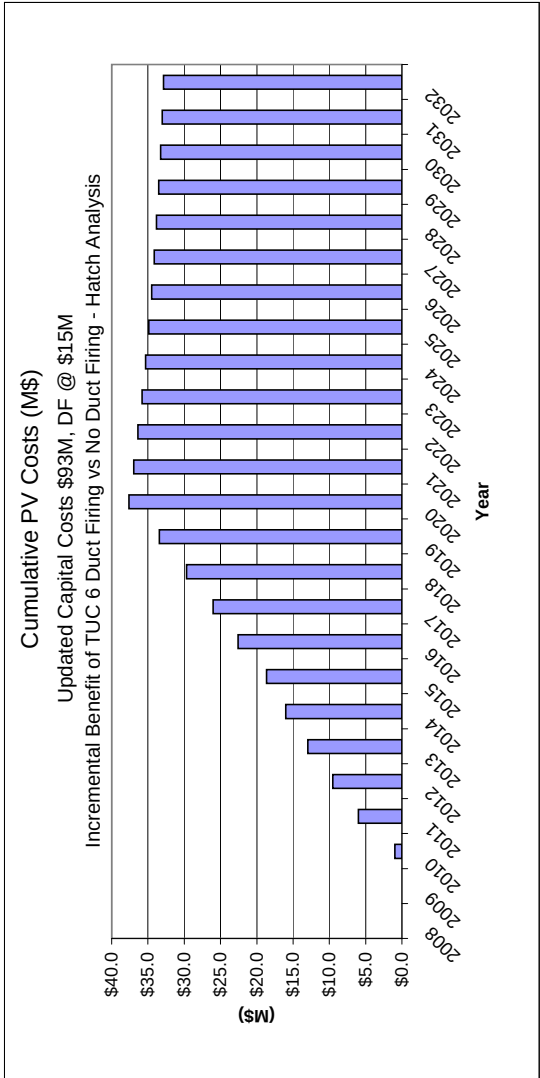
Cumulative NPV Costs 2008-2032	32.84 M\$
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Notes:

Operating Cost Benefits - Hatch Analysis (difference in system operating costs with TUC 6 at 125MW and 150MW)

- Hatch benefits calculated for 2010 were reduced by 11/12 because Hatch assumed TUC 6 in-service by Jan/2010 not Dec/2010. (\$5882/12)

Capital Costs are the annual charges for the combination of alternatives from Strategist.



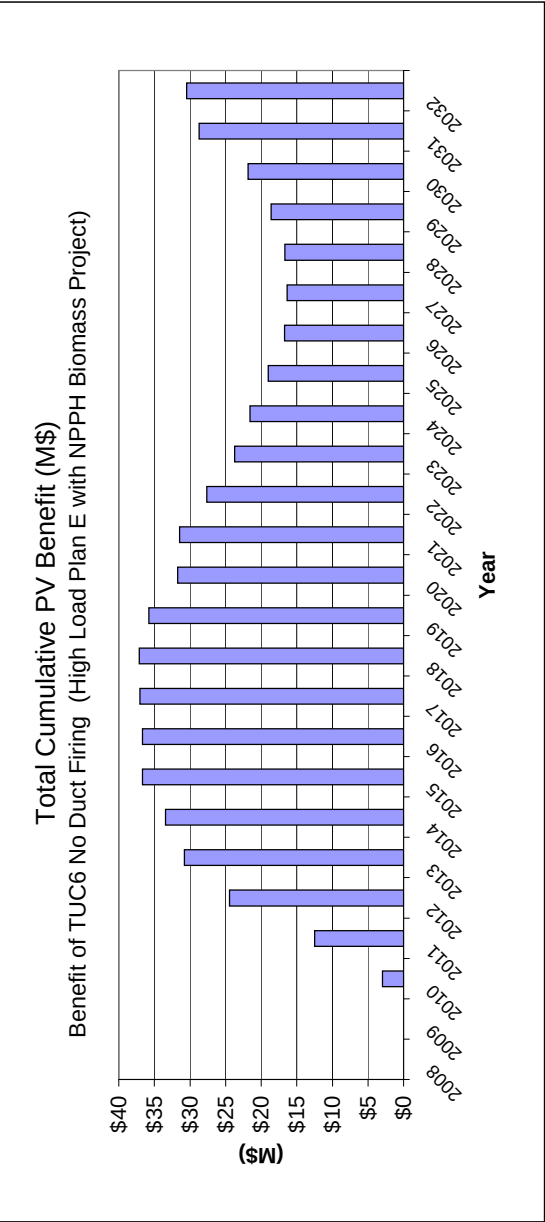
Assumptions:
- Base Case Plan A with NPPH Biomass project
- TUC 6 Duct Fired
- In-service Dec/2010
- Capital Cost \$93M (\$2010)
NPPH-BASE_TUC6 DF_\$93(DEC)_JUL12 SAV

Assumptions:
- Base Case Plan A with NPPH Biomass project
- TUC 6 No Duct Firing
- In-service Dec/2010
- Capital Cost \$78M (\$2010)
NPPH-BASE_TUC6 UNFIRED_\$78(DEC)_JUL12 SAV

NPV Benefit of TUC 6 No Duct Firing (High Load Plan E with NPPH Biomass Project)										
2009 IRP Update Assumptions with NPPH Biomass Project										
Operating Costs:										
Year	High Load NPPH Biomass		High Load NPPH Biomass		Capital Costs:		High Load NPPH Biomass		Total Cumulative PV Benefit (\$2008) (M\$)	
	TUC6 No Duct Firing	No TUC 6	TUC6 No Duct Firing	No TUC 6	Year	TUC6 No Duct Firing	No TUC 6			
	(K\$)	(K\$)	(K\$)	(K\$)		(K\$)	(K\$)			
2008	608,870.8	\$608,871	0	0	2008	1,726	110	0	0.0	
2009	621,666.5	\$621,667	0	0	2009	1,726	110	0	0.0	
2010	773,367.9	\$773,368	287	252	2010	9,361	12,465	3,104	3.0	
2011	702,060.8	\$724,809	22,748	18,920	2011	27,617	16,463	-11,154	12.5	
2012	704,105.4	\$730,285	26,179	39,035	2012	12,336	1,687	-10,650	24.4	
2013	709,102.1	\$728,163	19,061	52,746	2013	50,955	40,723	-10,232	30.8	
2014	724,076.8	\$737,979	13,902	62,109	2014	59,741	49,781	-9,961	33.4	
2015	740,646.0	\$755,557	14,911	71,511	2015	61,321	51,581	-9,741	36.7	
2016	761,639.5	\$771,103	9,463	77,098	2016	68,142	58,673	-9,468	36.7	
2017	768,869.9	\$778,682	9,812	82,520	2017	69,320	60,124	-9,196	37.0	
2018	770,063.8	\$779,157	9,093	87,226	2018	106,063	97,105	-8,957	37.1	
2019	767,025.0	\$772,961	5,936	90,102	2019	124,665	115,981	-8,685	35.8	
2020	771,810.1	\$771,297	-513	89,869	2020	157,665	149,252	-8,413	31.7	
2021	790,822.6	\$798,382	7,560	93,079	2021	170,131	161,991	-8,140	31.5	
2022	818,926.3	\$817,130	-1,796	92,365	2022	174,300	166,432	-7,868	27.6	
2023	794,103.1	\$791,274	-2,829	91,312	2023	171,345	163,750	-7,595	23.8	
2024	819,649.8	\$820,736	1,086	91,691	2024	166,332	159,009	-7,323	21.6	
2025	867,579.7	\$866,758	-822	91,423	2025	183,639	176,589	-7,051	19.0	
2026	871,785.2	\$871,011	-775	91,186	2026	181,997	175,219	-6,778	16.7	
2027	882,408.3	\$887,770	5,361	92,719	2027	176,309	169,804	-6,506	16.4	
2028	904,761.8	\$912,145	7,384	94,696	2028	170,433	164,234	-6,200	16.7	
2029	928,551.2	\$942,119	13,568	98,098	2029	155,868	149,941	-5,927	18.6	
2030	948,220.5	\$967,624	19,404	102,652	2030	150,972	145,316	-5,655	21.8	
2031	979,285.6	\$1,015,964	36,678	110,712	2031	150,155	144,772	-5,383	28.7	
2032	991,577.7	\$1,005,200	13,622	113,515	2032	146,195	141,118	-5,077	30.5	
NPV (Jan. '08 K\$)					NPV (Jan. '08 K\$)					
113,514.0					-83,053.9					
					(Discount Rate is 6.81%)					
Cumulative NPV Benefit 2008-2032										
30.46 M\$										

Files:
No TUC 6 Case
NPPH-HIGH_NoTUC6_JUL13.SAV
Planning NPV = \$12,047,370

TUC 6 No Duct Firing
NPPH-HIGH_TUC6 UNFIRE\$,78(DEC)_JUL13.SAV
Planning NPV = \$12,016,909



NOTE: NPPH Biomass Project - in-service Dec/2012.
Operating costs including fuel, purchased power and O&M.
Capital Costs are the annual charges for the combination of alternatives added.

Incremental NPV Benefit of TUC 6 Duct Fired - Operating Cost Benefits from Hatch Analysis
(High Load Plan E with NPPH Biomass Project)

Year	Operating Benefits Hatch Analysis (K\$)	Operating Benefits Cumulative (K\$)	Year	Capital Cost = \$93M High Load NPPH Biomass TUC6 Duct Fired In-service Dec/2010 (K\$)	Capital Cost = \$78M High Load NPPH Biomass TUC6 no Duct Firing In-service Dec/2010 (K\$)	Capital Costs DF Portion (K\$)	Capital Costs Cumulative PV Costs (K\$)	Total Benefits Nominal \$ (K\$)	Total Benefits PV (K\$)	Total Benefits Cumulative PV (M\$)
2008	0	0	2008	0	0	0	0	0	0	0.0
2009	0	0	2009	110	110	0	0	0	0	0.0
2010	490	430	2010	1,726	1,726	597	523	1,087	953	1.0
2011	8,318	7,256	2011	8,764	9,361	-2,145	-1,237	6,173	5,066	6.0
2012	6,639	12,357	2012	29,762	27,617	-2,048	-2,811	4,591	3,527	9.5
2013	6,732	17,200	2013	14,384	12,336	-1,968	-4,226	4,764	3,427	13.0
2014	6,419	21,523	2014	52,923	50,955	-1,916	-5,516	4,503	3,033	16.0
2015	6,052	25,339	2015	61,657	59,741	-1,873	-6,697	4,179	2,635	18.6
2016	8,496	30,354	2016	63,195	61,321	-1,821	-7,772	6,675	3,940	22.6
2017	7,971	34,760	2017	69,963	68,142	-1,768	-8,750	6,203	3,428	26.0
2018	8,785	39,306	2018	71,088	69,320	-1,723	-9,641	7,063	3,655	29.7
2019	9,402	43,861	2019	107,785	106,063	-1,670	-10,450	7,732	3,746	33.4
2020	10,919	48,813	2020	126,336	124,665	-1,618	-11,184	9,301	4,219	37.6
2021	0	48,813	2021	159,282	157,665	-1,565	-11,849	-1,565	-665	37.0
2022	0	48,813	2022	171,697	170,131	-1,513	-12,450	-1,513	-602	36.4
2023	0	48,813	2023	175,813	174,300	-1,461	-12,994	-1,461	-544	35.8
2024	0	48,813	2024	172,806	171,345	-1,408	-13,485	-1,408	-491	35.3
2025	0	48,813	2025	167,740	166,332	-1,356	-13,927	-1,356	-442	34.9
2026	0	48,813	2026	184,995	183,639	-1,304	-14,325	-1,304	-398	34.5
2027	0	48,813	2027	183,301	181,997	-1,251	-14,683	-1,251	-358	34.1
2028	0	48,813	2028	177,560	176,309	-1,192	-15,003	-1,192	-319	33.8
2029	0	48,813	2029	171,626	170,433	-1,140	-15,288	-1,140	-286	33.5
2030	0	48,813	2030	157,008	155,868	-1,088	-15,544	-1,088	-255	33.3
2031	0	48,813	2031	152,059	150,972	-1,035	-15,771	-1,035	-227	33.0
2032	0	48,813	2032	151,190	150,155	-976	-15,972	-976	-201	32.8
				147,171	146,195					
48,813.4 (Discount Rate is 6.81%)				NPV (Jan. '08 K\$)		-15,971.9 (Discount Rate is 6.81%)				

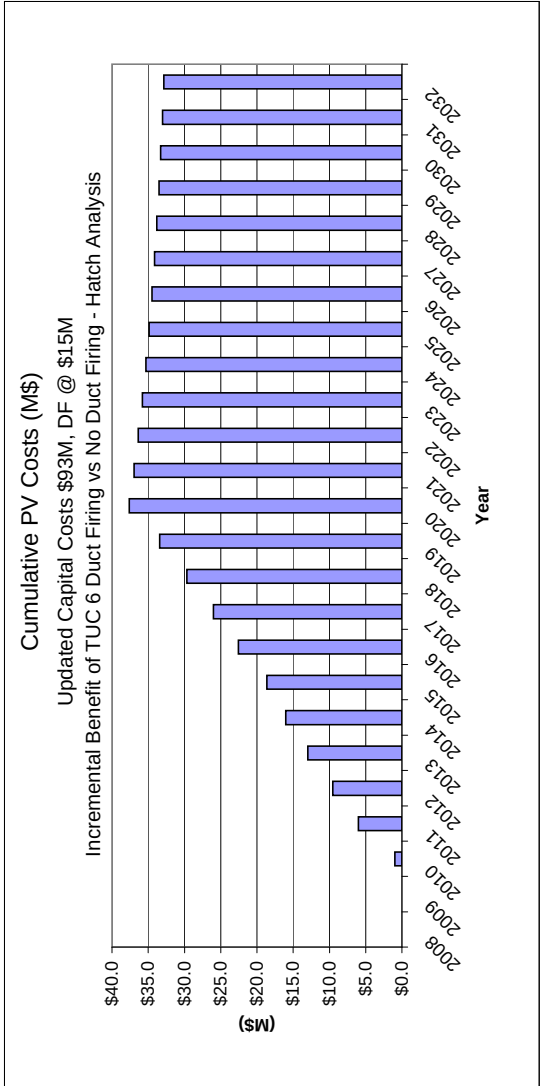
Cumulative NPV Costs 2008-2032 32.84 M\$

Notes:

Operating Cost Benefits - Hatch Analysis (difference in system operating costs with TUC 6 at 125MW and 150MW)

- Hatch benefits calculated for 2010 were reduced by 11/12 because Hatch assumed TUC 6 in-service by Jan/2010 not Dec/2010. (\$5882/12)

Capital Costs are the annual charges for the combination of alternatives from Strategist.



Assumptions:

- High Load Plan E with NPPH Biomass project
- TUC 6 Duct Fired
- In-service Dec/2010
- Capital Cost \$93M (\$2010)
- NPPH-HIGH_TUC6 DF_\$93(DEC)_JUL13.SAV

Assumptions:

- High Load Plan E with NPPH Biomass project
- TUC 6 No Duct Firing
- In-service Dec/2010
- Capital Cost \$78M (\$2010)
- NPPH-HIGH_TUC6 UNFIRE_\$78(DEC)_JUL13.SAV

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Request IR-3:

What is the present status of the project. Include in your response the percent complete and the latest estimate of the project in-service date.

Response IR-3:

The following details provide the present status of the project:

- Procurement of equipment is complete and all major pieces have been delivered to the site and placed on their foundations.
- Contract Number 1 for Site Preparation and Harbour Infill is 98 percent complete. Final site grading and two minor deficiencies are outstanding.
- Contract Number 2 for Foundations and Piling is complete.
- Contract Number 3 for Main Civil work including the powerhouse erection is substantially complete. A few deficiencies remain and need to be rectified.
- Contract Number 4 for Balance of Plant work which includes the supply and installation of the piping systems and installation of electrical systems is approximately 30 percent complete. Piping system design problems and interferences have delayed this contract.
- Contract Number 5 for Instrumentation and Controls installation is 5 percent complete.
- Distributed Control System (DCS) design and build is complete and currently undergoing factory acceptance testing.

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1 Response IR-3: (cont'd)

2

3 • Commissioning and acceptance is 5 percent complete.

4

5 The estimated in service date for the project is late December, 2010 or early January 2011.

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Request IR-4:

How much of the ATO increased cost is due to NSPI's decision to include duct firing in the project versus the base case project without duct firing?

Response IR-4:

\$1,474,864 of the increased cost is due to duct firing capability in the project and \$7,225,000 of the ATO is attributed to the base case project without duct firing.

Please refer to Attachment 1, page 1 to 3, in the May 3, 2010 TUC 6 Waste Heat Recovery Project - CI 28098 Authority to Overspend (ATO) (NSUARB P-128.07) Application.

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Request IR-5:

Reference Pages 2 and 3 of the May 3, 2010 ATO.

- a) Please confirm that, as stated in the first paragraph on page 2, the cost increases are due to "...changes to specific project cost elements unforeseen at the time of NSPI's original capital filing ...".
- b) Please confirm that "original capital filing" refers to the May 2008 filing
- c) NSPI states that the cost increase is primarily due to three items and then lists the items. Please provide a breakdown of the amount of the increase attributable to each of the three items.

Response IR-5:

- a) Confirmed.
- b) Confirmed. The original capital filing referenced refers to the UARB Approved, May 2008 Tufts Cove 6 Waste heat Recovery Project.
- c) Please refer to Attachment 1, pages 1 to 3, in the May 3, 2010 TUC 6 Waste Heat Recovery Project - CI 28098 Authority to Overspend (ATO) (NSUARB P-128.07) Application. The table in this attachment breaks down the increases in capital spend by cost element and project initiative (Duct-Firing versus No Duct-Firing). Additional operating benefits derived from these increases in cost are not reflected in the variance analysis, or the project economics.

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Request IR-6:

Reference Page 3 of May 3, 2010 ATO Application, the letter states:

Assumptions were included in the original scope of the project, but final specification could not be determined until the project was initiated.

a) Please identify the assumptions.

b) Please explain why it was necessary to employ assumptions.

c) Please identify the assumptions which changed, indicating when they changed, the reasons for the changes, and the impact of the changes on the Project.

Response IR-6:

a-c) 'Assumptions' refers to each cost component included in the project.

The cost components of the project include:

- Harbour Infill, Site Preparation and Foundations
- Environmental Assessment and Permits
- Buildings and Auxiliary Systems
- Steam Turbine generator and Major Components
- Boilers, Duct Burners and Gas Systems
- Local Control System Integration with Main Plant
- Generator Transformer, Cables, Protection and Balance of Plant
- Protection

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1 Response IR-6: (cont'd)

- 2
- 3 • Engineering Design, Procurement & Commissioning
 - 4 • Insurance, AFUDC, DUTY & Applied Overhead
 - 5 • Studies and Preliminary Engineering
- 6

7 Please refer to Attachment 1, pages 1 to 3, in the May 3, 2010 TUC 6 Waste Heat
8 Recovery Project - CI 28098 Authority to Overspend (ATO) (NSUARB P-128.07)
9 Application. The table in this attachment breaks down the increases in capital spend by
10 cost element and project initiative (Duct-Firing versus No Duct-Firing).

11

12 While the cost components have not changed, additional variance explanations for the
13 capital expense increases are provided in UARB IR-9 through UARB IR-20.

CI# 28098 TUC 6 Waste Heat Recovery Project
Authority to Overspend (ATO) (NSUARB P-128.07)
NSPI Responses to UARB Information Requests

NON-CONFIDENTIAL

Request IR-7:

Reference Page 3 of the May 3, 2010 ATO, last paragraph on the page.

- a) Please confirm that NSPI's reference to the "original filing" is to the May 2008 filing.
- b) Please provide a breakdown of the impact on the NPV of each of the three items listed, e.g. increased capital cost, additional operating costs and tax savings, so that the total of the three items is the total NPV change from the original filing to the ATO.

Response IR-7:

- a) Confirmed. The original capital filing referenced refers to the UARB Approved, May 2008 Tufts Cove 6 Waste Heat Recovery Project.
- b) The following tables provide a breakdown of the impact on NPV:

	NPV Benefit TUC 6 without Duct-Firing vs No TUC 6 (Strategist™) \$M	NPV Benefit TUC 6 with Duct-Firing vs TUC 6 without Duct-Firing \$M	Total Project NPV Benefit \$M
May 2008 Filing (Jun 2010 In-Service)	43.84	31.60	75.44
Revised Capital (Dec 2010 In-Service) 2010 Revision	37.70	29.49	67.19

CI# 28098 TUC 6 Waste Heat Recovery Project
Authority to Overspend (ATO) (NSUARB P-128.07)
NSPI Responses to UARB Information Requests

NON-CONFIDENTIAL

Response IR-7: (cont'd)

	Without Duct Firing \$M	With Duct Firing \$M	Total Project NPV Benefit \$M
Increased Capital Cost	(4.28)	(0.91)	(5.19)
Additional Operating Costs	(5.47)	(1.90)	(7.37)
Tax Savings	3.61	0.70	4.31
Change in Net Present Value	(6.14)	(2.11)	(8.25)

NON-CONFIDENTIAL

Request IR-8:

Reference Page 4 of the May 3, 2010 ATD, first paragraph on the page.

- a) Please identify the types of additional resources expected to be required.**
- b) Please explain why additional intermittent resources will likely increase the benefits of this project.**
- c) Please quantify these additional benefits.**

Response IR-8:

- a) Additional resources refers to intermittent renewable generation, most likely from sources such as wind energy.
- b) Intermittent energy requires support from fast acting dispatchable generation that can immediately respond to variations in energy production and provide system stability. This includes gas turbines and duct firing on combined cycle
- c) By the end of 2010 a significant portion of wind generation will be brought into operation. Following the operational in-service wind based generation, NSPI will be able to gather quantitative information on the industry acknowledged effects of increasing amounts of intermittent (wind) generation on the bulk power system operation.

NON-CONFIDENTIAL

Request IR-9:

Reference Capital Cost Breakdown Table

Harbour Infill, Site Prep. & Foundations

Sheet Piling Required to allow for permitting ...

- a) Please explain what "permit" is referenced here. Include in your reply the name of the relevant permitting authority and quote the relevant act, regulation, etc, being enforced by the permitting authority.
- b) When NSPI did the original design for this part of the project, did it consult with relevant permitting authorities as to what is required to obtain all necessary permits? Please provide a list of authorities consulted and include documentation of any meetings, phone calls, etc.
- c) When did NSPI receive notification that the design would have to be modified in order to obtain the permit referenced in part a? Please provide documentation.

CI# 28098 TUC 6 Waste Heat Recovery Project
Authority to Overspend (ATO) (NSUARB P-128.07)
NSPI Responses to UARB Information Requests

NON-CONFIDENTIAL

Response IR-9:

a) The following Permits/Approvals/Authorizations were obtained:

Permit/Approval/ Authorization	Authority	Relevant Act/Regulation	Trigger
Environmental Assessment Approval	Nova Scotia Environment	Environmental Assessment Regulations; Environment Act	Environmental Assessment Regulations Schedule A – Class I Undertaking – Section D
Industrial Approval (construction)	Nova Scotia Environment	Activities Designation Regulations; Approval Procedures Regulations; Environment Act	Part 9; Section 20 of Activities Designation Regulations
Navigable Waters Protection Permit	Navigable Waters Protection Division of Transport Canada	Navigable Waters Protection Act	Section 5 (1) of the Act – Approval of Works

b) NSPI Environmental Services consulted with all the agencies listed in the table above. NSPI has an internal Environmental Services group that interfaces regularly with numerous regulatory agencies on a variety of operational and capital construction project related items. This regular and frequent engagement has resulted in positive relationships with regulatory personnel and a comprehensive understanding of compliance and permitting requirements. NSPI was aware that to obtain the necessary permits, the design would have to respect the water lot boundaries for Tufts Cove Generating Station, minimize fish habitat destruction and incorporate a low velocity intake with screening to prevent fish from being drawn in and trapped. NSPI had a preliminary design concept for the intake structure and infill profile.

CI# 28098 TUC 6 Waste Heat Recovery Project
Authority to Overspend (ATO) (NSUARB P-128.07)
NSPI Responses to UARB Information Requests

NON-CONFIDENTIAL

Response IR-9: (cont'd)

c) In late 2008, the harbour infill was one of the first technical issues addressed. Information exchanges were ongoing as the detailed engineering progressed in parallel with discussion with Department of Fisheries, Nova Scotia Environment and Navigable Waters. Please refer to Attachment 1. Detailed engineering resulted in changes when it became clear the infill was technically unsuitable as the slope had to be increased for stability and this would result in the toe of the slope being off of NSPI property. Additional sheet piling was required to resolve this. The intake and discharge channels were also affected by the infill at the required slope so the design incorporated more sheet pile.

With this design, NSPI was able to obtain authorization from Fisheries and Oceans on June 17, 2009; Navigable Water Protection Program on June 30, 2009; and Construction Approval from Nova Scotia Environment on July 2, 2009. The permits were received three months beyond the anticipated project plan date. These approvals are provided in Attachments 2-4.

Technical Correspondence Sheet



To: _____ Our Ref.: NSP-AMEC 001
Your Ref.: _____
From: _____ Date: December 3, 2008

Project: TUFTS COVE 6 WASTE HEAT RECOVERY
Subject: Environmental Assessment
Ref.: _____

☐ COMMENT
☒ QUESTIONNAIRE
☒ REPLY
☐ INFORMATION

Here are some questions we are hoping AMEC will be able to answer as the cooling water intake design develops and the extent of the infill is determined. This information is necessary to complete the EA Registration document.

Infilling Details:

- What is the final footprint (still 6238 m)?
- What materials will be used?
- How much material will be used?
- What are the construction details?
- Will any of the sediment be disturbed?
- Will they use sediment control?

Construction Details:

- What sediment and erosion controls will be used?
- How much soil will be excavated?
- How will it be managed on site (stored, tested, etc)?
- How will it be disposed of?

Design/Operation Details:

- What is the final intake design?
- Will there be potential impacts from condenser cleaning (residual chlorine, etc)?
- Are there are other process (cleaning, maintenance, etc) that may result in discharges to the environment?

Also from discussions during last week's update meeting/conference call with AMEC, Heather looked into the operating approval at TUC with respect to using chlorine as a cleaning agent/biofoulant. The permit stipulates that TUC has to notify NSE prior to using biofouling reagents to treat the cooling water. The discharge is also not to exceed 0.5 mg/L. Based on her work with Trenton operating approval renewal, she knows that NSE is really looking to remove allowances for even 0.5 mg/L residual chlorine. We will pursue with NSE.

Also, with respect to the request from AMEC for water quality data, I have attached a link to the reports from the Harbour Solutions Project water quality analysis:

<http://www.halifax.ca/harboursol/WeeklyHarbourDataandReports.html> These reports should contain all of the analytical data they need.

Please let me know if you have any questions about our requests or require further information.

Technical Correspondence Sheet

Response:

INFILLING DETAILS

The final footprint from the top of the existing shore slope to the toe of the proposed slope and bottom of sheet piling is 3600m². This is based on an estimated top of slope elevation on 32.92m and a proposed slope 2.5 to 1 to harbour bottom.

Pending final design the following materials are expected to be used for the infill areas outside sheet piling and caissons:

From harbour bottom to average water level elevation 30.5m Type 3 engineered rock fill and Type 4 engineered rock fill from elevation 30.5m to elevation 32.0.

Engineered Fill 3 and Type 4): with the following requirements:

- .1 Quarried rock, or rockfill.
- .2 Material shall be free from deleterious material and conform to the following gradations:

	Type 3 below elev 100	Type 4 Elev 100-105
Size (mm)	% Passing	% Passing
450	100	--
300	70 - 100	--
150	45 - 80	100
100	--	75 - 100
50	25 - 55	25 - 60
25	10 - 40	10 - 35
5	0 - 10	0 - 10

Type 2 to NSTPW specs from Elevation 32 to finish surface subgrade.

The Type 4 layer will have a geotextile fabric on the face and have a 0.5m layer of core stone with an average weight of 70kg. with the following gradation:

Weight (kgs)	% Passing
100-70	50
70-40	40
less than 40	10

On top of the core stone will be a 1m layer of Armour stone with an average weight of 700kgs. with the following gradation:

Weight (kgs)	% Passing
1000 - 700	50
700 - 400	40
400 - 200	10

T Project Manager: _____

Date: _____

Technical Correspondence Sheet

The estimated amount of infill outside the sheet piling and caissons is 3100 cu metres. The estimated amount of infill material inside the sheet piling and caissons is 8400 cu metres, for a total infill volume of 11,500 cu metres. The estimated amount of excavated material for the intake structure trench is 700m³.

CONSTRUCTION DETAILS

The construction details for the infill are as generally outlined above for layering of the various materials up to finish surface subgrade at a 2.5:1 slope from harbour bottom. The harbour bottom may have to be dredged to remove soft sediment to allow the toe of the slope to sit on competent material. At this time we have no information on the thickness of the sediment for the infill areas.

Above the average water level the fill will be placed in 18" layers and compacted with a vibratory roller. The existing armour stone will be removed as much as possible and stockpiled for reuse. It is expected that infill will occur from the shoreline outwards. A geotextile material will be placed between the layers of fill to prevent long term migration of fines from the infill material to the harbour and to maintain stabilization of the infill slope from wave action.

The extent of infill has been reduced from the RFP document, in part due to the NSPI request to not extend the current CW outfall. Due to the limits of the water lot, a 2:1 slope is the best that could be achieved within the property limits without significantly reducing the work area near the construction site. Therefore we have proposed to use sheet piling, anchored wall or caissons to eliminate excess deep water fills that would extend over the water lot limits with more stable slopes. The sheet piling will extend from the existing sheet piling by the oil boom shed to the proposed new cooling water outfall. Depending on the bottom material composition at the sheet pile locations, dredging may have to occur within the sheet pile limits, to remove large boulders and reach competent bottom. Normal driving of sheet piles would occur from a barge. Pending final design, the infill area near the existing cold water outfall may be eliminated by extending the sheet piling to the caissons. Further information on the material composition of the bottom of the harbour will be required to finalize design and cost estimates.

The pipe end for the existing CW outfall however will be surrounded by concrete caissons in order to protect the existing pipe. These will be filled with rock ballast to allow for expansion of the top surface without having to extend the pipe. Concrete slabs will be placed over the caissons and existing outfall pipe to protect it from excessive loading by construction equipment.

SEDIMENT

AMEC has not received any definitive data on harbour bottom composition. Anecdotal information indicates mostly a rocky bottom with thin layers of sediment in the intake area for the most part due to currents in the Narrows up to 1.3 ft/sec during tidal action. We would expect more sediment in the near shore in the cove area but have reduced the area to be infilled to avoid extending the existing CW outfall pipe. Disruption of the sediment will likely occur for any dredging and rock placement.

SEDIMENT CONTROL

A floating silt curtain will circle the entire infill area to capture resuspended sediment. The sediment should resettle in the same area. The curtain will also capture any floating debris or material from the construction site.

Technical Correspondence Sheet

The silt curtain fabric will be specified with the following properties:

	Min.	Typical
Grab tensile (N)	1,000	1250
Mullen Burst (kpa)	2500	2700
Tear Strength (N)	475	635
Elongation at break(%)	-	70-100
Filtration opening (um)	-	60

Siltation curtain geosynthetics shall also have a slick surface, be insoluble in water and contain stabilizers or inhibitors resistant to deterioration by ultraviolet radiation. It will be suspended by a flotation boom and anchored with anchors and mooring lines to extend to the bottom of the harbour. It will extend from the shoreline to the southeast to the wharf and pier area around the new cooling water intake.

The top of the slope of the infill area will be surrounded by sediment control fence during construction operations to minimize debris and sediment laden site runoff.

SOIL EXCAVATION

Excavation for the cooling water intake will consist of a short section of trench about 20m from the sheet wall face outwards off shore, and a pad area for the cooling water intake support pad. The excavation is estimated at around 700m³ and would probably be done by a combination of shoreline based excavation and dredging barge.

Once infill is complete the excavation of soils behind the sheet pile wall will be limited to excavations for footings and trenches for piping. Exact quantities are difficult to determine at this time. This material will be stockpiled on site for reuse as trench and excavation backfill. The stockpile will be surrounded by silt fence to prevent migration of fines to any storm water collection system. Excess materials will be tested for contaminants in accordance with recognized guidelines and disposed of at an approved soil treatment facility if necessary.

Cooling Water Intake Structure

The cooling water intake structure will consist of two 1.59m OD HDPE pipes running from the sheet pile wall to a box screen structure. These will be non pressure pipes and will use the head of the water above to push the water through the pipes. The pipes will need to extend about 41m from the wall to achieve a depth where the water temperature meets operating requirements. The box screen would have 100mm maximum square mesh openings and has been sized to maintain a flow velocity of 0.15m/s at the screen face for the expected intake volume. The material has yet to be determined based on review of the best material to prevent attachment of mussels and seaweed. This screen is intended to prevent the intake of large fish and other objects. The box screen will be a single unit sitting in, but not attached to, corner supports and surrounding the pipe ends, with lifting rings on top. This will allow the box screen to be simply lifted to the surface cleaned, and dropped back in place.

The cooling water pump structure will consist of two main fore bays with wedge wire screens in "V" shape sized to provide a surface area to maintain a flow velocity of 0.15m/s at the lowest tide and based on a 50% reduction in surface area due to fouling. These screens will be able to be lifted to the surface to be periodically cleaned. At the apex of the "V" will be a fish bypass pipe opening approximately 500mm in dia. that will use an eductor system which will induce flow in the pipe to carry fish back to the harbour. The motive force of this system is a supply of water from a pump which is discharged into the eductor pipe. They will not go through an impeller. Flow into the chambers can be shut off by means of water stop

Technical Correspondence Sheet

plates slid down over the ends of the intake pipes. Two pump chambers will be behind the fore bays. Any of the chambers can be isolated by dropping down a solid gate which will allow the shut down of one pump unit and screen system for cleaning or maintenance during low flow requirement periods. Water will be pumped to a header outside the cooling water structure and then to the new plant. This type of intake system will provide a simple form of maintenance over the long term while achieving fish protection and low flow velocities.

06/30/2009 15:21 FAX 902 426 7585

NWPP DARTMOUTH

002/004

Transport
CanadaTransports
Canada

Navigable Waters Protection Program
Programme de protection des eaux navigables
PO Box/C.P. 1013
Dartmouth, NS (N.-É.) B2Y 4K2

Your File Votre référence

JUN 30 2009

Our File Notre référence
8200-8204-96

PRIORITY COURIER

Ken Meade
Nova Scotia Power Incorporated
PO Box 910, Scotia Square
Halifax, NS B3J 2W5

Re.: Application Under the *Navigable Waters Protection Act* by Nova Scotia Power Incorporated for Approval of Existing Fill, Outfall and Intake and Proposed Fill and Outfall Located at Approximately 44° 40' 30.4"N, 63° 35' 45"W, Tufts Cove, Halifax Harbour, Halifax Regional Municipality, Province of Nova Scotia

Enclosed herewith is an Approval document signed on behalf of the Minister of Transport, Infrastructure and Communities pursuant to subsection 6(4) of the *Navigable Waters Protection Act* (R.S.C. 1985, c. N-22), as amended by Part 7 of the *Budget Implementation Act*, 2009, S.C. 2009, c. 2.

Please note that the above-referenced project was subject to an environmental assessment under the *Canadian Environmental Assessment Act*. It is your responsibility to ensure that the mitigation measures and follow-up program, if any, be implemented as per the attached environmental assessment report.

NOTE: Should you not finish construction of your work by the dates indicated in your Approval document, it will be necessary to notify this office immediately at (902) 426-2726 or by facsimile transmission at (902) 426-7585 or by e-mail at nwpdar@tc.gc.ca so that alternate dates may be specified.

Yours truly,

Melinda Donovan
Manager
Navigable Waters Protection Program
Marine Safety
Transport Canada
Atlantic Maritimes

MD/wmg

Enclosure

Canada

06/30/2009 15:21 FAX 902 426 7585

NWPP DARTMOUTH

003/004



NAVIGABLE WATERS PROTECTION ACT (R.S.C. 1985, c. N-22) as amended by Part 7 of the *Budget Implementation Act*, 2009, S.C. 2009, c. 2 (*Navigable Waters Protection Act*), PART I
Subsection 6(4) – Approval after construction started

8200-8204-96

Approval

APPLICANT: Nova Scotia Power Incorporated
PO Box 910, Scotia Square
Halifax, NS B3J 2W5

WORK: Existing Fill, Outfall and Intake and Proposed Fill and Outfall

SITE-LOCATION: Located at approximately 44° 40' 30.4"N, 63° 35' 45"W, Tufts Cove,
Halifax Harbour, Halifax Regional Municipality, Province of Nova Scotia

IMPORTANT NOTICE: This document approves the work in terms of its effect on marine navigation under the *Navigable Waters Protection Act*. The work must be built, placed, maintained, operated, used and removed in accordance with the approved plan(s), the *Navigable Waters Protection Act*, its regulations and the terms and conditions in the Approval. It is the applicant's responsibility to obtain any other forms of approval, including building permits, under any applicable laws.

WHEREAS the above-named applicant has made application to the Minister of Transport, Infrastructure and Communities under the *Navigable Waters Protection Act* for approval of the above-described work at the above-referenced site in accordance with the attached plan(s);

THEREFORE, the Minister of Transport, Infrastructure and Communities, pursuant to subsection 6(4) of the *Navigable Waters Protection Act*, hereby approves the said work at the said site and plan(s) thereof, providing:

1. The Approval is valid for a period of 30 years.
2. The construction of the work is completed within 3 years of the Approval date.
3. Construction material and debris are not allowed to become waterborne.
4. Any temporary structures, piles, false works and debris are to be completely removed from the waterway.
5. All work(s) and associated equipment is to be removed from the waterway at owner's expense in the event the operation of the work(s) is terminated
6. Cofferdams and turbidity curtains are to be removed from the waterway upon completion of the work.

.../2

The wordmark for Canada, featuring the word "Canada" in a stylized serif font with a small crown over the 'a'.

06/30/2009 15:21 FAX 902 426 7585

NWPP DARTMOUTH

004/004

- 2 -

7. Any materials or equipment used in construction are marked in accordance to the "Collision Regulations" of the "Canada Shipping Act" when located on or in the waterway.
8. Advise the Notice to Shipping office (Sydney) at (902) 564-7751 or toll-free 1-800-686-8676 one week in advance of installation of the course, one day prior to commence of competition, upon completion of the competition, and once the course has been removed in order to allow for appropriate Notices to Shipping/Mariners action.

Dartmouth, NS JUN 30 2009



Melinda Donovan
Manager
Navigable Waters Protection Program
for Minister of Transport, Infrastructure and Communities

07/02/2009 14:30

902-424-0597

NS DEL

PAGE 02/13

**APPROVAL**

Province of Nova Scotia
Environment Act, S.N.S. 1994-95,

468 - 7564

APPROVAL HOLDER: Nova Scotia Power Incc
APPROVAL NO: 2009-066761 (Construction)
SITE PID: 00063677
EXPIRY DATE: November 30, 2010

Pursuant to Part V of the *Environment Act*, S.N.S. 1994-95, c.1 as amended from time to time, approval is granted to the Approval Holder subject to the Terms and Conditions attached to and forming part of this Approval, for the following activity:

The construction of Unit #6, a combined cycle heat recovery steam turbine for a thermal power generation facility and associated works, at or near 315 Windmill Dr. Dartmouth, Halifax Regional Municipality in the Province of Nova Scotia.

Administrator: Don FeldmanEffective Date: July 2, 2009

TERMS AND CONDITIONS

Nova Scotia Environment

Project: Combined Cycle Heat Recovery Steam Turbine(Construction)
Tufts Cove Generating Station (Unit #6)

Site: 315 Windmill Road, Dartmouth

PID: # 00063677

Approval No: 2009-066761

File No: 92100-30-/BED-066761

Reference Documents:

- a) Application for Industrial Approval for Construction with supporting documentation dated May 7, 2009.

Terms and Conditions:

This Approval is subject to the following terms and conditions:

1. Definitions:

- a) "Act" means the *Environment Act* S.N.S. 1994-1995, c.1 and includes all regulations made pursuant to the Act
- b) "Department" means the Central Region Office of Nova Scotia Environment located at the following address:

Nova Scotia Environment
Environmental Monitoring and Compliance Division
Central Region, Bedford Office,
Suite 224, 1595 Bedford Highway,
Bedford, Nova Scotia, B4A 3Y4.

Phone: (902) 424-7773

Fax: (902) 424-0597

- 2 -

- c) The "Facility" means the combined cycle heat recovery steam generator (Unit #6) for a thermal power generating plant and associated works. This Approval does not cover the operation of any of the components outlined in the Application for Approval except those used for environmental mitigation during construction.
- d) The "Minister" means the Minister of Nova Scotia Environment.
- e) "Regional Manager" means the manager of the Central Region Office of Nova Scotia Environment or the Regional Manager's designate.
- f) "Administrator" means a person appointed by the Minister for the purposes of this Act, and includes an acting administrator.

2. Scope of Approval

- a) This Approval (the "Approval") relates to Nova Scotia Power Incorporated (the "Approval Holder") and their application and supporting documentation, as listed in the reference documents above, to construct the Facility, situated at the Tufts Cove Generating Station, 315 Windmill Road, Dartmouth, Halifax Regional Municipality (the "Site").
- b) This Approval is restricted to the construction of the Facility as defined in clause 1c).
- c) This Approval will expire on November 30, 2010 unless otherwise revoked, amended, or renewed.
- d) The scope of the Approval is restricted to the construction of the Facility only, which includes the installation environmental controls and cooling water intake and discharge structures.
- e) This Approval does not apply to the architectural, electrical, roadways, and structural components of the project.

3. Conditions of Environmental Assessment

The Approval Holder shall comply with all terms and conditions of the Environmental Assessment Approval issued on May 4, 2009 in accordance with the *Environmental Assessment Regulations*, pursuant to Part IV of the *Environment Act* for Tufts Cove Unit #6, Waste Heat Recovery Project, Nova Scotia Power Incorporated at the Tufts Cove Generating Station, Dartmouth.

- 3 -

4. General Terms and Conditions

- a) The Approval Holder shall construct the Facility in accordance with provisions of the:
 - i) *Environment Act* S.N.S. 1994-1995, c.1, as amended from time to time;
 - ii) Regulations, as amended from time to time, pursuant to the above Act;
- b) The Approval Holder is responsible for ensuring that they construct the Facility on lands which they own or have a lease or written agreement with the landowner or occupier. The Approval Holder shall be responsible for ensuring that the Department has, at all times, a copy of the most recent lease or written agreement with the landowner or occupier. Breach of this condition may result in cancellation or suspension of the Approval.
- c) If there is a discrepancy between the reference documents and the terms and conditions of this Approval, the terms and conditions of this Approval shall apply.
- d) The Minister or Administrator may modify, amend or add conditions to this Approval at anytime pursuant to Section 58 of the Act.
- e) This Approval is not transferable without the consent of the Minister or Administrator.
- f)
 - (i) If the Minister or Administrator determines that there has been non-compliance with any or all of the terms and conditions contained in this Approval, the Minister or Administrator may cancel or suspend the Approval pursuant to subsections 58(2)(b) and 58(4) of the Act, until such time as the Minister or Administrator is satisfied that all terms and conditions have been met.
 - (ii) Despite a cancellation or suspension of this Approval, the Approval Holder remains subject to the penalty provisions of the Act and regulations.
- g) The Approval Holder shall notify the Department prior to any proposed extensions or modifications of the Facility, including the active area, process changes or waste disposal practices which are not granted under this Approval. An amendment to this Approval will be required before implementing any change. Extensions or modifications to the Facility may be subject to the Environmental Assessment Regulations.

- 4 -

- h) Pursuant to Section 60 of the Act, the Approval Holder shall submit to the Administrator any new and relevant information respecting any adverse effect that actually results, or may potentially result, from any activity to which the Approval relates and that comes to the attention of the Approval Holder after the issuance of the Approval.
- i) The Approval Holder shall immediately notify the Department of any incidents of non-compliance with this Approval.
- j) The Approval Holder shall bear all expenses incurred in carrying out the environmental monitoring required under the terms and conditions of this Approval.
- k) Unless specified otherwise in this Approval, all samples required to be collected by this Approval shall be collected, preserved and analysed, by qualified personnel, in accordance with recognized industry standards and procedures.
- l) Unless written approval is received otherwise from the Administrator, all samples required by this Approval shall be analysed by a laboratory that meets the requirements of the Department's "Policy on Acceptable Certification of Laboratories" as amended from time to time.
- m) The Approval Holder shall submit any monitoring results or reports required by this Approval to the Department. Unless specified otherwise in this Approval, All monitoring results shall be submitted within 30 days following the month of monitoring.
- n) The Approval Holder shall ensure that this Approval, or a copy, is kept on Site at all times and that personnel directly involved in the Facility operation are made fully aware of the terms and conditions which pertain to this Approval.
- o) All phases of construction shall be overseen by a qualified professional engineer, licensed to practice in the Province of Nova Scotia, or technologist who works under the supervision of an engineer.
- p)
 - (i) Written certification by a professional engineer is required stating that all construction or installation has been conducted in accordance with the terms and conditions of this Approval and has met the minimum requirements of the drawings and specifications.
 - (ii) This certification must be provided to the Department, within 6 weeks following project completion.

- 5 -

- (iii) The certification must confirm that all as-built drawings and any other relevant documentation have been turned over to the Approval Holder by the engineer.
 - (iv) The certification must include all field and laboratory tests conducted on the installed Facility such as plant construction, commissioning and quality testing, and any other testing reports produced during the construction.
- q) The Approval Holder shall designate in writing, to the Department, a contact for this Approval.

5. Construction of Facility and Liquid Effluent Discharge

- a) Erosion and sediment control measures are to be installed as required, such that watercourses or water resources adjacent to and downstream of the construction site are protected from siltation. It is recommended to follow control measures as outlined in the "Erosion and Sedimentation Control Handbook for Construction Sites, 1988". The Act prohibits release of a material that may cause an adverse effect.
- b) The terms and conditions contained in this Approval and the drawings provided and listed in the reference section of this Approval and the requirements of 5 a) form the minimum guidelines for erosion and sedimentation control for the construction area. The Approval Holder is not limited to these control measures and every effort must be taken to ensure minimum disturbance and siltation of any watercourse.
- c) Adequate erosion and sedimentation controls shall be installed prior to the commencement of construction.
- d) The Approval Holder shall ensure the following liquid effluent levels are met and that the effluent is monitored at the frequency and locations indicated.

- i) **Total Suspended Solids**

Clear Flows (Normal Background Conditions):

- 1) Maximum increase of 25 mg/l from background levels for any short term exposure (24 hour or less)
- 2) Maximum average increase of 5 mg/l from background levels for longer term exposure (inputs lasting between 24 hours and 30 days)

- 6 -

High Flow (Spring Freshets and Storm Events)

- 1) Maximum increase of 25 mg/l from background levels at any time when background levels are between 25 mg/l and 250 mg/l
- 2) Shall not increase more than 10% over background levels when background is > 250 mg/l

ii) pH

- 1) Maximum 5 to 9 in grab sample
- 2) Maximum 6 to 9 as a Monthly Arithmetic Mean

iii) Monitoring Locations

- 1) The Approval Holder shall sample at the following locations:

As directed by the Department

iv) Sampling Frequency

- 1) The Approval Holder shall sample at the following frequency:

Monthly or as directed by the Department

- e) The Approval Holder shall sample for the parameters and at the frequency indicated to ensure the following liquid effluent levels from any discharge from the Site are met:

Liquid Effluent Discharge Limits

Parameters	Maximum in a Grab Sample	Monitoring Frequency
Toxicity	Non-Acutely Lethal	Monthly or as directed by the Department
Total Petroleum Hydrocarbons	1.0 mg/l	Monthly or as directed by the Department
Total BTEX (benzene, toluene, ethyl benzene and xylene)	0.36 mg/l	Monthly or as directed by the Department

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- f) Non-compliance with the effluent discharge limits noted in condition 5(d) and 5(e) shall be immediately reported to the Department.
- g)
 - (i) The monitoring station(s) for the liquid effluent shall be any discharge point on Site from which construction effluent may be released.
 - (ii) The Department reserves the right to modify the monitoring locations, parameters and frequency, and to require remedial measures depending on the information obtained.
- h) All areas exposed during construction or control structures such as berms, ditches, etc., shall be stabilized immediately.
- i) When dewatering of construction areas is required, the water shall not be discharged directly to a watercourse or water resource or harbour, nor to a conveyance (a ditch, culvert, manhole) that may lead to a watercourse or water resource or harbour without prior treatment to meet limits established in condition 5(d) and 5(e).
- j) All excavated material, including aggregate, soil or dredge spoil shall be stored or disposed of in a manner that will not result in sedimentation of adjacent and downstream watercourses or water resources or harbour.
- k) Temporary erosion and sedimentation controls are to remain in place until Site stability is established. Approval for the removal of such controls must be obtained from the Department. All erosion and sedimentation control measures shall be monitored daily throughout the construction period and maintained as necessary.
- l) The Approval Holder shall maintain a record of the estimated volume of discharge and results of analysis and forward these to the Department upon request.
- m) Any excavation or control structure at the Site which is found to contain wastewater with free product or hydrocarbon sheen shall be removed from the Site by a licensed contractor or treated to comply with limits established in condition 5(d) and 5(e) prior to release.

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6. Particulate Emissions (Dust)

- a) Particulate emissions shall not exceed the following limits at or beyond the Site property boundaries:

Annual Geometric Mean 70 $\mu\text{g}/\text{m}^3$

Daily Average (24 hr.) 120 $\mu\text{g}/\text{m}^3$

- b) The use of used oil as a dust suppressant is strictly prohibited. The generation of dust from the Site shall be suppressed as required.
- c) Monitoring of particulate emissions shall be conducted at the request of the Department. The location of the monitoring station(s) for particulate will be established by a qualified person retained by the Approval Holder and submitted to the Department for approval, this may include point(s) beyond the property boundary of the Site.
- d) When requested, suspended particulate matter shall be measured by the EPA standard; EPA/625/R-96/010a; Sampling of Ambient Air for Total Suspended Particulate Matter (SPM) and PM_{10} . Using High Volume (HV) Sampler.

7. Sound Levels

- a) Sound levels measured at the Site property boundaries shall not exceed the following equivalent sound levels (Leq):

Leq 65 dBA 0700-1900 hours (Days)
 60 dBA 1900-2300 hours (Evenings)
 55 dBA 2300-0700 hours (Nights)

- b) Monitoring of sound levels shall be conducted at the request of the Department. The location of the monitoring station(s) for sound will be established by a qualified person retained by the Approval Holder and submitted to the Department for approval, this may include point(s) beyond the property boundary of the Site.

9. Soil and Dredge Spoil Management

- a) The Approval Holder shall follow the soils and dredge spoil management plan outlined in their Application. Harbour infilling shall be completed with only clean, uncontaminated and non-acid generating aggregate.

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- b) The Approval Holder shall maintain daily records of the disposition of all soils and dredge spoils including disposal/storage locations (with location sketch), tonnage and results of any analyses.
- c)
 - (i) The Approval Holder shall analyse one composite sample for every 100 m³ of dredge spoil material which is excavated.
 - (ii) Dredge spoils shall be analysed for the total metals, benzene, toluene, ethyl benzene and xylene (BTEX) and total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (pah's).
 - (iii) All dredge spoils which result in analyses which exceed the applicable Canadian Council of the Ministers of the Environment (CCME) and the Atlantic Tier I risk based screening level guidelines shall be disposed of at an approved off-Site soil disposal facility.
- d) Stockpiles of soil or dredge spoil contamination encountered during the course of construction shall be covered with an impermeable cover while not actively adding or removing materials from portions of the stockpile.
- e) New pipeline service trenches shall be constructed with impermeable checks to limit the migration of contaminants along the trench.
- f) The Approval Holder shall be required to implement specific soil or dredge spoil management programs if so directed by the Department.
- g) The Approval Holder shall be required cease construction, in whole or in part, if so directed by the Department.

10. Groundwater Monitoring

- a) The Approval Holder shall monitor the existing three (3) groundwater monitoring stations outlined on Figure No.1, Project 20617B, MGI, Proposed Monitor Well Locations, Dec. 2002 on a monthly basis for the parameters listed below:
 - i) Metal scan, including vanadium, nickel, zinc, copper and arsenic,
 - ii) Total Petroleum Hydrocarbons,
 - iii) BTEX (benzene, toluene, ethyl benzene and xylene),

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- iv) PAH's(Polycyclic aromatic hydrocarbons), including those listed in the most current CCME Canadian Environmental Quality Guidelines, Canadian Water Quality Guidelines for the Protection of Aquatic Life and,
- v) Static water level
- b) The Approval Holder shall submit details of a proposal for installation of additional monitoring wells and an expanded monitoring program at the request of the Department.

11. Contingency Plans, Spills and Releases

- a) All spills or releases of dangerous goods, waste dangerous goods, or petroleum hydrocarbon shall be reported to the Department in accordance with the Act (Part VI) and the *Emergency Spill Regulations*.
- b) Spills or releases shall be cleaned up immediately.
- c) An adequate quantity of spill/release response material is to be maintained on Site at all times.
- d) The Approval Holder shall maintain and update a contingency plan and emergency response plan to address discharges of dangerous goods, fires or other emergency situations at the Site. The contingency plan shall be developed and updated in accordance with the Department's for Contingency Planning Guidelines dated September, 2004, as amended from time to time and made available to the Department upon request.
- e) The Approval Holder shall ensure that all personnel are trained to address environmental emergencies in a manner consistent with the Facility's approved contingency and emergency response plan(s) and that the necessary materials and equipment are available at all times for such purpose.

12. Complaint Response

- a) The Approval Holder shall have standard procedures to address complaints associated with the Facility which shall include;
 - (i) An immediate investigate of the cause of the complaint and the undertaking of immediate and appropriate action, if necessary, to correct the problem.

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- (ii) A record or description of operations at the time of the complaint, including weather conditions, wind direction, smoke plumes, etc.
- (iii) a record of all complaints and documentation of the date, time, name, address and telephone number of the individual lodging the complaint. The record shall also state any cause of the complaint and the action taken to correct the problem.
- (iv) Records referenced in condition 12 shall be made available to the Inspector upon request.

Fisheries and Oceans
CanadaPêches et Océans
Canada

PO Box 1035
Dartmouth, Nova Scotia
B2Y 4T3

JUN 17 2009

Our file *Notre référence*

Mr. Ken Meade, Manager, Environmental Services
Nova Scotia Power Incorporated
Halifax, Nova Scotia
B3J 2W5

Dear Mr. Meade:

Re: **Fisheries Act Subsection 35(2) Authorization-Proposed Expansion
of Tufts Cove 6, Halifax Harbour, Halifax Regional Municipality, NS**

This is in reference to your *Application for Authorization for Works or Undertakings Affecting Fish Habitat* to carry out the construction of an expansion of the Tufts Cove 6 Generating Station located on the Halifax Harbour, which requires the infilling of approximately 2727 square meters (m²) of subtidal and intertidal fish habitat, the dredging of 132 m² of benthic habitat and the installation of intake and outfall structures.

In the assessment of impacts on fish habitat at the location of the proposed project, the department has considered the following:

1. Registration Document by Nova Scotia Power Incorporated in support of Registration of Tufts Cove 6 Waste Heat Recovery Project, Under the Nova Scotia Environment Act, March 3, 2009;
2. Habitat Compensation Plan and Application for Authorization for Tufts Cove 6 Waste Heat Recovery Project, submitted to DFO on March 19, 2009;
3. All consultant's reports that were prepared for NSPI, and submitted as part of the Application for Authorization for works or undertaking affecting fish habitat, submitted on March 19, 2009; and
4. Erosion and Sediment Control Plan for Tufts Cove 6 Waste Heat Recovery Project submitted by NSPI to DFO on June 10, 2009.

Based on the above, the Department of Fisheries and Oceans Canada has determined that the construction of the expansion of Tufts Cove 6, with associated infilling, dredging and marine installations of intake and outfall structures, will cause the harmful alteration, disruption, or destruction (HADD) of fish habitat. A HADD is any change in fish habitat that reduces its ability to support one or more life processes of fish.

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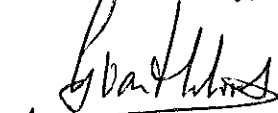
Your *Application for Authorization for Works or Undertaking Affecting Fish Habitat*, dated March 19, 2009 is therefore deemed appropriate. Attached, please find the Authorization, granting authorization for works or undertakings affecting fish habitat as described in your application.

Upon receipt, please confirm in writing that you will undertake all of the terms and conditions of the *Fisheries Act* Authorization 08-HMAR-MA7-00263.

Please contact the Mr. David Longard (902) 426-2253 should you have any questions about the attached.

None of the foregoing should be taken to imply authorization of these undertakings in accordance with any section of the *Fisheries Act*, other than Section 35. Also note that authorization under the *Fisheries Act* does not release the proponent from the requirements of any other federal, provincial or municipal legislation.

Yours sincerely,



Faith G. Scattolon
Regional Director-General
Maritimes Region

Attachment

cc: Bill Ritchie

AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT

DFO File #: 08-G7-263

Referral #: 08-HMAR-MA7-00263

Authorization #: 08-HMAR-MA7-00263

Authorization issued to:

Name: Nova Scotia Power Incorporated (NSPI)
Attention: Ken Meade, Manager, Environmental Services
Address: P.O. Box 910
Halifax, Nova Scotia
B3J 2W5
Telephone: 902-428-6582

Location of Project

The project is located adjacent to the NSPI Tufts Cove Generating Station, located on the eastern shore of Halifax Harbour in the north end of Dartmouth, south of the Murray MacKay Bridge, Latitude N44° 40' 29.77", Longitude W 63° 35' 47.70".

Valid Authorization Period

The valid Authorization period for the harmful alteration, disruption or destruction (HADD) of fish habitat associated with the work or undertaking is:

From/De: Date signed by the Regional Director-General

To/À: December 31, 2010

Valid Authorization Period

The valid Authorization period for the fish habitat compensation associated with the work or undertaking is:

From/De: Date signed by the Regional Director-General

To/À: December 31, 2011

Description of Works or Undertakings

The overall project proposed by Nova Scotia Power Incorporated (NSPI) includes the construction of the Tufts Cove 6 Generating Station, including the infilling of approximately 2727square metres (m²) of marine fish habitat in the Halifax Harbour, and the dredging of approximately 132 m² of marine fish habitat to facilitate the placement of the new cooling water structures. The new area of infill will extend seaward of the existing infill for the original Tufts Cove installation. The cooling water structures will extend out from the new infill, and remain within NSPI's deeded water lot boundaries.

AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT

DFO File #: 08-G7-263

Referral #: 08-HMAR-MA7-00263

Authorization #: 08-HMAR-MA7-00263

Conditions of Authorization

1. The conditions of this authorization notwithstanding, should the above works or undertaking, due to weather conditions, different soil or other natural conditions, or for any other reason, appear, in the opinion of the Department of Fisheries and Oceans Canada (DFO) likely to cause greater impacts than the parties previously contemplated, then DFO may direct the Proponent (NSPI), and its agents, and contractors, to suspend or alter works or other activities associated with the project, to avoid or mitigate adverse impacts to fisheries resources. DFO may also direct the Proponent and its agents, and contractors, to carry out at the Proponent's expense any works or activities deemed necessary by DFO to avoid or mitigate further adverse impacts to fisheries resources. In circumstances where DFO is of the view that greater impacts may occur than were contemplated by the parties, DFO may also modify or rescind this authorization. If the authorization is to be changed, the Proponent will be given an opportunity to discuss any proposed modifications or rescission.
2. Conditions that relate to the **Proponent's plan**:
 - 2.1. The Proponent confirms that all plans and specifications relating to this Authorization have been duly prepared and reviewed by appropriate professionals working on their behalf. The Proponent acknowledges that they are solely responsible for all design, safety and workmanship aspects of all works associated with this Authorization.
 - 2.2. The construction must comply with those criteria as identified within this Authorization. The harmful alteration, disruption, or destruction of fish habitat, other than that specifically identified within this Authorization, is not permitted.
 - 2.3. Works will be conducted following the practices outlined in the following:
 - 2.3.1. Registration Document by Nova Scotia Power Incorporated in support of Registration of Tufts Cove 6 Waste Heat Recovery Project, Under the Nova Scotia Environment Act, March 3, 2009;
 - 2.3.2. Application for Authorization for works or undertaking affecting fish habitat, submitted to DFO on March 19, 2009;
 - 2.3.3. Habitat Compensation Plan and Application for Authorization for Tufts Cove 6 Waste Heat Recovery Project, submitted to DFO on March 19, 2009;
 - 2.3.4. All consultant's reports that were prepared for NSPI, and submitted as part of the Application for Authorization for works or undertaking affecting fish habitat, on March 19, 2009; and

AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT

DFO File #: 08-G7-263

Referral #: 08-HMAR-MA7-00263

Authorization #: 08-HMAR-MA7-00263

2.3.5. Erosion and Sediment Control Plan for Tufts Cove 6 Waste Heat Recovery Project submitted by NSPI to DFO on June 10, 2009.

The above documents are hereafter referred to as the **Plan**.

3. Conditions that relate to the **mitigation** of the potential harmful alteration, disruption, or destruction of fish habitat. The following measures shall be implemented:
 - 3.1. All mitigation(s) described within the Plan shall be implemented as described within the Plan.
 - 3.2. Silt curtains and containment booms are to be placed in the water during the main in-water construction activities. The water inside and outside of the containment area is to be monitored daily for total suspended solids (TSS) to ensure that the measures remain effective. Adjustments will be made when necessary as to ensure the effectiveness of the structures.
 - 3.3. Machinery must be checked for leakage of lubricants or fuel, and must be in good working order. Refueling must be done at least 100 metres (m) from any water body. Basic petroleum spill clean-up equipment shall be kept on-site during construction.
 - 3.4. All spills or leaks shall be promptly contained, cleaned up and reported to the 24 hour environmental emergencies reporting system (1-800-565-1633).
 - 3.5. All rock fill used below the ordinary high water mark must be non-acid producing, non-toxic, free of fines and obtained from an approved non-water source.
 - 3.6. The shoreline, and any approach slopes disturbed by any activity associated with the proposed work, shall be permanently restored and stabilized as soon as possible following initial disturbance.
 - 3.7. All erosion and sediment control devices shall be inspected and maintained on a daily basis until the project site has been permanently stabilized.
 - 3.8. An environmental monitor, on behalf of the proponent, will oversee all aspects of the project to ensure all mitigative measures as described within the Plan are implemented as required.
 - 3.9. The Proponent will ensure that all persons involved with the project are aware of the terms and conditions of this Authorization and will comply with them.

AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT

DFO File #: 08-G7-263

Referral #: 08-HMAR-MA7-00263

Authorization #: 08-HMAR-MA7-00263

4. Conditions that relate to the **compensation** for the loss of 2859 square meters (m²) of fish habitat – the following shall be implemented:
 - 4.1. The proponent shall satisfy the requirement to provide compensation for the loss of 2859 m² of marine fish habitat, as specified in the Habitat Compensation Plan and Application for Authorization for Tufts Cove 6 Waste Heat Recovery Project. The Proponent will satisfy all objectives and measures specified in the Habitat Compensation Plan to successfully achieve the following measures:
 - 4.1.1. Construction of a fish ladder to facilitate fish passage for Atlantic Whitefish and other fish species at the Hebbville Dam, located on Hebb Lake, Petite Riviere, Lunenburg County, NS.
 - 4.1.2. All fish habitat compensatory works shall be completed before **December 31, 2011**.
 - 4.1.3. If the Proponent deems it necessary to make any amendments to the compensation measures detailed in the Habitat Compensation Plan for any reason, and/or if at any time the Proponent becomes aware that the compensatory measures are not completed and/or functioning as described in the Habitat Compensation Plan, the Proponent shall notify the HPSD Division of DFO to determine if additional measures are necessary to meet the compensation objectives for the HADD resulting from the works.
5. Conditions that relate to the **monitoring** of the proponent's Plan, the mitigation, and the fish habitat compensation, the "Monitoring Program":
 - 5.1. The Proponent shall submit to HPSD an "as-built" report within 1 year of completion of the in-water construction (the infill and construction of the outfall and intake structures). The "as-built" report must confirm the dimensions of the harmful alteration and provide an outline of the construction methodology, a summary of the mitigation and monitoring and dated photographs of the completed project.
 - 5.2. The Proponent shall submit to HPSD an "as-built" report for the Habitat Compensation measures within 6 months of completion of the compensation measures. The "as-built" report for the compensation measures shall include drawings and photographs of the fishway, details on the flows within the fishway, and confirmation that all detailed measures outlined in the Compensation Plan were completed.
 - 5.3. A monitoring plan shall be established for the fishway, to be constructed as part of the fish habitat compensation plan, and shall be submitted to DFO for formal review and approval. The monitoring plan shall include a study to evaluate the effectiveness of the fishway at passing the target species (Atlantic Whitefish) as to inform future requirements, if any, for

AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT

DFO File #: 08-G7-263

Referral #: 08-HMAR-MA7-00263

Authorization #: 08-HMAR-MA7-00263

additional studies. The Monitoring Plan shall be developed and reviewed in consultation with DFO; to facilitate this, a draft Monitoring Plan shall be submitted to DFO for review, prior to the commissioning of the fishway.

- 5.4. All monitoring reports are to be submitted to the HPSD Division of DFO, Maritimes Region, at the following address:

Fisheries and Oceans Canada
Habitat Protection & Sustainable Development Division
P.O. Box 1006
Dartmouth, NS B2Y 4A2

Attention: David Longard

6. Any deviation from the approved documents and Plans, the construction schedule, the mitigation measures, or the compensation measures stated above must be discussed and approved in writing by the HPSD prior to implementation.

The holder of this authorization is hereby authorized under the authority of Subsection 35(2) of the *Fisheries Act*, R.S.C., 1985, c. F. 14, to carry out the work or undertaking described herein. This authorization is valid only with respect to fish habitat and for no other purposes. It does not purport to release the applicant from any obligation to obtain permission from or to comply with the requirements of any other regulatory agencies.

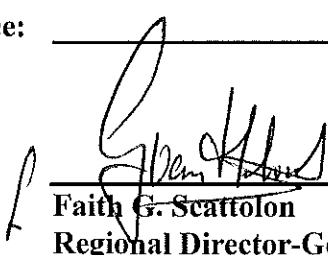
Failure to comply with any condition of this authorization may result in charges being laid under the *Fisheries Act*.

This authorization form should be held on-site and work crews should be made familiar with the conditions attached.

JUN 17 2009

Date of issuance: _____

Approved by: _____


Faith G. Scattolon
Regional Director-General
Maritimes Region

NON-CONFIDENTIAL

Request IR-10:

Reference Capital Cost Breakdown Table

Buildings and Auxiliary Systems

Design Code Changes

- a) Please provide details on the design code referenced, e.g. whose design code is been referenced?
- b) Please provide a copy of the old design code and the new design code and indicate the changes that resulted in the design change for this project.
- c) When did NSPI become aware of the change in design code?

Response IR-10:

- a) The design code referenced is the National Building Code of Canada.
- b) Please refer to Attachment 1 for the Nova Scotia Building Code Regulations – September 1, 2010 Amended Regulation. As provided in Schedule B, the requirements for seismic and wind loading design loads have changed.

Please refer to Attachment 2, section 6 of the design criteria developed by AMEC prior to tender.
- c) NSPI became aware of the change in design code in December 2008 when AMEC submitted their Design Criteria for NSPI review.

This consolidation is unofficial and is for reference only. For the official version of the regulations, consult the original documents on file with the [Registry of Regulations](#), or refer to the [Royal Gazette Part II](#).

Regulations are amended frequently. Please check the list of [Regulations by Act](#) to see if there are any recent amendments to these regulations filed with the Registry that are not yet included in this consolidation.

Although every effort has been made to ensure the accuracy of this electronic version, the Registry of Regulations assumes no responsibility for any discrepancies that may have resulted from reformatting.

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Nova Scotia Building Code Regulations
made under Section 4 of the
Building Code Act
R.S.N.S. 1989, c. 46

N.S. Reg. 322/2009 (November 19, 2009, effective December 31, 2009)
as amended by N.S. Reg. 326/2009 (December 8, 2009, effective December 31, 2009)

[Effective September 1, 2010, these regulations are amended by N.S. Reg. 96/2010]

Part 1 - Repeals, Interpretation, Scope, Definitions and Administration

1.1. Repeals, Adoption and Interpretation

1.1.1. Title, Repeals, and Effective Date

1.1.1.1. Title.

These *regulations* may be cited as the Nova Scotia *Building Code Regulations*.

1.1.1.2. Repeals and Effective Date of *Regulations*.

- (1) The Nova Scotia *Building Code Regulations* (N.S. Reg. 143/2006) made by the Minister of Environment and Labour on July 13, 2006, ~~2006~~ as amended by N.S. Reg. 241/2008 (March 31, 2008, effective April 30, 2008), are hereby repealed on and after December 31, 2009.
- (2) These Nova Scotia *Building Code Regulations* made by the Minister of Labour and Workforce Development shall come into effect on and after December 31, 2009.

1.1.2. Adoption

1.1.2.1. Nova Scotia *Building Code*

- (1) These Nova Scotia *Building Code Regulations* made by the Minister of Labour and Workforce Development shall come into effect on and after December 31, 2009.
- (2) These regulations adopt the National Building Code of Canada, 2005 and the 1st Revisions and Errata dated December 1, 2007, and the 2nd Revisions and Errata

dated June 20, 2008, which together with the regulations shall be known as the “Nova Scotia Building Code” and may be referred to as the “Code”.

1.1.3. Interpretation

1.1.3.1. Numbering System

- (1) These *regulations* have been prepared following the same decimal numbering system as used in the *Code*.
- (2) The first number indicates the Part of the *regulations*; the second, the Section in the Part; the third, the Subsection and the fourth, the Article in the Subsection. An Article may be further broken down into Sentences (indicated by numbers in brackets), and the Sentence further divided into Clauses and Subclauses. They are illustrated as follows:

A	Division
A-3	Part
A-3.5	Section
A-3.5.2.	Subsection
A-3.5.2.1.	Article
A-3.5.2.1.(2)	Sentence
A-3.5.2.1.(2)(a)	Clause
A-3.5.2.1.(2)(a)(I)	Subclause

1.1.3.2. Schedules

The Schedules “A” through “A-9” inclusive, “B”, “C” and “D” form part of these *regulations*.

1.1.4. Nova Scotia Building Advisory Committee

1.1.4.1. Appointment of Nova Scotia Building Advisory Committee

- (1) The Minister may appoint to the Committee such number of members as the Minister determines, for such terms as may be specified in the appointments.
- (2) The Committee shall include
 - (a) a representative of municipal government appointed from among persons nominated by the Executive of the Union of Nova Scotia Municipalities;
 - (b) a representative of the Fire Marshal for the Province;
 - (c) a representative appointed from among persons nominated by the Disabled Persons Commission;
 - (d) a representative appointed from among persons nominated by the Executive of the Association of Professional Engineers of Nova Scotia;
 - (e) a representative appointed from among persons nominated by the Executive of the Nova Scotia Association of Architects;
 - (f) a representative appointed from among persons nominated by the Executive of the Nova Scotia Home Designers Association;

- (g) a representative appointed from among persons nominated by the Executive of Association of Interior Designers of Nova Scotia;
- (h) a representative appointed from among persons nominated by the Executive of the Nova Scotia Home Builders Association;
- (i) a representative appointed from among persons nominated by the Executive of the Construction Association of Nova Scotia;
- (j) a representative appointed from among persons nominated by the Executive of the Nova Scotia Building Officials Association;
- (k) a representative appointed from among persons nominated by the Executive of the Atlantic Provinces Building Supply Dealers Association, who shall be a resident of Nova Scotia;
- (l) a representative appointed from among persons nominated by the Executive of the NS & PEI Regional Council of Carpenters, Millwrights & Allied Workers, who shall be a resident of Nova Scotia, and
- (m) up to 3 additional members, as selected by the Minister.

1.2 Scope and Application

1.2.1. Application

1.2.1.1. Scope

- (1) These *regulations* apply to the administration and enforcement of the *Building Code Act* in the design, construction, erection, placement and *occupancy* of new *buildings*, and the *alteration*, reconstruction, *demolition*, removal, relocation, *occupancy* and change of *occupancy* classification of existing *buildings* and to the work necessary to correct *unsafe conditions* in existing *buildings* reported to the *authority having jurisdiction* or observed during an inspection.
- (2) Any construction or condition that lawfully existed prior to the effective date of these regulations need not conform to these regulations provided that such construction or condition does not constitute an unsafe condition in the opinion of the authority having jurisdiction.
- (3) Construction pursuant to a building permit in effect prior to December 31, 2009, and still in effect, need not conform to these regulations provided that such construction conforms to the regulations in force on the date that the building permit was issued.
- (4) Where a *building* or any part thereof is altered, these *regulations* apply to the parts of the *building* that are altered.
- (5) Where the whole or any part of a *building* is relocated either within or into the area of jurisdiction of the *authority having jurisdiction* these *regulations* apply only to the parts of the *building* that are being altered or *constructed*.

- (6) When the whole or any part of a *building* is demolished, these *regulations* apply to the work involved in the *demolition* and to the work required to any parts remaining after *demolition* to the extent that deficiencies occurring or remaining after *demolition* require correction.
- (7) When a *building* is damaged by fire, earthquake or other cause, these *regulations* apply to the work necessary to reconstruct damaged portions of the *building*.
- (8) “Alternate Compliance Methods for Existing *Buildings*, contained in Schedule D” of these *regulations*, or a combination of the “Alternate Compliance Methods for Existing *Buildings*”, and the *Code*, may be used where a *building* existed prior to March 13, 1987
 - (a) where an existing *building* is undergoing *construction* other than for a change of use, or
 - (b) where an existing *building* is undergoing *construction*, and where a change of *occupancy* classification results in an *occupancy* with a reduced fire hazard risk.
- (9) When a *heritage building* or part thereof is undergoing a change in *occupancy* classification the *owner* may choose the “Alternate Compliance Methods for Existing *Buildings*”, contained in Schedule “D” of these *regulations*, or a combination of the “Alternate Compliance Methods for Existing *Buildings*”, and the *Code*.
- (10) In a *Heritage Conservation District* any *building* undergoing a change in occupancy classification the *owner* may choose the “Alternate Compliance Methods for Existing *Buildings*”, contained in Schedule “D” of these *regulations*, or a combination the “Alternate Compliance Methods for Existing *Buildings*”, and the *Code*.

1.2.1.2. Exemptions

- (1) The *Code* does not apply to;
 - (a) sewerage, water, electrical, telephone, rail or similar systems located above, below or on an area which has been dedicated or deeded for public use,
 - (b) public utility towers and poles, television and radio or other communication aerials and towers, except for loads resulting from those located on or attached to *buildings*,
 - (c) flood control, dams for public water supply, hydroelectric dams and their related structures (not excluding *buildings*).
 - (d) mechanical or other equipment and *appliances* not specifically regulated by the *Code*,
 - (e) above ground or below ground bulk storage tanks not regulated under Part 6 of the *Code*, or the National Farm Building Code of Canada,

- (f) free-standing signs,
 - (g) fences,
 - (h) retaining walls or exterior steps not attached to, and forming part of, a *building's* construction,
 - (i) manufactured homes built to CSA Z240 MH Series Standard “Manufactured Homes” except for
 - (i) the notifications required by Sentence 2.1.1.11.(1) where the *manufactured home* is constructed before January 1, 2010 and has not been structurally altered, or
 - (ii) the notifications required by Sentence 2.1.1.11.(1) and the requirements of Article 3.1.1.23. Schedule E, Part 10 Energy Efficiency Measures where the *manufactured home* is constructed after December 31, 2009 (See Appendix Note A-1.2.1.2.(1)(i) and (j). NSBCR)
 - (j) modular homes certified to CAN/CSA-A277-08 “Procedure for Factory Certification of Buildings” as complying with the technical requirements of this Code, except for
 - (i) the notifications required by Sentence 2.1.1.11.(1) where the *modular home* is constructed before January 1, 2010 and has not been structurally altered, or
 - (ii) the notifications required by Sentence 2.1.1.11.(1) and the requirements of Article 3.1.1.23. Schedule E, Part 10 Energy Efficiency Measures where the *modular home* is constructed after December 31, 2009(See Appendix Note A-1.2.1.2.(1)(i) and (j). NSBCR)
- (2) Unless a municipality otherwise requires by by-law, or where *regulations* are in another enactment, the *Code* applies but a *building permit* is not required for
- (a) accessory *buildings* not greater than 20 square metres (215.2 square feet) in area,
 - (b) except under Clause 1.2.1.2.(2)(c), interior and exterior non-structural material *alterations* and material repairs with a monetary value of five thousand dollars or less.
 - (c) replacement or installation of a new plumbing *fixture* that does not increase the hydraulic load of the drainage system or require alterations to an existing water distribution system or drainage system.

1.3 Definitions of Words and Phrases

1.3.1. Definitions

1.3.1.1. General Definitions contained in Section 2 of the *Building Code Act*, also apply in these *regulations*.

1.3.1.2. Italicized Words.

The words and phrases defined in Article 1.1.3.2. of the *Code* identified in these *regulations* in italics, also apply in these *regulations* unless otherwise defined.

1.3.1.3. Specific Definitions.

In these *regulations* the following definitions apply

“Architect” means a member licensed to practice or licensee of the Nova Scotia Association of Architects.

“Building Code Act” or “Act” means Chapter 46 of the Revised Statutes of Nova Scotia, 1989, the *Building Code Act*.

“Building Official” means a person appointed as an inspector pursuant to Section 5 of the Act.

“Camping accommodation” means any *building* within a campground which is intended to serve the public or is intended as rental accommodation for the travelling or vacationing public.

“Care facility” means the *occupancy* or use of a *building* or part thereof by persons who require special care or treatment because of cognitive or physical limitations.

“Code” means the Nova Scotia *Building Code*.

“Construct” means to do anything in the erection, installation, extension, relocation, material *alteration* or material repair of a *building* and includes the installation of a factory-made *building* fabricated or moved from elsewhere.

“Demolition” means the doing of anything in the removal of a *building* or any material part thereof.

“Electric space heating” means an electric energy source that provides more than 10 per cent of the heating capacity provided for a *building* and includes,

- (a) electric resistance unitary baseboard heating,
- (b) electric resistance unitary cabinet heating,
- (c) electric resistance ceiling cable or floor cable heating,
- (d) electric resistance central furnace heating,
- (e) electric hot water space heating, and
- (f) air source heat pumps in combination with electric resistance backup heating.

“Field Review of Construction” means, and is limited to, the inspection of the construction work at intervals appropriate to the stage of construction, at the project site and where applicable at the fabrication location where *building*

components are fabricated for use at the project site, that the *designer* in their professional discretion consider necessary to determine general compliance with the design drawings accepted by the *authority having jurisdiction* and all revisions thereto. “*Field Review of Construction*” does not include the coordination, quality and performance of construction.

“Flow control roof drain” means a *roof drain* that restricts the flow of *storm water* into the *storm drainage system*.

“Heritage *Building*” means a registered heritage property, registered under the Heritage Property Act by the Province or by a municipality.

“Heritage Conservation District” means a heritage conservation district designated by the municipality in accordance with the Heritage Property Act.

“Interior Designer” means a member licensed to practice or a licensee of the Association of Interior Designers of Nova Scotia.

“Manufactured home” means a transportable, single or multiple section *dwelling unit* certified by an accredited certification body, as complying with the CAN/CSA Series Z240 Series “Manufactured Homes” at the time of manufacture, prior to placement on the site.

“Modular home” means a finished section or sections of a complete *dwelling unit* built in a factory for transport to the site for installation, and certified to CSA Standard A277-08 “Procedures for the Factory Certification of Buildings”, by an accredited certification body, at the time of manufacture, prior to placement on the site.

“National *Building Code* of Canada, 2005” means the National *Building Code* of Canada, 2005 as issued by the Canadian Commission on Building and Fire Codes, National Research Council of Canada, NRCC No. 38726, including all revisions and errata and corrections to errata made by that body on or before the date these *regulations* come into force.

“Owner” includes a person controlling the property under consideration, and also prima facie the assessed *owner* of the property whose name appears on the assessment role prepared in accordance with the Assessment Act.

“Professional Engineer” means a member or licensee of the Association of Professional Engineers of Nova Scotia.

“Roofed accommodation” means a *building*, part of a *building*, or a group of *buildings* which is intended as rental accommodation for the travelling or vacationing public.

“Work” means any construction duty or function regulated by these *regulations*, carried out on or about a construction site or on, in, or about a *building* or part thereof.

1.4 Administration

1.4.1. *Permits*

1.4.1.1. **General**

- (1) A *permit* is required if work regulated by the *Code* is to be done.
- (2) The *authority having jurisdiction* may place a value on the cost of the work based on an accepted costing standard for the purpose of determining *permit* fees to be applicable.
- (3) The *authority having jurisdiction* may, if applicable, withhold ~~an~~ [a] *building permit* until satisfied that there is a valid on-site sewage disposal system *permit* issued by the Department of the Environment for the construction of a *building* requiring a new *private sewage disposal system*.
- (4) The *authority having jurisdiction* may, if applicable, withhold an *occupancy permit*
 - (a) until satisfied that there is a valid electrical *permit* issued by the electrical *authority having jurisdiction*
 - (b) until satisfied that the civic address is posted where a municipality has so provided by
by-law, in accordance with Section 313 of the Municipal Government Act,
- (5) The *authority having jurisdiction* may, if applicable, withhold a *building permit* until satisfied that there is a valid “Minister’s Consent For Building and Access to Property” issued by the Department of Transportation and ~~Public Works~~ [Infrastructure Renewal], under the Public Highways Act.
- (6) Where a municipality has so provided by by-law, the *authority having jurisdiction* may withhold the issuance of a *building permit* until satisfied that any and all applicable *regulations* of the *Heritage Property Act*, and the *Municipal Government Act*, including any *Land Use Bylaw*, *Subdivision Bylaw*, lot grading plan or Development Agreement, have been complied with and all required permits have been issued by the Development Officer.

- (7) Unless a municipality in accordance with Section 7 of the *Building Code Act* has provided other or additional *regulations* by by-law, an *occupancy permit* is required
 - (a) to allow the initial *occupancy* of a *building* or part thereof,
 - (b) when the *occupancy* classification of a *building* or part thereof is changed, or
 - (c) to allow partial *demolition* or *alteration* of a *building*.

1.4.1.2. Application. To obtain a *permit* the *owner* shall file an application as prescribed by the *authority having jurisdiction*.

1.4.1.3. Required Information

- (1) Every *building permit* application as a minimum shall
 - (a) identify and describe in detail the work and *occupancy* to be covered by the *permit* for which application is made,
 - (b) describe the land by including where Nova Scotia property mapping exists in the unique Parcel Identifier (PID) or where this mapping does not exist the assessment account number, and a description that will readily identify and locate the *building* lot,
 - (c) include plans and specifications as required by Division C, Subsection 2.2.2. of the *Code*,
 - (d) state the valuation of the proposed work and be accompanied by the required fee,
 - (e) state the names, addresses and telephone numbers of the *owner*, architect, *professional engineer*, or other *designer*, *constructor* and any inspection or testing agency that has been engaged to monitor the work or part of the work,
 - (f) describe any special *building* systems, materials and *appliances*, and
 - (g) such additional information as may be required by the *authority having jurisdiction*.

1.4.1.4. Letter of Undertaking when Professional Required to Design.

The *owner* shall, along with the application referred to in Article 1.4.1.2., submit a letter of undertaking to the *authority having jurisdiction* for the *Field Review of Construction* when the *building*, or part thereof, has been designed within the Scope of Part 4 of the *Code* and as provided under 2.1.1.6. for Part 9 *buildings*.

1.4.1.5. Dimensional Tolerances.

If, in the opinion of the *authority having jurisdiction*, safety to life will not be reduced and *barrier-free* design and access will not be adversely affected, an *authority having jurisdiction* may accept a minor variation, not more than 2%, in a dimension given in this *Code*.

1.4.1.6. Deviations.

The *owner* shall not deviate, nor authorize a deviation, from the *Code*, or the conditions of a *permit*, without first obtaining permission in writing to do so from the *authority having jurisdiction*.

1.4.1.7. Land Survey.

In addition to Clause 1.4.1.3.(1)(c) the *owner*, if requested by the *authority having jurisdiction* shall submit an up-to-date plan of survey or real property report, prepared by a registered Nova Scotia Land Surveyor, containing sufficient information regarding the site and the location of the *building*,

- (1) to establish before construction begins that the regulations of the *Code* related to the site and the location of the *building* will be complied with, and
- (2) to verify that, upon completion of the work, compliance with all such regulations.

1.4.1.8. Responsibility for carrying out work.

The acceptance of drawings and specifications, the granting of a *permit*, and inspections made by the *authority having jurisdiction* shall not in any way relieve the *owner*, *owner's* agent, the *constructor*, the *architect*, the *professional engineer*, or the *designer*, of a *building* from their respective responsibility for carrying out the work or having it carried out in accordance with these *regulations*, including ensuring that the *occupancy* of the *building*, or any part thereof, is in accordance with the terms of the *permit*.

1.4.1.9. Inspection Exemption Modular and Manufactured Homes

Modular homes and *manufactured homes* are subject to the notification for inspection required by sentence 2.1.1.11.(2) of these *regulations*, and are exempt for the work certified at the factory as complying with CAN/CSA Series Z240 Series "Manufactured Homes" or certified to CSA Standard A277-08 "Procedures for the Factory Certification of Buildings". (See Appendix Note A-1.2.1.2.(1)(i) and (j) NSBCR)

1.4.1.10. Site Grading.

The *authority having jurisdiction* may require an *owner* to have a *building* site graded in conformance with any storm drainage plan, prepared or accepted by the *authority having jurisdiction*, for the area in which the *building* is located.

1.4.1.11. Permission to Proceed in Part

- (1) The *authority having jurisdiction* may allow, at the risk of the *owner*, with conditions if necessary, to ensure conformance with this *Code*, the *owner* to proceed with *excavation* or construction of part of a *building* before the plans of the entire *building* have been submitted.
- (2) If the *authority having jurisdiction* allows *excavation* or construction of part of a *building* under Sentence (1), the *owner* shall submit all such plans and

specifications as may be required in connection therewith by the *authority having jurisdiction*, including at a minimum, complete plans and specifications for the work which is authorized under sentence (1).

- (3) If an *owner* proceeds to excavate or *construct* part of a *building* under Sentences (1) and (2), the *owner* proceeds without assurance that the *excavation* or construction of other parts of the *building* will be allowed.

1.4.1.12. Temporary *Building* or *Occupancy* [see A-1.4.1.12.]

- (1) Notwithstanding anything contained elsewhere in these *regulations*, a permit for a temporary *building* or part thereof, or a temporary change of occupancy classification of an existing *building*, may be issued by the *authority having jurisdiction*, authorizing for a limited time only the erection and existence of a *building*, or part thereof, or for a temporary change of *occupancy* classification, for an *occupancy* which, because of its nature, will exist for a short time, under circumstances which warrant only selective compliance with the *Code*.
- (2) A *permit* for a temporary *building* or temporary change of *occupancy* classification shall state the date after which and the conditions under which the *permit* is no longer valid.
- (3) A *permit* for a temporary *building* or temporary change of *occupancy* classification may be extended provided permission in writing is granted by the *authority having jurisdiction*.
- (4) A *permit* for a temporary *building* or temporary change of *occupancy* classification shall be posted on the *building*.
- (5) A *permit* issued for a tent or temporary *air-supported structure*, shall be required to be renewed every twelve months.
- (6) A *permit* issued for a temporary change of *occupancy* classification shall be required to be renewed every twelve months.

Part 2 - Responsibilities and Obligations

2.1 Obligations of Owner

2.1.1. General

2.1.1.1. Required *Permits*.

Every *owner* shall obtain all required *permits* or approvals prior to commencing the work to which they relate.

2.1.1.2. Start Up Date.

Every *owner* shall give written notice to the *authority having jurisdiction* of the date on which the *owner* intends to begin work prior to commencing work on the *building* site.

2.1.1.3. Notice of Employees.

- (1) Every *owner* shall, prior to commencing the work, give notice in writing to the *authority having jurisdiction* of,
 - (a) the name, address and telephone number of
 - (i) the *constructor* or other person in charge of the work,
 - (ii) the *designer* of the work,
 - (iii) the *architect(s)*, *professional engineer(s)*, and prime consultant(s) performing the *Field Review of Construction(s)*, and
 - (iv) any inspection or testing agency engaged to monitor the work or part of the work, and
 - (b) any change in or termination of employment of such persons during the course of the construction in writing, as soon as practical but not later than 72 hours of such change, or termination occurs.
- (2) Every *owner* shall give notice in writing to the *authority having jurisdiction*
 - (a) as soon as any change in ownership or change in the address of the *owner* occurs prior to the issuance of an *occupancy permit*, and
 - (b) prior to occupying any portion of the *building* if it is to be occupied in stages.

2.1.1.4. Plans at Site.

Every *owner* shall ensure that the plans, specifications and related documents on which the issuance of the *building permit* was based are available at the site of the work for inspection during working hours by the *authority having jurisdiction*, and that the *permit*, or true copy thereof, is posted conspicuously on the site during the entire execution of the work.

2.1.1.5. Professional Design and Review

The *owner* who undertakes to *construct* or have *constructed* a *building* or part thereof within the scope of Part 4 of the *Code* shall,

- (1) ensure that an *architect*, *professional engineer*, or both, as required, are appointed to undertake the design of the *building* or part thereof, and
- (2) complete and submit a letter of undertaking in the form specified in Schedule “A” for the *Field Review of Construction* of such *buildings*.

2.1.1.6. Design Regulations for Structural Components.

Where the dimensions of a structural component are not provided in Part 9 of the *Code* for use in a *building* within the scope of that part, and such dimensions are to be determined on the basis of calculation, testing or other means of evaluation, the *owner* shall,

- (1) ensure that a *professional engineer* is appointed to undertake the design of the structural component, and
- (2) when required by the *authority having jurisdiction*, complete and submit a letter of undertaking in the form specified in Schedule “A” for the *Field Review of Construction* for this structural component.

2.1.1.7. Site Conditions, Size, or Complexity Requiring Professional Design and Inspection

Where the site conditions, the size or complexity of a *building*, part of a *building* or *building* component warrant, the *authority having jurisdiction* may require the *owner* to file a Letter of Undertaking and have appropriate Field Review of Construction letters submitted as deemed necessary.

2.1.1.8. Design Regulations for Sprinklered Building

- (1) Where a *building* is required or intended to be *sprinklered*, the *owner* shall
 - (a) ensure that a *professional engineer* is appointed to undertake the design of the sprinkler system, and
 - (b) complete and submit a Letter of Undertaking in the form specified in Schedule “A” of the *Field Review of Construction*
- (2) Where the *alteration* of an existing *building* requires changes to an existing sprinkler system, the *authority having jurisdiction* may waive compliance with Clauses 2.1.1.8.(1), (a) and (b). Where Clauses 2.1.1.8.(1), (a) and (b) are waived, the design documents and test results conducted on the system, required under the provincial maintenance regulations made under the Fire Safety Act must be filed with the *authority having jurisdiction*.

2.1.1.9. Alteration to Property Boundary or Ground Elevation

No *owner* or person hired by the *owner* shall allow the ground elevations or the property boundaries of a *building* lot to be changed so as to place a *building* or part thereof, in contravention of these *regulations*, unless the *building* or part thereof, is so altered, after obtaining the necessary *permit*, that no contravention will occur as a result of the change of the property boundary or grades.

2.1.1.10. Right of Entry

Every *owner* shall allow the *authority having jurisdiction* to enter any *building* or premises at any reasonable time for the purpose of administering and enforcing these *regulations* in accordance with the provisions of ~~Sections~~ [subsections] 10(1), 10(2), and 10(3) of the *Building Code Act*.

2.1.1.11. Notification for Inspection and Certification of Field Review of Construction

- (1) The owner of a *building being constructed* under the scope of Part 9 of the Code shall notify the *authority having jurisdiction* to inspect for compliance with the Code at the following stages of construction,
- (a) footings in place,
 - (b) subfloor plumbing
 - (c) subfloor and foundation insulation
 - (d) pre-backfill
 - (e) except for *manufactured and modular homes*
 - (i) the framing, roof, and plumbing and mechanical systems,
 - (ii) insulation and vapour barrier before wall framing is covered, and
 - (f) for *manufactured and modular homes*,
 - (i) superstructure installation and anchorage systems,
 - (ii) foundation insulation and vapour barrier before wall framing is covered, and plumbing connections below the first floor, and
 - (g) before occupancy
- (See Appendix Notes A-2.1.1.11.(1) and (2) and A-1.2.1.2.(1)(i) and (j) NSBCR)
- (2) The owner of a *building being constructed* outside the scope of Part 9 of the Code shall notify the *authority having jurisdiction* to inspect for compliance with the Code
- (a) of the intent to undertake construction that will be inspected and will be reviewed as per the appropriate Letter of Undertaking required by Article 2.1.1.5., 2.1.1.6., or 2.1.1.7.
 - (b) of intent to cover construction that has been ordered to be inspected by the *authority having jurisdiction* before covering and,
 - (c) at intervals deemed necessary by the *authority having jurisdiction* based on the complexity of the *building*, and,
 - (d) when construction has been completed so that a final inspection can be made.
- (See Appendix Note A-2.1.1.11.(3) NSBCR)

2.1.1.12. Occupancy Prior to Completion.

Should the owner require *occupancy* to occur prior to the completion of all work the owner shall apply for the occupancy *permit* and shall ensure that no *unsafe condition* exists or will exist because of the work being undertaken or not completed.

2.1.1.13. Test or Inspections to Prove Compliance.

Every owner shall make, or have made at their own expense, the tests or inspections necessary to prove compliance with these *regulations* and shall promptly file a copy of all such test or inspection reports with the *authority having jurisdiction*.

2.1.1.14. Repairs to Public Property.

Every *owner* is responsible for the cost of repair of any damage to public property or works located therein that may occur as a result of undertaking work for which a *permit* was or was not required.

2.1.1.15. Discontinuation of Work.

Every *owner* who is unable to continue work owing to bankruptcy or other cause, is responsible, before leaving the site of the work, for ensuring that no *unsafe condition* remains at the site.

2.2 Obligations of Professional

2.2.1. General

2.2.1.1. Design.

The *architect*, or *professional engineer* who undertakes to design a *building* or part thereof shall do so in accordance with their respective statutes and bylaws to ensure that the design meets the intent of the *Code*.

2.2.1.2. Field Review of Construction.

The *architect*, or *professional engineer* who undertakes the *Field Review of Construction* shall do so in accordance with their respective statutes and bylaws, and shall

- (1) inspect the *building* at intervals appropriate to the stage of construction to determine general compliance with design referred to in Article 2.2.1.1.
- (2) coordinate with the *authority having jurisdiction* the review of changes to the design documents for consistency with the intent of the plans and specifications.
- (3) file with the *authority having jurisdiction* the Certification of *Field Review of Construction*.

2.3 Obligations of Constructor

2.3.1. General

2.3.1.1. Construction Safety Regulations.

Every *constructor* shall ensure that all construction safety requirements of the Department of Labour [and Workforce Development], Occupational Health and Safety Division, are complied with.

2.3.1.2. Work on Public Property.

Every *constructor* is responsible for ensuring that no *excavation* or other work is undertaken on public property, and that no *building* is erected or materials stored in whole or in part therein without approval having first been obtained in writing from the appropriate government authority.

2.3.1.3. Responsibilities for the Work Undertaken.

- (1) Every *constructor* is responsible jointly and severally with the *owner* for all and any work actually undertaken.
- (2) Every *constructor* who is unable to continue work owing to bankruptcy or other cause, is responsible, before leaving the site of the work, for ensuring that no *unsafe condition* remains at the site.

2.3.1.4. Owner Deemed to be constructor.

Where the work for which a *permit* is issued is not under the control of a *constructor*, the *owner* shall be deemed to be the *constructor* and shall accept the responsibilities and obligations of a *constructor*.

2.3.1.5. Materials, Systems, to Comply with Code.

Every *constructor* shall ensure that all materials, systems, equipment, used in the construction, *alteration*, reconstruction or renovation of a *building* meet the *regulations* of the *Code* for the work undertaken.

2.4 Obligation of Authority having Jurisdiction**2.4.1. Qualifications of Building Officials****2.4.1.1. Appointment A person appointed or eligible to be appointed by a municipality as a building official shall**

- (1) hold a valid diploma from the Nova Scotia Building Code Training and Certification Board, and
- (2) be a member in good standing of the Nova Scotia Building Officials Association.

2.4.1.2. Administration and Enforcement of the Building Code Act and Regulation

- (1) *Building Officials* are required to administer and enforce the provisions of the *Building Code Act* and Regulation.
- (2) *Building Officials* may only administer and enforce the provisions of the *Building Code Act* and Regulation within the scope for which they hold a valid diploma from the Nova Scotia Building Code Training and Certification Board.

2.4.2. General**2.4.2.1. Administration and Enforcement**

The *authority having jurisdiction* shall administer and enforce these *regulations*.

2.4.2.2. Copies of Applications, Inspections, and Tests

The *authority having jurisdiction* shall keep copies of all applications received, *permits* and orders issued, inspections and tests made and of all papers and documents connected with the administration of these *regulations* for such time as is required by law.

2.4.2.3. Notices and Orders

The *authority having jurisdiction* shall issue, in writing, such notices or orders as may be necessary to inform the *owner* where a contravention of these *regulations* has been observed. Such notices or orders may specify any remedial or other measures that are required to meet the *regulations* in accordance with the provisions of Section 12 of the Act. Where the *authority having jurisdiction* issues such written notice or order, a copy shall be retained by the *authority having jurisdiction* and a copy shall be sent to

- (1) the *owner*, by regular mail, at the address given on the *permit* application;
- (2) the *designer*, *architect* or *professional engineer* by regular mail, at the address given on the *permit* application;
- (3) the *constructor*, by regular mail, or if the *constructor* is present during the inspection, may be given to the *constructor*.

2.4.2.4. Responding to Code Inquiries

The *authority having jurisdiction* shall answer such relevant questions as may be reasonable with respect to the provisions of these *regulations* when requested to do so, but shall refrain from assisting in the laying out of any work and from acting in the capacity of a *designer*.

2.4.2.5. Authority having Jurisdiction to Issue Permits

The *authority having jurisdiction* shall issue a *building permit* or an *occupancy permit* to the *owner* when, to the best of *authority having jurisdiction's* knowledge, the applicable conditions, as set forth in these *regulations*, have been met.

2.4.1.6. Safety Regulations

The *authority having jurisdiction* shall, when inspecting *building* sites and structures, comply with the safety *regulations* made pursuant to the Occupational Health and Safety Act, Department of Labour, Province of Nova Scotia.

2.5 Powers of Authority having Jurisdiction

2.5.1. General

2.5.1.1. Right to Enter Property.

The *authority having jurisdiction* may enter and inspect any *building* or premises at any reasonable time for the purpose of administering or enforcing these *regulations* in accordance with the provisions of Sections 10(1), 10(2), and 10(3) of the *Building Code Act*.

2.5.1.2. Orders

- (1) The *authority having jurisdiction* is empowered to order
- (a) a person who contravenes these *regulations* to comply with them within the time period that may be specified,
 - (b) work to stop on the *building* or any part thereof if such work is proceeding in contravention of these *regulations*, or if there is deemed to be an *unsafe condition*,
 - (c) the removal of any unauthorized encroachment on public property,
 - (d) the removal of any *building* or part thereof constructed in contravention of these *regulations*,
 - (e) the cessation of any *occupancy* in contravention of these *regulations*,
 - (f) the cessation of any *occupancy* if any *unsafe condition* exists because of work being undertaken or not completed,
 - (g) correction of any *unsafe condition*, and
 - (h) the *owner* to uncover and replace at their own expense
 - (i) work that has been ordered to be done pursuant to an order issued by the *authority having jurisdiction* and which has been covered without being inspected; and
 - (ii) work for which notification to inspect is required to be given pursuant to Article 2.1.1.11., and where uncovering the work is necessary to determine compliance with the *Code*.

2.5.1.3. Tests Required to Prove Compliance

The *authority having jurisdiction* may direct that tests of materials, equipment, devices, construction methods, structural assemblies or foundation conditions be made, or sufficient evidence or proof be submitted at the expense of the *owner*, where such evidence or proof is necessary to determine whether the material, equipment, device, construction or foundation condition meets these *regulations*.

2.5.1.4. Reports Regarding Failure or Potential Failure

The *authority having jurisdiction* may require the *owner* or the *owner's* representative, where any failure occurs which causes or has the potential to cause injury or loss of life, to submit a report stating the nature and details of the failure and the name and addresses of the *constructor*.

2.5.1.5. Conditional *Building* or *Occupancy Permit*

- (1) The *authority having jurisdiction* may issue a *building* or *occupancy permit* conditional upon
- (a) The submission of additional information not available at the time where such information is of such a nature that withholding of the *permit* until the information becomes available would be unreasonable.
 - (b) Completion of such work that is incomplete at the time of inspection, or application is of such a nature that no *unsafe condition* exists and that withholding of the *permit* would be unreasonable.

2.5.1.6. Refuse to Issue Permit

- (1) The *authority having jurisdiction* may refuse to issue any *permit*
- (a) whenever information submitted is inadequate to determine compliance with the provisions of these *regulations*,
 - (b) whenever incorrect information is found to have been submitted,
 - (c) that would authorize any *building* work or *occupancy* that would not be permitted by these *regulations*, or
 - (d) that would be prohibited by any other Act, regulation or bylaw.

2.5.1.7. Revoke a Permit

- (1) The *authority having jurisdiction* may revoke a *permit* by written notice to the *permit* holder if
- (a) there is contravention of any condition under which the *permit* was issued,
 - (b) the *permit* was issued in error, or
 - (c) the *permit* was issued on the basis of incorrect information.

2.5.1.8. Occupancy Prior to Completion

The *authority having jurisdiction* may issue an *occupancy permit*, subject to compliance with provisions to safeguard persons in or about the premises, to allow the *occupancy* of a *building* or part thereof for the accepted use, prior to commencement or completion of the construction or *demolition* work.

2.5.1.9. Provide Reasons for Refusal

The *authority having jurisdiction* shall provide the reasons for refusal to grant a *permit*, when requested to do so.

Part 3 - Amendments to the Nova Scotia Building Code**3.1 Amendments Made to Division A, B and C of the National Building Code of Canada and the National Plumbing Code of Canada****3.1.1. Amendments****3.1.1.1. Definition of Owner**

The definition of “owner” in Section 1.4 (Part 1, Division A, Volume 1), of the National Building Code of Canada, 2005 is deleted and replaced herein with the definition of “owner” in Article 1.3.1.3. of these *regulations*.

3.1.1.2. Sentence 1.1.1.1.(2) (Part 1, Division A, Volume 1) amended.

Sentence 1.1.1.1.(2) (Part 1, Division A, Volume 1) of the National Building Code of Canada, 2005 is amended by deleting sentence (2) and substituting the following

Sentence 1.1.1.1.(2)

- (a) Except as provided by Clauses 1.2.1.2.(1)(i) and (j) of this regulation, the *Code* applies to both site assembled, and factory built buildings. (See Appendix Note A-1.2.1.2.(1)(i) and (j) NSBCR)

3.1.1.3. Climatic Values Sentence 1.1.3.1.(1) (Part 1, Division B, Volume 1) amended.

Sentence 1.1.3.1.(1) (Part 1, Division B, Volume 1) of the National Building Code of Canada, 2005 is amended by deleting “Table C 2, Appendix C.” in the last line and substituting “Schedule B, Design Data for Selected Locations in Nova Scotia”.

3.1.1.4. Climatic Values Sentence 1.1.3.1.(2) (Part 1, Division B, Volume 1) amended.

Sentence 1.1.3.1.(2) (Part 1, Division B, Volume 1) of the National Building Code of Canada, 2005 is amended by deleting “Table C-2 (Appendix C, Division B, Volume 2)” in the middle line and substituting, “Schedule B, Design Data for Selected Locations in Nova Scotia”.

3.1.1.5. Barrier-Free Design Section 3.8. (Part 3, Division B, Volume 1) deleted and replaced.

Section 3.8. (Part 3, Division B, Volume 1) of the National Building Code of Canada, 2005 is deleted and replaced with the Section 3.8 “*Barrier-Free Design*” contained in Schedule “C” of these *regulations*.

3.1.1.6. Barrier-Free Design. Sentence 9.5.2.1. (1) (Part 9, Division B, Volume 1) deleted and replaced

Sentence 9.5.2.1.(1) General (Part 9, Division B, Volume 1) of the National Building Code of Canada, 2005 is deleted and replaced by the following sentence

Sentence 9.5.2.1.(1) General

Subject to Article 3.8.1.1. of this regulation every *building* shall be designed in conformance with Section 3.8.

3.1.1.7. Exception for Apartment Buildings Article 9.5.2.3. (Part 9, Division B, Volume 1) deleted

Article 9.5.2.3. Exception for Apartment *Buildings* (Part 9, Division B, Volume 1) of the National Building Code of Canada, 2005 is deleted.

3.1.1.8. Section 3.2. (Part 3, Division B, Volume 1) Amended

Section 3.2. (Part 3, Division B, Volume 1) 3.2. of the National Building Code of Canada, 2005 is amended by adding Article 3.2.2.84. Alternate Compliance Methods For Existing *Buildings*.

Section 3.2.2.84. Alternate Compliance Methods For Existing Buildings

(1) Scope

- (2) **Application.** The Alternate Compliance Methods for Existing *Buildings* contained in Schedule “D” of these *regulations* are hereby adopted and may be used in accordance with Sentences 1.2.1.1.(8), (9), and (10) of these *regulations*.

3.1.1.9. Section 9.1. General (Part 9, Division B, Volume 1) Amended

Section 9.1. (Part 9, Division B, Volume 1) of the National Building Code of Canada, 2005 is amended by adding Sentence 9.1.1.1.(2).

- (2) The Alternate Compliance Methods for Existing *Buildings* contained in Schedule “D” of these *regulations* are hereby adopted and may be used in accordance with Sentences 1.2.1.1.(8), (9), and (10) of these *regulations*.

3.1.1.10. Clause 3.1.2.5.(2)(d) (Part 3, Division B, Volume 1) Amended

Clause 3.1.2.5.(2) (Part 3, Division B, Volume 1) of the National Building Code of Canada, 2005 is amended by italicizing the words, “*care facility*.” [Note that the term “care facility” is defined within these regulations.]

3.1.1.11. Sentence 9.27.2.2.(5) (Division B, Volume 1) amended

Sentence 9.27.2.2.(5) is amended by replacing the comma after the word break with a period and deleting the balance of the sentence including deletion of Clauses 9.27.2.2.(5) (a) and (b) and the reference to Appendix C for information on the moisture index.

3.1.1.12. Article 9.32.3.6. (Part 9, Division B, Volume 1) deleted.

Article 9.32.3.6. (Part 9, Division B, Volume 1) of the National Building Code of Canada, 2005 is deleted and Appendix Note A-9.32.3.6. (Appendix A, Division B, Volume 2) is deleted.

3.1.1.13. Article 1.3.1.2. (Part 1, Division B, Volume 1) Applicable Editions Amended

Article 1.3.1.2. (Part 1, Division B, Volume 1) of the National Building Code of Canada, 2005 is deleted and replaced with the following

- (1) Except as provided under sentence (2) where documents are referenced in this Code, they shall be the editions designated in Table 1.3.1.2. (Part 1, Division B, Volume 1) except those documents designated under the following Acts and Regulations of the Province of Nova Scotia in which case the edition so referenced shall be deemed to be enforce,
- (a) Fuel Safety Regulations
 - (b) *Boilers and Pressure Vessels Act* and Regulations
 - (c) Elevators and Lifts Act and Regulations
 - (d) Electrical Installation and Inspection Act and Regulations
- (See Appendix note A-3.1.1.13. NSBCR)

- (2) Where amendments to documents adopted by this code apply, these amendments shall apply to the particular provisions of those documents adopted by the above Acts and Regulations unless amended by this regulation.

3.1.1.14. Article 1.3.3.2. (Part 1, Division A, Volume 1) amended

Article 1.3.3.2. (Part 1, Division A, Volume 1) of the National Building Code of Canada 2005 is amended by adding new Sentence 1.3.3.2.(2) (Part 1, Division A, Volume 1).

Sentence 1.3.3.2.(2) Except as provided in Sentence 1.1.1.1.(3) (Part 1, Division A, Volume 1) and Clause 9.10.1.2.(10)(b)(NSBCR), Articles 3.2.2.18. and 3.2.2.44 to 3.2.2.48. inclusive (Part 3, Division B, Volume 1), apply to all *buildings* used for major occupancies classified as Group C, residential occupancies exceeding 300 m² in *building* area. (see 3.1.1.19. and Appendix A -1.3.3.2.(2) NSBCR)

3.1.1.15. Table 3.2.2.47. (Part 3, Division B, Volume 1) deleted and replaced

Table 3.2.2.47. (Part 3, Division B, Volume 1) of the National Building Code of Canada 2005 is deleted and replaced with

**Table 3.2.2.47.
Maximum *Building* Area, Group C, up to 3 Storeys**

No. of Storeys	Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	900	1 120	1350
2	450	560	675
3	300	375	450

3.1.1.16. Table 3.2.2.46. (Part 3, Division B, Volume 1) deleted and replaced

Table 3.2.2.46. (Part 3, Division B, Volume 1) of the National Building Code of Canada 2005 is deleted and replaced with

**Table 3.2.2.46.
Maximum *Building* Area, Group C, up to 3 Storeys, Increased Area**

No. of Storeys	Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	1 200	1 500	1 800
2	600	750	900

3	400	500	600
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3.1.1.17. Table 3.2.2.44. (Part 3, Division B, Volume 1) deleted and replaced
Table 3.2.2.44. (Part 3, Division B, Volume 1) of the National Building Code of Canada 2005 is deleted and replaced with

Table 3.2.2.44.
Maximum *Building Area*, Group C, up to 3 Storeys

No. of Storeys	Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	2 400	3 000	3 600
2	1 200	1 500	1 800
3	800	1 000	1 200

3.1.1.18. Article 3.2.2.50. Group D, up to 6 Storeys (Part 3, Division B) deleted and replaced

Article 3.2.2.50. Group D, up to 6 Storeys (Part 3, Division B) of the National Building Code of Canada 2005 is deleted and replaced with

3.2.2.50.

- (1) A *building* classified as Group D is permitted to conform to Sentence (2) provided
- (a) it is not more than 3 storeys in *building height*, and
 - (b) it has a *building area* not more than the value in Table 3.2.2.50.

Table 3.2.2.50.
Maximum *Building Area*, Group D, up to 3 Storeys

No. of Storeys	Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	not limited	not limited	not limited
2	7 200	not limited	not limited
3	4 800	6 000	7 200

- (2) The *building* referred to in Sentence (1) shall be of noncombustible construction, and

- (a) floor assemblies shall be fire separations with a fire-resistance rating not less than 1 h,
- (b) mezzanines shall have a fire-resistance rating not less than 1 h,
- (c) roof assemblies shall have a fire-resistance rating not less than 1 h, except that in a *building* not more than 1 storey in *building height* this requirement is waived, and
- (d) loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.

3.1.1.19. Article 9.10.1.2. Amended

Article 9.10.1.2. Items under Part 3 Jurisdiction is amended by adding

9.10.1.2.(10)(a) Except as provided in Sentence 1.1.1.1.(3) (Part 1, Division A, Volume 1), and as provided in Clause 9.10.1.2.(10)(b) and (c), Articles 3.2.2.18. and 3.2.2.44 to 3.2.2.48. inclusive (Part 3, Division B, Volume 1) apply to all *buildings* used for major occupancies classified as Group C, residential occupancies exceeding 300 m² in *building area* or are greater than 3 storeys in *building height*. (Appendix A -1.3.3.2.(2) NSBCR)

9.10.1.2.(10)(b) Single detached dwelling units are exempt.

9.10.1.2.(10)(c) A residential *building* containing two dwelling units, with a building area of less than 600 m² or not more than 3 storeys *building height* is exempt.

3.1.1.20. Sentence 3.2.4.20.(5) (Part 3, Division B, Volume 1) Smoke Alarms Deleted and Replaced

Sentence 3.2.4.20.(5) (Part 3, Division B, Volume 1) of the National Building Code of Canada 2005 is deleted and replaced with

- (5) Smoke alarms referred in Sentence (1) shall
 - (a) be installed
 - (i) by permanent connections to an electrical circuit, (See Appendix A, Division B, Volume 2 A-3.2.4.20.(5) NBC)
 - (ii) have no disconnect switch between the overcurrent device and the smoke alarm, and
 - (iii) in case the regular power supply to the *smoke alarm* is interrupted, be provided with a battery as an alternate power source that can continue to provide power to the *smoke alarm* for a period of no less than 24 hours in the normal condition, followed by five minutes of alarm.

3.1.1.21. Sentence 9.10.19.3.(1) (Part 9, Division B, Volume 1) Power Supply Deleted and Replaced

Sentence 9.10.19.3.(1) (Part 9, Division B, Volume 1) of the National Building Code of Canada 2005 is deleted and replaced with

- 9.10.19.3. (1)** Smoke alarms referred in Article 9.10.19.1. shall
- (a) be installed
 - (i) by permanent connections to an electrical circuit,
 - (ii) have no disconnect switch between the overcurrent device and the smoke alarm, and
 - (iii) in case the regular power supply to the *smoke alarm* is interrupted, be provided with a battery as an alternate power source that can continue to provide power to the *smoke alarm* for a period of no less than 24 hours in the normal condition, followed by five minutes of alarm,
 - or
 - (b) in a single dwelling unit be installed
 - (i) as a component of a household fire warning system which includes a certified control unit that meets the applicable requirements of ULC-S545 “Standard for Residential Fire Warning System Control Units” and,
 - (ii) in case the regular power supply to the control unit is interrupted, be provided with a battery as an alternate power source that can continue to provide power to the control unit for a period of no less than 24 hours in the normal condition, followed by five minutes of alarm.

3.1.1.22. Appendix Notes

The Appendix Notes to the National Building Code of Canada 2005 edition apply as appendix notes to the *Code* and where amendments made by this regulation unless specifically replaced or amended herein.

3.1.1.23. Schedule E, Part 10 Energy Efficiency Measures

The National Building Code of Canada 2005 (Division B, Volume 1) is amended by adding the energy efficiency measures contained in Schedule “E” of these regulations.

3.1.1.24. Division A NBC and NPC 2.2 Objectives

Add the following objective to Division A Sentence 2..2.1.1.(1) (See Appendix Note NSBCR A-3.1.1.24.)

OR Resource Conservation

An *objective* of this Code is to limit the probability that, as a result of the design or *construction* of a *building*, a natural resource will be exposed to an unacceptable risk of depletion or the capacity of the infrastructure supporting the use of the resource will be exposed to an unacceptable risk of being exceeded.

OR1 Water Conservation

An *objective* of this Code is to limit the probability that, as a result of the design or *construction* of a *building*, water resources will be exposed to an unacceptable risk of depletion or the capacity of the water supply, treatment and disposal infrastructure will be exposed to an unacceptable risk of being exceeded, caused by the consumption of water.

OR2 Energy Conservation

An *objective* of this Code is to limit the probability that, as a result of the design or *construction* of a *building*, a natural resource will be exposed to an unacceptable risk of depletion or the capacity of the infrastructure supporting the use of the resource will be exposed to an unacceptable risk of being exceeded, caused by the consumption of energy.

3.1.1.25. Division A NBC and NPC 3.2 Functional Statements

Add the following functional statement to Division A Sentence 3.2.1.1.(1)

F 130 To limit excessive water consumption.

F 131 To limit excessive energy consumption.

3.1.1.26. Division B Table 1.3.1.2. amended

Table 1.3.1.2. is amended to add additional standards and/or code references to which the standards apply. See Schedule E, Energy Efficiency Measures, Division B, Part 1, Acceptable Solutions NSBCR.

3.1.1.27. Table 1.3.1.2. amended

Table 1.3.1.2. is amended by adding

Issuing Agency	Document #	Title of Document	code reference
ULC	Can/ULC-S545	Standard for Residential Fire Warning System Control Units	9.10.19.3.(1)

3.1.1.28. Article 2.4.9.1. No Reduction in Size is replaced

In the National Plumbing Code of Canada Division B replace the existing sentence (1) and add sentences (2) and (3)

2.4.9.1. No Reduction in Size

- (1) Except as permitted in Sentence (3), no drainage pipe that is of minimum *size* required by this Part for the purpose for which it is installed shall be so connected as to drain to other drainage pipe of lesser *size*.
- (2) Where a *building drain* connects to a stack through a wall or floor, the drain shall retain its full *size* through the wall or floor.

- (3) A sanitary drainage pipe may be connected to a pre-engineered waste water heat recovery system that incorporates piping of a lesser size than required by Sentence (1) provided that it does not convey *sewage*,
- (a) from a *sanitary unit*, or
 - (b) that contains solids.

3.1.1.29. Article 2.6.1.8. Solar Domestic Hot Water Systems

In the National Plumbing Code of Canada Division B is replaced with

2.6.1.8. Solar Domestic Hot Water Systems

- (1) Except as provided in Sentence (2), a system for solar heating of *potable* water shall be installed in accordance with good engineering practice.
- (2) Systems for solar heating of *potable* water in *residential occupancies* shall be installed in conformance with CAN/CSA-F383, “Installation Code for Solar Domestic Hot Water Systems”.

3.1.1.30. Article 2.6.4. Water Efficiency

Is added in the National Plumbing Code of Canada Division B.

2.6.4. Water Efficiency

2.6.4.1. Water Supply Fittings

- (1) The flow rates of fittings that supply water to a fixture shall not exceed the maximum flow rates at the test pressures listed for that fitting in Table 2.6.4.1.
- (2) Sentence (1) does not apply to a fixture located in a heritage *building*.

Table 2.6.4.1.
Maximum Flow Rates for Water Supply Fittings
Forming Part of Sentence 2.6.4.1.(1)

Fitting	Maximum Flow, L/min	Test Pressure, kPa
Lavatory Faucet	8.35	413
Kitchen Faucet	8.35	413
Shower Heads	9.5	550
Column 1	2	3

2.6.4.2. Plumbing Fixtures

- (1) Water closets and urinals shall be certified to CAN/CSA-B45.0, “General Requirements for Plumbing Fixtures”.

- (2) The flush cycle for each fixture that is a water closet or urinal and that is installed as a replacement for a fixture in a *building* that existed before the 1st day of January 2010 shall not exceed the maximum flush cycle listed for that fixture in Table 2.6.4.2.A.

Table 2.6.4.2.A.
Maximum Flush Cycles for Sanitary Fixtures
Forming Part of Sentences 2.6.4.2.(2)

Fixture	Litres
Water Closet (Tank Type)	13.25
Water Closet (Direct Flush)	13.25
Urinal (Tank Type)	5.68(1)
Urinal (Direct Flush)	5.68(1)
Column 1	2

Notes to Table 2.6.4.2.A.

(1) Urinals equipped with automatic flushing devices shall be controlled to prevent unnecessary flush cycles during *building* down time.

- (3) Except as provided in Sentence (2) the flush cycle for each fixture that is a water closet or urinal shall not exceed the maximum flush cycle listed for that fixture in Table 2.6.4.2.B.
- (4) Urinals which utilize water free technology and conform to CSA B 45 Plumbing Fixtures Series may be substituted under 2.6.4.2.(1).
- (5) Sentences (2) and (3) do not apply to a fixture located in a heritage *building*, care or detention occupancy or passenger station.

Table 2.6.4.2.B.
Maximum Flush Cycles for Sanitary Fixtures
Forming Part of Sentence 2.6.4.2.(3)

Fixture	Litres
Water Closet (Tank Type)	6
Water Closet (Direct Flush)	6
Urinal (Tank Type)	3.8(1)

Urinal (Direct Flush)	3.8(1)
Column 1	2

Notes to Table 2.6.4.2.B.

(1) Urinals equipped with automatic flushing devices shall be controlled to prevent unnecessary flush cycles during *building* down time.

3.1.1.31. Article 3.7.2.1. Plumbing and Drainage Systems

Amend the National Building Code of Canada Division B Sentence 3.7.2.1.(1) by replacing the existing sentences 3.7.2.1.(1) and 3.7.2.2. (5).

3.7.2.1. Plumbing and Drainage Systems

(1) Except under clause 3.7.2.2.(5)(b), if the installation of a sanitary drainage system is not possible because of the absence of a water supply, sanitary privies, chemical closets or other means for the disposal of human waste shall be provided.

3.7.2.2. (5)

- (a) Urinals are permitted to be substituted for two thirds of the number of water closets required by this Article for males, except that if only 2 water closets are required for males, one urinal is permitted to be substituted for one of the water closets.
- (b) Where urinals are permitted they may be of a type that utilizes water free technology and shall conform to CSA B 45 "Plumbing Fixtures Series."

3.1.1.32. Sentence 9.7.2.1.(2) Part 9 Division B Window Standards is deleted.

3.1.1.33. Replace Article 9.25.1.1. Application as

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- (1) This Section applies to thermal insulation and measures to control heat transfer, air leakage and condensation.
- (2) Insulation and sealing of heating and ventilating ducts shall conform to Sections 9.32. and 9.33.
- (3) Thermal Insulation shall meet the requirements of Part 10 NSBCR.

3.1.1.34. Replace Article 9.25.3.2. Air Barrier System Properties

(See Appendix A, Division B, Volume 2 A-9.25.3.2. NBC) as follows,

- (1) Sheet and panel type materials intended to provide the principal resistance to air leakage shall have an air leakage characteristic not greater than $0.02 \text{ L}/(\text{s.m}^2)$ measured at a differential of 75 Pa.

- (2) Where polyethylene sheet is used to provide airtightness in the air barrier system, it shall conform to CAN/CGSB-51.34-M, “Vapour Barrier, Polyethylene Sheet for Use in Building Construction.”

3.1.1.35. Table 3.9.1.1.

Is amended by replacing functional statement 3.8.3.17. and adding functional statement 3.8.3.18.

3.8.3.17 Sleeping Units in Roofed Accommodations	
-1	F 74-OA2
-2	F 74-OA2
-3	F 74-OA2
3.8.3.18 Suites of Residential Occupancies Required to be Barrier Free	
-1	F 73-OA1, F 74-OA2
-2	F 73-OA1, F 74-OA2
-3	F 73-OA1, F 74-OA2
-4	F 73-OA1, F 74-OA2

Schedule “A”
Letter of Undertaking
Confirmation of Commitment by Owner
to the Municipal Authority Having Jurisdiction
Field Review of Construction

Preamble

Whereas the Building Code Act, RSNS 1989, Chapter 46, hereinafter referred to as the ‘Act’ applies to the construction or demolition of a building;

And Whereas the Minister of the Department of Labour and Workforce Development has by regulation adopted the National Building Code, with amendments as the Nova Scotia Building Code, requiring compliance with it as adopted for the construction or demolition of buildings;

And Whereas architects and professional engineers are required by their respective statutes, regulations, and bylaws, to ensure the general public of competent standards and ethical conduct in the design of buildings;

And Whereas Part 2 of the Nova Scotia Building Code requires professionals to design buildings in conformance with the minimum standards of the Nova Scotia Building Code with sufficient drawings and documents to show how these standards have been met;

And Whereas Part 2 of the Regulations made pursuant to the Act, requires that these buildings be inspected at intervals appropriate to the stage of construction to determine general compliance with the design drawings accepted by the authority having jurisdiction and all revisions thereto;

To:

Authority Having Jurisdiction

Date:

Address

Dear

Authority Having Jurisdiction

Re:

Address of Project

Name of Project

Legal Description of Project

I (the owner) submit this Letter of Undertaking to the authority having jurisdiction along with a completed application for a *building* permit.

The undersigned has appointed an architect(s), professional engineer(s), or designer(s), or prime consultant(s) to undertake, as required in Articles 2.1.1.5. and 2.1.1.6. of the Regulations, the Field Review of Construction and I have attached to this Letter of Undertaking

(check appropriate boxes)

- ☐ Field Review of Construction Commitment Certificates completed by me or the prime consultant appointed by me to coordinate the Field Review of Construction.
- ☐ Field Review of Construction Commitment Certificates (identified below) completed by individual designers appointed by me to perform the Field Review of Construction for the applicable discipline(s).
- ☐ shall forward Field Review of Construction Commitment Certificates for those not yet appointed.

- ☐ *Building Design*
- ☐ Structural
- ☐ Plumbing
- ☐ Mechanical
- ☐ Electrical
- ☐ Geotechnical
- ☐ Fire Suppression System

Signature of Owner		Date
Print name		
Address		Postal Code
Phone	Fax	e-mail

And Whereas Part 2 of the Nova Scotia Building Code requires professionals to design buildings in conformance with the minimum standards of the Nova Scotia Building Code with sufficient drawings and documents to show how these standards have been met;

And Whereas Part 2 of the Regulations made pursuant to the Act, requires that these buildings be inspected at intervals appropriate to the stage of construction to determine general compliance with the design drawings accepted by the authority having jurisdiction and all revisions thereto;

To:

Authority Having Jurisdiction

Date:

Address

Dear

Authority Having Jurisdiction

Re:

Address of Project

Name of Project

Legal Description of Project

This is to advise that I am the architect, professional engineer or designer appointed by the owner as prime consultant to coordinate the Field Review of Construction for the above referenced project.

I hereby certify as prime consultant for this project that I will coordinate the Field Review of Construction for the following disciplines which I have checked and initialled.

- | | | |
|--|-------------------------------------|---------------------------------------|
| ☐ Building Design | ☐ Structural | ☐ Plumbing |
| ☐ Mechanical | ☐ Electrical | ☐ Geotechnical |
| ☐ Fire Suppression System | | |

I attach for your review the Field Review of Construction Inspection Commitment Certificates for each above marked and initialled discipline completed by an appropriate professional for each discipline, or shall forward the Field Review of Commitment Certificate for those not yet appointed.

I, and professionals who have completed the various Field Review of Construction Inspection Commitment Certificates, will perform the Field Review of Construction.

I also certify that

- 1) I will coordinate the review of shop drawings;
- 2) I will coordinate the review of changes to the design documents; and
- 3) I will complete or have completed by the appropriate professional the Certification of Field Review of Construction and return it to the authority having jurisdiction prior to requesting the occupancy permit.

Please be advised that I may delegate some or all of my duties associated with the coordination of the Field Review of Construction to another person employed by me or my firm where it is consistent with prudent professional practice to do so. The functions will however be performed under my supervision in accordance with the Engineering Profession Act, or the Architects Act.

The undersigned shall notify the authority having jurisdiction, in writing as soon as practical, but not later than 72 hours, if the contract for Field Review of Construction is terminated at any time during construction.

Print Name

Signature

Initials Sample

Affix below the seal of the *Architect* or licensed *Professional Engineer* in accordance with provincial legislation.

Print Name of Firm or Company

Print Address

Print Municipality

Postal Code

Telephone

Fax

e-mail

Schedule "A-2"
Field Review of Construction
Inspection Commitment Certificate
Building Design Requirements

Preamble

Whereas the Building Code Act, RSNS 1989, Chapter 46, hereinafter referred to as the 'Act' applies to the construction or demolition of a building;

And Whereas the Minister of the Department of Labour and Workforce Development has by regulation adopted the National Building Code, with amendments as the Nova Scotia Building Code, requiring compliance with it as adopted for the construction or demolition of buildings;

And Whereas architects, and professional engineers are required by their respective statutes, regulations, and bylaws, to ensure the general public of competent standards and ethical conduct in the design of buildings;

And Whereas Part 2 of the Nova Scotia Building Code requires professionals to design in conformance with the minimum standards of the Nova Scotia Building Code with sufficient drawings and documents to show how these standards have been met;
And Whereas Part 2 of the Regulations made pursuant to the Act, requires that these buildings be inspected at intervals appropriate to the stage of construction to determine general compliance with the design drawings accepted by the authority having jurisdiction and all revisions thereto;

To:

Authority Having Jurisdiction

Date:

Address

Dear

Authority Having Jurisdiction

Re:

Address of project

Name of Project

Legal Description of Project

This is to advise that I am the architect, or professional engineer appointed by the owner or prime consultant to perform the Field Review of Construction for the *Building* DESIGN aspects of the project, which are within Part 3 and Part 5 of the Code and as shown in design documents submitted to the authority having jurisdiction but do not include areas of work referred to in certificates A-3 to A-8 inclusive.

I hereby certify for the *Building* Design Requirements that

- 1) I will review the shop drawings relevant to this certificate to determine general compliance with the design documents, however, the party producing the shop drawings remains responsible for the design expressed therein;
- 2) I will coordinate the review of changes to the design documents relevant to this certificate to ensure that the changes conform to the Code; and
- 3) I will complete the Certification of Field Review of Construction and return it to the authority having jurisdiction prior to requesting the occupancy permit.

Please be advised that I may delegate some or all of my duties associated with the coordination of the Field Review of Construction to another person employed by me or my firm where it is consistent with prudent professional practice to do so. The functions will however be performed under my supervision in accordance with the *Architects Act*, or ~~*Professional Engineer's Act*~~ [*Engineering Profession Act*].

The undersigned shall notify the authority having jurisdiction, in writing as soon as practical, but not later than 72 hours, if the contract for Field Review of Construction is terminated at any time during construction.

Print Name

Signature

Initials Sample

Affix below the seal of the *Architect* or licensed *Professional Engineer* in accordance with provincial legislation.

Print Name of Firm or Company

Print Address

Print Municipality

Postal Code

Telephone

Fax

e-mail

Schedule "A-3"
Field Review of Construction
Inspection Commitment Certificate
Structural Design Requirements

Preamble

Whereas the Building Code Act, RSNS 1989, Chapter 46, hereinafter referred to as the 'Act' applies to the construction or demolition of a *building*;

And Whereas the Minister of the Department of Labour and Workforce Development has by regulation adopted the National Building Code, with amendments as the Nova Scotia Building Code, requiring compliance with it as adopted for the construction or demolition of *buildings*;

And Whereas architects, and professional engineers are required by their respective statutes, regulations, and bylaws, to ensure the general public of competent standards and ethical conduct in the design of *buildings*;

And Whereas Part 2 of the Nova Scotia Building Code requires professionals to design *buildings* in conformance with the minimum standards of the Nova Scotia Building Code with sufficient drawings and documents to show how these standards have been met;

And Whereas Part 2 of the Regulations made pursuant to the Act, requires that these *buildings* be inspected at intervals appropriate to the stage of construction to determine general compliance with the design drawings accepted by the authority having jurisdiction and all revisions thereto;

To:

Authority Having Jurisdiction

Date:

Address

Dear

Authority Having Jurisdiction

Re:

Address of Project

Name of Project

Legal Description of Project

This is to advise that I am the professional engineer appointed by the owner or prime consultant to perform the Field Review of Construction for the STRUCTURAL DESIGN requirements.

I hereby certify for the Structural Design Requirements that

- 1) I will review the structural shop drawings to determine general compliance with the design documents, however, the party producing the shop drawings remains responsible for the design expressed therein;
- 2) I will coordinate the review of changes to the structural design drawings to determine that the changes conform to the Code; and
- 3) I will complete the Certification of Field Review of Construction and return it to the authority having jurisdiction prior to requesting the occupancy permit.

Please be advised that I may delegate some or all of my duties associated with the Field Review of Construction to another person employed by me or my firm where it is consistent with prudent professional practice to do so. The functions will however be performed under my supervision in accordance with the Engineering Profession Act.

The undersigned shall notify the authority having jurisdiction, in writing as soon as practical, but not later than 72 hours if the contract for Field Review of Construction is terminated at any time during construction.

Print Name

Signature

Initials Sample

Affix below the seal of the licensed
Professional Engineer in
accordance
with provincial legislation.

Print Name of Firm or Company

Print Address

Print Municipality

Postal Code

Telephone

Fax

e-mail

Schedule "A-4"

Field Review of Construction Inspection Commitment Certificate Mechanical Design Requirements

Preamble

Whereas the Building Code Act, RSNS 1989, Chapter 46, hereinafter referred to as the 'Act' applies to the construction or demolition of a *building*;

And Whereas the Minister of the Department of Labour and Workforce Development has by regulation adopted the National Building Code, with amendments as the Nova Scotia Building Code, requiring compliance with it as adopted for the construction or demolition of *buildings*;

And Whereas architects and professional engineers are required by their respective statutes, regulations, and bylaws, to ensure the general public of competent standards and ethical conduct in the design of *buildings*;

And Whereas Part 2 of the Nova Scotia Building Code requires professionals to design *buildings* in conformance with the minimum standards of the Nova Scotia Building Code with sufficient drawings and documents to show how these standards have been met;

And Whereas Part 2 of the Regulations made pursuant to the Act, requires that these *buildings* be inspected at intervals appropriate to the stage of construction to determine general compliance with the design drawings accepted by the authority having jurisdiction and all revisions thereto;

This is to advise that I am the professional engineer appointed by the owner or prime consultant to perform the Field Review of Construction for the MECHANICAL DESIGN requirements.

To:

Authority Having Jurisdiction

Date:

Address

Dear

Authority Having Jurisdiction

Re:

Address of Project

Name of Project

Legal Description of Project

This is to advise that I am the professional engineer appointed by the owner or prime consultant to perform the Field Review of Construction for the MECHANICAL DESIGN requirements.

I hereby certify for the Mechanical Design Requirements that

- 1) I will review the mechanical shop drawings to determine general compliance with the design documents, however, the party producing the shop drawings remains responsible for the design expressed therein;
- 2) I will coordinate the review of changes to the mechanical design documents to ensure that the applicable professional engineer(s) determines whether the changes conform to the Code; and
- 3) I will complete the Certification of Field Review of Construction and return it to the authority having jurisdiction prior to requesting the occupancy permit.

Please be advised that I may delegate some or all of my duties associated with the Field Review of Construction to another person employed by me or my firm where it is

consistent with prudent professional practice to do so. The functions will however be performed under my supervision in accordance with the Engineering Profession Act.

The undersigned shall notify the authority having jurisdiction, in writing as soon as practical, but not later than 72 hours, if the contract for Field Review of Construction is terminated at any time during construction.

Print Name

Signature

Initials Sample

Affix below the seal of the licensed
Professional Engineer in
accordance
with provincial legislation.

Print Name of Firm or Company

Print Address

Print Municipality

Postal Code

Telephone

Fax

e-mail

Schedule "A-5"

Field Review of Construction Inspection Commitment Certificate Electrical Design Requirements

Preamble

Whereas the Building Code Act, RSNS 1989, Chapter 46, hereinafter referred to as the 'Act' applies to the construction or demolition of a *building*;

And Whereas the Minister of the Department of Labour and Workforce Development has by regulation adopted the National Building Code, with amendments as the Nova Scotia Building Code, requiring compliance with it as adopted for the construction or demolition of *buildings*;

And Whereas architects and professional engineers are required by their respective statutes, regulations, and bylaws, to ensure the general public of competent standards and ethical conduct in the design of *buildings*;

And Whereas Part 2 of the Nova Scotia Building Code requires professionals to design *buildings* in conformance with the minimum standards of the Nova Scotia Building Code with sufficient drawings and documents to show how these standards have been met;

And Whereas Part 2 of the Regulations made pursuant to the Act, requires that these *buildings* be inspected at intervals appropriate to the stage of construction to determine

general compliance with the design drawings accepted by the authority having jurisdiction and all revisions thereto;

To:

Authority Having Jurisdiction

Date:

Address

Dear

Authority Having Jurisdiction

Re:

Address of Project

Name of Project

Legal Description of Project

This is to advise that I am the professional engineer appointed by the owner or prime consultant to perform the Field Review of Construction for the ELECTRICAL DESIGN requirements.

I hereby certify for the Electrical Design Requirements that

- 1) I will review the electrical shop drawings to determine general compliance with the design documents, however, the party producing the shop drawings remains responsible for the design expressed therein;
- 2) I will coordinate the review of changes to the electrical design documents to ensure that the applicable professional engineer(s) determines whether the changes conform to the Code; and
- 3) I will complete the Certification of Field Review of Construction and return it to the authority having jurisdiction prior to requesting the occupancy permit.

Please be advised that I may delegate some or all of my duties associated with the Field Review of Construction to another person employed by me or my firm where it is

consistent with prudent professional practice to do so. The functions will however be performed under my

supervision in accordance with the Engineering Profession Act.

The undersigned shall notify the authority having jurisdiction, in writing as soon as practical, but not later than 72 hours, if the contract for Field Review of Construction is terminated at any

time during construction.

Print Name

Signature

Initials Sample

Affix below the seal of the licensed
Professional Engineer in
accordance
with provincial legislation.

Print Name of Firm or Company

Print Address

Print Municipality

Postal Code

Telephone

Fax

e-mail

Schedule “A-6”
Field Review of Construction
Inspection Commitment Certificate
Fire Suppression Systems Design Requirements

Preamble

Whereas the Building Code Act, RSNS 1989, Chapter 46, hereinafter referred to as the ‘Act’ applies to the construction or demolition of a *building*;

And Whereas the Minister of the Department of Labour and Workforce Development has by regulation adopted the National Building Code, with amendments as the Nova Scotia Building Code, requiring compliance with it as adopted for the construction or demolition of *buildings*;

And Whereas architects and professional engineers are required by their respective statutes, regulations, and bylaws, to ensure the general public of competent standards and ethical conduct in the design of *buildings*;

And Whereas Part 2 of the Nova Scotia Building Code requires professionals to design *buildings* in conformance with the minimum standards of the Nova Scotia Building Code with sufficient drawings and documents to show how these standards have been met;

And Whereas Part 2 of the Regulations made pursuant to the Act, requires that these *buildings* be inspected at intervals appropriate to the stage of construction to determine

general compliance with the design drawings accepted by the authority having jurisdiction and all revisions thereto;

To:

Authority Having Jurisdiction

Date:

Address

Dear

Authority Having Jurisdiction

Re:

Address of Project

Name of Project

Legal Description of Project

This is to advise that I am the professional engineer appointed by the owner or prime consultant to perform the Field Review of Construction for the FIRE SUPPRESSION SYSTEMS DESIGN requirements.

I hereby certify for the Fire Suppression Systems Design Requirements that

- 1) I will review the fire suppression systems shop drawings to determine general compliance with the design documents, however, the party producing the shop drawings remains responsible for the design expressed therein;
- 2) I will coordinate the review of changes to the fire suppression systems design documents to ensure that the applicable professional engineer(s) determines whether the changes conform to the Code;
- 3) I will complete the Certification of Field Review of Construction and return it to the authority having jurisdiction prior to requesting the occupancy permit;
- 4) I will file a copy of this form, a copy of the shop drawings, and specifications for the fire suppression system, and a copy of the appropriate contractor's material and test certificate for the system, as required by sentence 3.2.5.13.(1) of the Code, with the Office of the Fire Marshal. I shall forward proof of receipt for each of the documents filed, issued by the Office of the Fire Marshal, to the authority having jurisdiction prior to requesting the occupancy permit.

Please be advised that I may delegate some or all of my duties associated with the Field Review of Construction to another person employed by me or my firm where it is consistent with prudent professional practice to do so. The functions will however be performed under my

supervision in accordance with the Engineering Profession Act.

The undersigned shall notify the authority having jurisdiction, in writing as soon as practical, but not later than 72 hours, if the contract for Field Review of Construction is terminated at any

time during construction.

Print Name

Signature

Initials Sample

Affix below the seal of the licensed
Professional Engineer in
accordance
with provincial legislation.

Print Name of Firm or Company

Print Address

Print Municipality

Postal Code

Telephone

Fax

e-mail

Schedule "A-7"

Field Review of Construction Inspection Commitment Certificate Geotechnical Design Requirements

Preamble

Whereas the Building Code Act, RSNS 1989, Chapter 46, hereinafter referred to as the 'Act'

applies to the construction or demolition of a *building*;

And Whereas the Minister of the Department of Labour and Workforce Development has by regulation adopted the National Building Code, with amendments as the Nova Scotia Building

Code, requiring compliance with it as adopted for the construction or demolition of

buildings;

And Whereas architects and professional engineers are required by their respective statutes, regulations, and bylaws, to ensure the general public of competent standards and ethical conduct

in the design of *buildings*;

And Whereas Part 2 of the Nova Scotia Building Code requires professionals to design *buildings* in conformance with the minimum standards of the Nova Scotia Building Code with

sufficient drawings and documents to show how these standards have been met;

And Whereas Part 2 of the Regulations made pursuant to the Act, requires that these *buildings* be inspected at intervals appropriate to the stage of construction to determine general compliance with the design drawings accepted by the authority having jurisdiction and all

revisions thereto;

To:

Authority Having Jurisdiction

Date:

Address

Dear

Authority Having Jurisdiction

Re:

Address of Project

Name of Project

Legal Description of Project

This is to advise that I am the professional engineer appointed by the owner or prime consultant to perform the Field Review of Construction for the GEOTECHNICAL (PERMANENT) DESIGN requirements.

I hereby certify for the Geotechnical (Permanent) Systems Design Requirements that

- 1) I will review the Geotechnical shop drawings to determine general compliance with the design documents, however, the party producing the shop drawings remains responsible for the design expressed therein;
- 2) I will coordinate the review of changes to the Geotechnical design documents to ensure that the applicable professional engineer(s) determines whether the changes conform to the Code; and
- 3) I will complete the Certification of Field Review of Construction and return it to the authority having jurisdiction prior to requesting the occupancy permit.

Please be advised that I may delegate some or all of my duties associated with the Field Review of Construction to another person employed by me or my firm where it is consistent with prudent professional practice to do so. The functions will however be performed under my supervision in accordance with the Engineering Profession Act.

The undersigned shall notify the authority having jurisdiction, in writing as soon as practical, but not later than 72 hours, if the contract for Field Review of Construction is terminated at any time during construction.

Print Name

Signature

Initials Sample

Affix below the seal of the licensed
Professional Engineer in
accordance
with provincial legislation.

Print Name of Firm or Company

Print Address

Print Municipality

Postal Code

Telephone

Fax

e-mail

Schedule "A-8"
Field Review of Construction
Inspection Commitment Certificate
Plumbing Design Requirements

Preamble

Whereas the Building Code Act, RSNS 1989, Chapter 46, hereinafter referred to as the 'Act' applies to the construction or demolition of a *building*;

And Whereas the Minister of the Department of Labour and Workforce Development has by regulation adopted the National Building Code, with amendments as the Nova Scotia Building Code, requiring compliance with it as adopted for the construction or demolition of *buildings*;

And Whereas architects and professional engineers are required by their respective statutes, regulations, and bylaws, to ensure the general public of competent standards and ethical conduct in the design of *buildings*;

And Whereas Part 2 of the Nova Scotia Building Code requires professionals to design *buildings* in conformance with the minimum standards of the Nova Scotia Building Code with sufficient drawings and documents to show how these standards have been met;

And Whereas Part 2 of the Regulations made pursuant to the Act, requires that these *buildings* be inspected at intervals appropriate to the stage of construction to determine general compliance with the design drawings accepted by the authority having jurisdiction and all revisions thereto;

To:

Authority Having Jurisdiction

Date:

Address

Dear

Authority Having Jurisdiction**Re:**

Address of Project

Name of Project

Legal Description of Project

This is to advise that I am the professional engineer appointed by the owner or prime consultant to perform the Field Review of Construction for the PLUMBING DESIGN requirements.

I hereby certify for the Plumbing Design Requirements that

- 1) I will review the plumbing shop drawings to determine general compliance with the design documents, however, the party producing the shop drawings remains responsible for the design expressed therein;
- 2) I will coordinate the review of changes to the plumbing design documents to ensure that the applicable professional engineer(s) determines whether the changes conform to the Code; and
- 3) I will complete the Certification of Field Review of Construction and return it to the authority having jurisdiction prior to requesting the occupancy permit.

Please be advised that I may delegate some or all of my duties associated with the Field Review of Construction to another person employed by me or my firm where it is consistent with prudent professional practice to do so. The functions will however be performed under my supervision in accordance with the Engineering Profession Act.

The undersigned shall notify the authority having jurisdiction, in writing as soon as practical, but not later than 72 hours, if the contract for Field Review of Construction is terminated at any time during construction.

Print Name

Signature

Initials Sample

Affix below the seal of the licensed
Professional Engineer in
accordance
with provincial legislation.

Print Name of Firm or Company

Print Address

Print Municipality

Postal Code

Telephone

Fax

e-mail

Schedule "A- 9" **Certification of Field Review of Construction**

NOTE This letter must be signed by a Licensed Architect or Professional Engineer as appropriate in accordance with Provincial Legislation and must be submitted after completion of the project but before the occupancy permit is issued. A separate letter must be submitted by each architect, or professional engineer hired by the owner or prime consultant.

To:

Authority Having Jurisdiction

Date:

Address

Dear

Authority Having Jurisdiction

Re:

Address of Project

Name of Project

Legal Description of Project

I hereby certify that I have fulfilled my obligations for Field Review of Construction as defined in the Letter of Undertaking and the Inspection Commitment Certificate, and advise that I have reviewed the work at intervals appropriate, to determine general compliance with the design and all revisions thereto as accepted by the authority having jurisdiction for the following disciplines which I have checked and initialled.

- ☐ *Building Design* ☐ Structural ☐ Plumbing ☐ Mechanical
☐ Electrical ☐ Geotechnical ☐ Fire Suppression System

Print Name

Signature

Initials Sample

Print Name of Firm or Company

Print Address

Print Municipality

Postal Code

Telephone

Fax

e-mail

Affix below the seal of the licensed
Professional Engineer in
accordance
with provincial legislation.

Schedule “B”

Design Data for Selected Locations in Nova Scotia

[illegible]

Dartmouth	-16	-18	26	20	4200	18	144	1250	1400	1.6	0.6	0.40	0.55	0.23	0.13	0.069	0.019	0.12
Debert	-22	-25	27	21	4600	18	118	1000	1200	2.1	0.6	0.39	0.58	0.23	0.12	0.062	0.017	0.12
Digby	-15	-17	25	20	4050	15	139	1100	1275	2.2	0.6	0.40	0.55	0.26	0.13	0.069	0.020	0.14
East Gore	-20	-22	27	21	4325	16	-	-	-	-	-	0.35	-	-	-	-	-	-
Elmsdale	-19	-21	27	21	4424	16	-	-	-	-	-	0.40	-	-	-	-	-	-
Enfield	-19	-21	27	21	4424	16	-	-	-	-	-	0.40	-	-	-	-	-	-
Greenwood	-17	-19	28	21	4300	15	123	925	1100	2.7	0.6	0.36	0.54	0.25	0.13	0.067	0.018	0.14
Halifax	-16	-18	26	20	4100	15	150	1350	1500	1.9	0.6	0.40	0.58	0.23	0.13	0.069	0.019	0.12
Kennetcook	-20	-22	27	21	4325	15	-	-	-	-	-	0.35	-	-	-	-	-	-
Kentville	-18	-20	28	21	4200	18	128	950	1200	2.4	0.6	0.36	0.54	0.24	0.13	0.067	0.018	0.14
Lantz	-19	-21	27	21	4424	16	-	-	-	-	-	0.40	-	-	-	-	-	-
Liverpool	-14	-16	27	20	4050	15	150	1325	1425	1.7	0.6	0.44	0.61	0.24	0.14	0.072	0.020	0.13
Lockeport	-14	-16	25	20	4100	15	139	1250	1450	1.4	0.6	0.44	0.60	0.26	0.14	0.074	0.021	0.14
Louisbourg	-15	-17	26	20	4500	15	118	1300	1500	2.1	0.6	0.52	0.65	0.22	0.12	0.066	0.018	0.12
Lunenburg	-15	-17	26	20	4250	15	144	1300	1450	1.9	0.6	0.43	0.61	0.23	0.13	0.069	0.019	0.12
Maitland	-21	-23	26	22	4400	16	-	-	-	-	-	0.37	-	-	-	-	-	-
Milford Station	-20	-22	27	21	4500	16	-	-	-	-	-	0.38	-	-	-	-	-	-
Mount Uniacke	-19	-21	27	21	4610	17	-	-	-	-	-	0.42	-	-	-	-	-	-
New Glasgow	-21	-23	27	21	4450	15	107	975	1200	2.2	0.6	0.40	0.55	0.18	0.13	0.058	0.016	0.086
Noel	-20	-22	26	22	4400	15	-	-	-	-	-	0.37	-	-	-	-	-	-
North Sydney	-16	-18	27	21	4600	13	123	1200	1475	2.4	0.6	0.47	0.59	0.19	0.11	0.061	0.016	0.098
Pictou	-21	-24	27	21	4400	15	107	950	1175	2.2	0.6	0.40	0.55	0.18	0.11	0.057	0.016	0.084
Port Hawkesbury	-19	-22	27	21	4400	15	128	1325	1450	2.1	0.6	0.59	0.74	0.21	0.12	0.064	0.018	0.11
Shubenacadie	-20	-22	27	21	4500	16	-	-	-	-	-	0.38	-	-	-	-	-	-
Springhill	-20	-23	27	21	4600	18	123	1075	1175	3.1	0.6	0.39	0.56	0.24	0.13	0.063	0.018	0.14
Stewiacke	-21	-23	27	21	4400	18	128	1050	1250	1.8	0.6	0.39	0.55	0.22	0.12	0.065	0.018	0.12
Sydney	-16	-18	27	21	4650	13	123	1200	1475	2.3	0.6	0.47	0.59	0.20	0.12	0.062	0.017	0.10
Tatamagouche	-21	-24	27	21	4500	18	118	875	1150	2.2	0.6	0.40	0.55	0.19	0.11	0.057	0.016	0.097
Truro	-21	-23	27	21	4650	18	123	1000	1175	2.0	0.6	0.37	0.53	0.21	0.12	0.062	0.017	0.12
Walton	-19	-21	26	22	4400	15	-	-	-	-	-	0.38	-	-	-	-	-	-
Wolfville	-19	-21	28	21	4200	18	123	975	1175	2.4	0.6	0.36	0.54	0.25	0.13	0.067	0.018	0.14
Yarmouth	-13	-15	22	19	4100	13	150	1125	1260	1.8	0.6	0.41	0.56	0.23	0.13	0.068	0.018	0.12
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Note: If a municipality has recent climatic values for additional locations that it wishes included in a subsequent amendment of this table, please send them to the Building Code Coordinator, Public Safety Division, Nova Scotia Environment and Labour, PO Box 697, Halifax, NS, B3J 2T8.

As it is not practical to list values for all municipalities in Nova Scotia, recommended climatic design values for locations not listed can be obtained by writing to the Atmospheric Environment Service, Environment Canada, 4905 Dufferin Street, Downsview, Ontario M3H 5T4 or by contacting (416) 739-4365.

Seismic values for those not listed may be obtained through the Natural Resources Canada Website at www.eathquakescanada.ca, or by writing to the Geological Survey of Canada, 7 Observatory Crescent Ottawa, ON, K1A 0Y3.

Schedule C

Barrier-Free Design

As amended by Article 3.1.1.5. of these regulations Section 3.8 Barrier-Free Design of the Code is replaced with the following

3.8 Barrier-Free Design

3.8.1. General (See Appendix Note 3.8.1. NSBCR)

3.8.1.1. Application

- (1)** The requirements of this section apply to all *buildings*, except
 - (a) houses, including semi-detached, duplexes, triplexes, townhouses, row houses, boarding houses, and rooming houses,
 - (b) houses on their own lot, except as required by Sentence 3.8.1.1.(5), for houses used as roofed accommodation, for not more than 10 persons including the owner and the owner's family,
 - (c) *buildings* of Group F, Division 1 major occupancy,
 - (d) *buildings* which are not intended to be occupied on a daily or full time basis, including automatic telephone exchanges, pumphouses, and substations, and
 - (e) industrial occupancies with an operation which is not adaptable to barrier-free.
 - (f) fire, rescue, and emergency response facilities intended to house vehicles and their crews. (See Appendix Note A-3.8.1.1.(1)(f) NSBCR)
- (2)** In camping accommodation where sleeping accommodations are provided, and in roofed accommodation one sleeping unit conforming to Article 3.8.3.17. shall be provided for every twenty (20) sleeping units or part thereof.
- (3)** In roofed accommodation, when a fire alarm system is required by Subsection 3.2.4. (Part 3, Division B, Volume 1) or Subsection 9.10.18. (Part 9, Division

B, Volume 1) NBC, at least one sleeping unit for every twenty (20) sleeping units or part thereof, other than those required in Sentence 3.8.1.1.(2), shall be provided with a warning system which shall conform to Article 3.2.4.19. Visual Signals (Part 3, Division B, Volume 1).

- (4) Every floor area to which a barrier-free path of travel is required to provide access, shall conform to Article 3.3.1.7. (Part 3, Division B, Volume 1).
Protection on Floor Areas with a Barrier-Free Path of Travel
- (5) Where an alteration on the entrance level is made to a dwelling unit used as roofed accommodation, exempt by Clause 3.8.1.1.(1)(b), to add sleeping accommodation,
 - (a) one sleeping unit conforming to Article 3.8.3.17.,
 - (b) barrier-free entrance shall be designed in accordance with Article 3.8.3.3.,
 - (c) barrier free path of travel conforming to Article 3.8.1.3., and
 - (d) one parking stall for each required sleeping unit under this sentence conforming with Sentence 3.8.2.2.(5)shall be provided.
- (6) Except as exempt by 3.8.1.1.(1)(a), in residential occupancies of multiple suites, one unit conforming to Article 3.8.3.18. shall be provided for every twenty (20) units or part thereof. (See Appendix A-3.8.1.1.(6) NSBCR)

3.8.1.2. Entrances (See Appendix A, Division B, Volume 2 A-3.8.1.2. NBC)

- (1) In addition to the barrier-free entrances required by Sentence (2), not less than 50% of the pedestrian entrances of a *building* referred to in Sentence 3.8.1.1.(1) shall be barrier-free and shall lead from
 - (a) the outdoors at sidewalk level, or
 - (b) a ramp that conforms to Article 3.8.3.4. and leads from a sidewalk.
- (2) A suite of assembly occupancy, business and personal services occupancy or mercantile occupancy that is located in the first storey of a *building*, or in a storey to which a barrier-free path of travel is provided, and that is completely separated from the remainder of the *building* so that there is no access to the remainder of the *building*, shall have at least one barrier-free entrance.
- (3) A barrier-free entrance required by Sentences (1) or (2) shall be designed in accordance with Article 3.8.3.3.
- (4) At a barrier-free entrance that includes more than one doorway, only one of the doorways is required to be designed in accordance with the requirements of Article 3.8.3.3.

- (5) If a walkway or pedestrian bridge connects two barrier-free storeys in different *buildings*, the path of travel from one storey to the other storey by means of a walkway or bridge shall be barrier free.
- (6) Where a principal entrance to a *building* of residential occupancy is equipped with a security door system,
 - (a) both visual and audible signals shall be used to indicate when the door lock is released, and
 - (b) there are more than 20 suites a closed circuit visual monitoring system shall be provided capable of connection to individual suites.
- (7) Where a house is required to conform to the requirements of sentence 3.8.1.1.(5) such house shall provide one barrier free entrance in conformance with sentence (1).

3.8.1.3. Barrier-Free Path of Travel

- (1) Except as required by Sentence 3.8.3.2. (1), or as permitted by Article 3.8.3.3. for doorways, the unobstructed width of a *barrier-free* path of travel shall be not less than 920 mm.
- (2) Interior and exterior walking surfaces that are within a barrier-free path of travel shall
 - (a) have no opening that will permit the passage of a sphere more than 13 mm diam,
 - (b) have any elongated openings oriented approximately perpendicular to the direction of travel,
 - (c) be stable, firm and slip-resistant,
 - (d) be bevelled at a maximum slope of 1 in 2 at changes in level not more than 13 mm, and
 - (e) be provided with sloped floors or ramps at changes in level more than 13 mm.
- (3) A barrier-free path of travel is permitted to include ramps, passenger elevators, inclined moving walks, or passenger-elevating device to overcome a difference in level.
- (4) The width of a barrier free path of travel that is more than 30 m long shall be increased to not less than 1500 mm for a length of 1500 mm at intervals not exceeding 30 m.

3.8.1.4. Storeys Served by Escalators

- (1) In a *building* in which an escalator or inclined moving walk provides access to any floor level above or below the entrance floor level, an interior barrier-free path of travel shall be provided to that floor level.
(See Appendix A, Division B, Volume 2 A-3.8.1.4.(1) NBC)

- (2) The route from the escalator or inclined moving walk to the barrier-free path of travel from floor to floor required by Sentence (1) shall be clearly indicated by appropriate signs.

3.8.1.5. Controls

- (1) Except as required by Sentence 3.5.2.1. (NBC Division B, Volume 1) for elevators, controls for the operation of *building* services or safety devices, including electrical switches, thermostats and intercom switches, intended to be operated by the occupant and located in or adjacent to a barrier-free path of travel shall be accessible to a person in a wheelchair, operable with one hand, and mounted between 400 mm and 1 200 mm above the floor.

3.8.2. Occupancy Requirements

3.8.2.1. Areas Requiring a Barrier-Free Path of Travel (See Appendix A-3.8.2.1. NSBCR)

- (1) Except as permitted by Sentence (2), a barrier-free path of travel from the entrances required by Sentences 3.8.1.2.(1) and (2) to be barrier-free shall be provided throughout and within all normally occupied floor areas of
 - (a) the entrance storey,
 - (b) each storey exceeding 600 m² in area, and
 - (c) each storey served by a passenger elevator, escalator, inclined moving walk, or a passenger-elevating device. (See 3.8.3.5.(1) NSBCR and A-3.8.2.1.(1)(c))

(See Article 3.3.1.7. Protection on Floor Areas with a Barrier-Free Path of Travel (Part 3, Division B, Volume 1) for additional requirements for floor areas above or below the first storey to which a barrier-free path of travel is required.)

- (2) A barrier-free path of travel for persons in wheelchairs is not required
 - (a) to service rooms,
 - (b) to elevator machine rooms,
 - (c) to janitor's rooms,
 - (d) to service spaces,
 - (e) to crawl spaces,
 - (f) to attic or roof spaces,
 - (g) to floor levels not served by a passenger elevator, a passenger-elevating device, an escalator, or an inclined moving walk,
 - (h) to high hazard industrial occupancies,
 - (i) within portions of a floor area with fixed seats in an assembly occupancy where those portions are not part of the barrier-free path of travel to spaces designated for wheelchair use,
 - (j) within floor levels of a suite of residential occupancy that are not at the same level as the entry level to the suite,
 - (k) within a suite of residential occupancy not required by 3.8.1.1.(6) or

- ⊕(1) within those parts of a floor area that are not at the same level as the entry level, provided amenities and uses provided on any raised or sunken level are accessible on the entry level by means of a barrier-free path of travel.
- (3) In an assembly occupancy, the number of spaces designated for wheelchair use within rooms or areas with fixed seats shall conform to Table 3.8.2.1. (See also Article 3.8.3.6. for additional requirements.)

Table 3.8.2.1. Designated Wheelchair Spaces

Number of Fixed Seats in Seating Area	Number of Spaces Required for Wheelchairs
2 - 100	2
101 - 200	3
201 - 300	4
301 - 400	5
401 - 500	6
501 - 900	7
901 - 1 300	8
1 301 - 1 700	9
each increment of up to 400 seats in excess of 1 700	one additional space

3.8.2.2. Access to Parking Areas

- (1) If exterior parking is provided, a barrier-free path of travel shall be provided between the exterior parking area and a barrier-free entrance conforming to Article 3.8.1.2. (See Appendix A, Division B, Volume 2 A-3.8.1.2. NBC)
- (2) If a passenger elevator serves one or more indoor parking levels, a barrier-free path of travel shall be provided between at least one parking level and all other parts of the *building* required to be provided with barrier-free access in accordance with Article 3.8.2.1.
- (3) If an exterior passenger loading zone is provided, it shall have
- (a) an access aisle not less than 1 500 mm wide and 6 000 mm long adjacent and parallel to the vehicle pull-up space,
 - (b) a curb ramp conforming to 3.8.3.2(2), where there are curbs between the access aisle and the vehicle pull-up space, and
 - (c) a clear height not less than 2 750 mm at the pull-up space and along the vehicle access and egress routes.
- (4) Where on-site parking is provided, parking stalls for use by disabled persons shall be provided
- (a) as designated by Table 3.8.2.2.,

- (b) one parking stall for disabled persons shall be provided for each viewing position required in assembly occupancies in Sentence 3.8.2.1.(3) or
- (c) one parking stall for each barrier free residential suite.

Table 3.8.2.2. Designated Parking Stalls

Number of Parking Stalls	Number of Designated Stalls Required for Wheelchairs
2 - 15	1
16 - 45	2
46 - 100	3
101 - 200	4
201 - 300	5
301 - 400	6
401 - 500	7
501 - 900	8
901 - 1 300	9
1 301 - 1 700	10
each increment of up to 400 stalls in excess of 1 700	one additional space

- (5) Parking stalls for use by persons with physical disabilities shall
- (a) be not less than 2 400 mm wide and provided on one side with an access aisle not less than 1 500 mm wide. (If more than one parking space is provided for persons with physical disabilities, a single access aisle can serve two adjacent parking stalls.) and if parallel parking stalls shall be not less than 7 000 mm long.
 - (b) have a firm, slip-resistant and level surface of asphalt, concrete or compacted gravel,
 - (c) be located close to an entrance required to conform to Article 3.8.1.2., but not exceeding 50 m,
 - (d) be clearly marked as being for the use of persons with physical disabilities, and
 - (e) be identified by a sign located not less than 1 500 mm above ground level in conformance the Motor Vehicle Act of Nova Scotia, traffic sign regulations.

3.8.2.3. Washrooms Required to be Barrier-Free (See Appendix A, Division B, Volume 2 A-3.8.2.3. NBC)

- (1) Except as permitted by Sentence (2), a washroom in a storey to which a barrier-free path of travel is required in accordance with Article 3.8.2.1., shall be barrier-free in accordance with the appropriate requirements in Articles 3.8.3.8. to 3.8.3.13.
- (2) A washroom need not conform to the requirements of Sentence (1) provided

- (a) it is located within a suite of residential occupancy, except where required by 3.8.1.1.(6), or
 - (b) other barrier-free washrooms are provided on the same floor area within 45 m.
- (3) In a *building* in which water closets are required in accordance with Subsection 3.7.2., one or more barrier-free water closets shall be provided in the entrance storey, unless
 - (a) a barrier-free path of travel is provided to barrier-free water closets elsewhere in the *building*, or
 - (b) the water closets required by Subsection 3.7.2. are for dwelling units only.
- (4) In any washroom containing not more than three water closets, one of water closets stalls may be replaced by a universal toilet room conforming to Article 3.8.3.12. (See Appendix Note A-3.8.2.3. NSBCR).
- (5) In any washroom containing 4 or more water closets at least one of the water closets shall conform to Articles 3.8.3.8.(1).
- (6) A universal toilet room conforming to Article 3.8.3.12. is permitted to be substituted for one water closet required by Sentence (5), in lieu of facilities for disabled persons in washrooms used by the general public. (See Appendix Note A-3.8.2.3. NSBCR).
- (7) Where alterations are made to existing *buildings* a universal toilet room conforming to Article 3.8.3.12. is permitted to be provided in lieu of facilities for disabled persons in washrooms used by the general public.

3.8.3. Design Standards

3.8.3.1. Accessibility Signs

- (1) Signs incorporating the international symbol of accessibility for persons with physical disabilities shall be installed to indicate the location of a barrier-free entrance. (See Appendix A, Division B, Volume 2, A-3.8.3.1.(1) to (3) NBC)
- (2) A teletypewriter (TTY/TDD) phone, washroom, shower, elevator or parking space designed to be barrier-free shall be identified by a sign consisting of the international symbol of accessibility for persons with physical disabilities and by appropriate graphic or written directions to indicate clearly the type of facility available. (See Appendix A, Division B, Volume 2, A-3.8.3.1.(1) to (3) NBC)
- (3) If a washroom is not designed to accommodate persons with physical disabilities in a storey to which a barrier-free path of travel is required, signs shall be provided to indicate the location of barrier-free facilities. (See Appendix A, Division B, Volume 2, A-3.8.3.1.(1) to (3) NBC)

- (4) Signs incorporating the symbol of accessibility for persons with hearing disabilities shall be installed to indicate the location of facilities for persons with hearing disabilities. (See Appendix A, Division B, Volume 2, A-3.8.3.1(4) to (3) NBC)

3.8.3.2. Exterior Walks

- (1) Exterior walks that form part of a barrier-free path of travel shall
 - (a) be not less than 1 100 mm wide, and
 - (b) have a level area conforming to Clause 3.8.3.4.(1)(c) adjacent to each entrance doorway.
- (2) A curb ramp shall have
 - (a) a minimum width of 1200 mm
 - (b) a maximum slope of 1 in 12
 - (c) flared sides with a maximum slope of 1 in 10. (See Appendix Note A-3.8.3.2. NSBCR)

3.8.3.3. Doorways and Doors

- (1) Every doorway that is located in a barrier-free path of travel shall have a clear width not less than 800 mm when the door is in the open position. (See Appendix A, Division B, Volume 2, A-3.8.3.3.(1) NBC)
- (2) Door operating devices shall be of a design which does not require tight grasping and twisting of the wrist as the only means of operation. (See Appendix A, Division B, Volume 2, A-3.8.3.3.(3) NBC)
- (3) A threshold for a doorway referred to in sentences (1) or (2) shall not be more than 13 mm higher than the finished floor surface and shall be bevelled to facilitate the passage of wheelchairs.
- (4) Except as permitted by Sentences (5) and (11), every door that provides a barrier-free path of travel through an entrance referred to in Article 3.8.1.2. shall be equipped with a power door operator if the entrance serves
 - (a) a hotel,
 - (b) a *building* containing a Group B, Division 2 major occupancy, or
 - (c) a *building* more than 500 m² in *building area* containing an assembly occupancy, a business and personal services occupancy or a mercantile occupancy. (See Appendix A, Division B, Volume 2, A-3.8.3.3.(5) NBC)
- (5) The requirements of Sentence 3.8.3.3.(4) do not apply to an individual suite having an area less than 500 m² in a *building* having only suites of assembly occupancy, business and personal services occupancy or mercantile occupancy if the suite is completely separated from the remainder of the *building* so that there is no access to the remainder of the *building*.

- (6) Except as permitted by Sentence 3.8.3.3.(7) and except for a door with a power door operator, a closer for a door in a barrier-free path of travel shall be designed to permit the door to open when the force applied to the handle, push plate or latch-releasing device is not more than
 - (a) 38 N in the case of an exterior door, or
 - (b) 22 N in the case of an interior door.
- (7) Sentence 3.8.3.3.(6) does not apply to a door at the entrance to a dwelling unit, or where greater forces are required in order to close and latch the door against the prevailing difference in air pressure on opposite sides of the door. (See Appendix A, Division B, Volume 2, A-3.8.3.3.(8) NBC)
- (8) Except for a door at the entrance to a dwelling unit, a closer for an interior door in a barrier-free path of travel shall have a closing period of not less than 3 s measured from when the door is in an open position of 70° to the doorway, to when the door reaches a point 75 mm from the closed position, measured from the leading edge of the latch side of the door. (See Appendix A, Division B, Volume 2, A-3.8.3.3.(9) NBC)
- (9) Unless equipped for power door operation, a door in a barrier-free path of travel shall have a clear space on the latch side extending the height of the doorway and not less than
 - (a) 600 mm beyond the edge of the door opening if the door swings toward the approach side, and
 - (b) 300 mm beyond the edge of the door opening if the door swings away from the approach side. (See Appendix A, Division B, Volume 2, A-3.8.3.3.(10) NBC)
- (10) A vestibule located in a barrier-free path of travel shall be arranged to allow the movement of wheelchairs between doors and shall provide a distance between 2 doors in series of not less than 1 200 mm plus the width of any door that swings into the space in the path of travel from one door to another.
- (11) Only the active leaf in a multiple leaf door in a barrier-free path of travel need conform to the requirements of this Article.
- (12) Except as provided in Clause 3.8.3.4.(1)(c), the floor surface on each side of a door in a barrier-free path of travel shall be level within a rectangular area
 - (a) as wide as the door plus the clearance on the latch side required by Sentence 3.8.3.3.(9), and
 - (b) whose dimension perpendicular to the closed door not less than the width of the barrier-free path of travel but need not exceed 1 500 mm.

- (13) The power door operator required by Sentence (4) shall function for passage in both directions through the door.
- (14) Where a power door operator is required at least one leaf in each set of doors in the barrier free path of travel through a vestibule shall meet the requirements. (See Appendix A-3.8.3.3.(14) NSBCR)
- (15) Doorways in a path of travel to and into at least one bathroom within a suite of residential occupancy shall have a clear width of not less than 800 mm when the door is in the open position.

3.8.3.4. Ramps

- (1) A ramp located in a barrier-free path of travel shall
 - (a) have a width not less than 870 mm between handrails,
 - (b) have a slope not more than 1 in 12 (See Appendix A, Division B, Volume 2 A-3.8.3.4.(1)(b) NBC),
 - (c) have a level area not less than 1 500 by 1 500 mm at the top and bottom and at intermediate levels of a ramp leading to a door, so that on the latch side the level area extends not less than
 - (i) 600 mm beyond the edge of the door opening where the door opens towards the ramp, or
 - (ii) 300 mm beyond the edge of the door opening where the door opens away from the ramp (See Appendix A, Division B, Volume 2, A-3.8.3.4.(1)(c) NBC),
 - (d) have a level area not less than 1 200 mm long and at least the same width as the ramp
 - (i) at intervals not more than 9 m along its length, and
 - (ii) where there is an abrupt change in the direction of the ramp, and
 - (e) except as permitted by Sentence (2), be equipped with handrails and guards conforming to Articles 3.4.6.4. and 3.4.6.5.
- (2) The requirement for handrails in Clause 3.8.3.4.(1)(e) need not apply to a ramp serving as an aisle for fixed seating.
- (3) Floors or walks in a barrier-free path of travel having a slope steeper than 1 in 20 shall be designed as ramps.

3.8.3.5. Passenger-elevating Device

- (1) A passenger-elevating device referred to in Sentence 3.8.1.1.(1)(c) shall conform to CSA B355, "Lifts for Persons with Physical Disabilities."

3.8.3.6. Spaces in Seating Area

- (1) Spaces designated for wheelchair use referred to in Sentence 3.8.2.1.(3) shall be
 - (a) clear and level, or level with removable seats,

- (b) not less than 900 mm wide and 1 525 mm long to permit a wheelchair to enter from a side approach and 1 220 mm long where the wheelchair enters from the front or rear of the space,
- (c) arranged so that at least 2 designated spaces are side by side,
- (d) located adjoining a barrier-free path of travel without infringing on egress from any row of seating or any aisle requirements, and
- (e) situated, as part of the designated seating plan, to provide a choice of viewing location and a clear view of the event taking place.

3.8.3.7. Assistive Listening Devices (See Appendix A, Division B, Volume 2, A-3.8.3.7. NBC)

- (1) Except as permitted in Sentence (2), in *buildings* of assembly occupancy, all classrooms, auditoria, meeting rooms, churches or places of worship, and theatres with an area of more than 100 m², and all courtrooms shall be equipped with an assistive listening system encompassing the entire seating area.
- (2) Where the assistive listening system required in Sentence (1) is an induction loop system, only half the seating area in the room need be encompassed.

3.8.3.8. Water Closet Stalls

- (1) At least one water closet stall or enclosure in a room or space required by Article 3.8.2.3. to be barrier-free shall
 - (a) be not less than 1 500 mm wide by 1 500 mm deep,
 - (b) be equipped with a door which shall
 - (i) be capable of being latched from the inside,
 - (ii) provide a clear opening not less than 800 mm wide with the door in the open position,
 - (iii) swing outward, unless sufficient room is provided within the stall or enclosure to permit the door to be closed without interfering with the wheelchair (See Appendix A, Division B, Volume 2, A-3.8.3.8.(1) (b)(iii) NBC)
 - (iv) be provided on the inside with a door pull not less than 140 mm long located so that its midpoint is not less than 200 mm and not more than 300 mm from the hinged side of the door and not less than 900 mm and not more than 1 000 mm above the floor (See Appendix A, Division B, Volume 2, A-3.8.3.8.(1) (b)(iv) NBC), and
 - (v) be provided with a door pull on the outside, near the latch side of the door,
 - (c) have a water closet located so that its centre line is 460 mm from the wall with the grab bar and 1030 mm from any obstruction on the other side wall.
 - (d) be equipped with grab bars which shall

- (i) be mounted horizontally on the side wall closest to the water closet and shall extend not less than 450 mm in both directions from the most forward point of the water closet (See Appendix A, Division B, Volume 2, A-3.8.3.8.(1) (d)(i) NBC),
 - (ii) be mounted horizontally on the wall behind the water closet, extending not less than 600 mm and centred on the toilet bowl, if the water closet does not have an attached water tank,
 - (iii) be mounted not less than 840 mm and not more than 920 mm above the floor,
 - (iv) be installed to resist a load of not less than 1.3 kN applied vertically or horizontally,
 - (v) be not less than 30 mm and not more than 40 mm in diameter, and
 - (vi) have a clearance of not less than 35 mm and not more than 45 mm from the wall,
- (e) be equipped with a coat hook mounted not more than 1 200 mm above the floor on a side wall and projecting not more than 50 mm from the wall, and
- (f) have a clearance of not less than 1 700 mm between the outside of the stall face and the face of an in-swinging washroom door and 1 400 mm between the outside of the stall face and any wall-mounted fixture.

3.8.3.9. Water Closets (See Appendix A, Division B, Volume 2, A-3.8.3.9.(1) NBC)

- (1) A water closet for a person with physical disabilities shall
- (a) be equipped with a seat located at not less than 400 mm and not more than 460 mm above the floor,
 - (b) be equipped with hand-operated flushing controls that are easily accessible to a wheelchair user or be automatically operable,
 - (c) be equipped with a seat lid or other back support, and
 - (d) not have a spring-actuated seat.
 - (e) be located so that its centre line is 460 mm from the wall with the grab bar and 1030 mm from any obstruction on the other side wall.

3.8.3.10. Urinals

- (1) If urinals are provided in a barrier-free washroom, at least one urinal shall be
- (a) wall mounted, with the rim located between 488 mm and 512 mm above the floor, or
 - (b) floor mounted, with the rim level with the finished floor.
- (2) The urinal described in Sentence (1) shall have
- (a) a clear width of approach of 800 mm centred on the urinal,
 - (b) no step in front, and
 - (c) installed on each side a vertically mounted grab bar that is not less than 300 mm long, with its centerline 1 000 mm above the floor, and located not more than 380 mm from the centerline of the urinal.

3.8.3.11. Lavatories (See Appendix A, Division B, Volume 2, A-3.8.3.11.(1)(c) and (d) NBC)

- (1) A barrier-free washroom shall be provided with a lavatory which shall
- (a) be located so that the distance between the centerline of the lavatory and the side wall is not less than 460 mm,
 - (b) have a rim height not more than 865 mm above the floor,
 - (c) have a clearance beneath the lavatory not less than
 - (i) 760 mm wide,
 - (ii) 735 mm high at the front edge,
 - (iii) 685 mm high at a point 205 mm back from the front edge, and
 - (iv) 230 mm high over the distance from a point 280 mm to a point 430 mm back from the front edge
 - (d) have insulated pipes where they would otherwise present a burn

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- (e) have soap dispensers located close to the lavatory, not more than 1 200 mm above the floor, and accessible to persons in wheelchairs, and
- (f) have towel dispensers or other hand drying equipment located not more than 1 200 mm above the floor in an area that is accessible to persons in wheelchairs.

- (2) If mirrors are provided in a barrier-free washroom, at least one mirror shall be
- (a) mounted with its bottom edge not more than 1 000 mm above the floor, or
 - (b) be inclined to the vertical to be usable by a person in a wheelchair.

3.8.3.12. Universal Toilet Room (See NBC 3.7.2. (Part 3, Division B Volume 1) and (See Appendix A, Division B, Volume 2, A-3.8.3.12. NBC)

- (1) A universal toilet room shall
- (a) be served by a barrier-free path of travel,
 - (b) have a door capable of being locked from the inside and released from the outside in case of emergency and which has

- (i) a graspable latch operating mechanism located not less than 900 mm and not more than 1 000 mm above the floor,
- (ii) on an outward swinging door, a door pull not less than 140 mm long located on the inside so that its midpoint is not less than 200 mm and not more than 300 mm from the hinged side of the door and not less than 900 mm and not more than 1 000 mm above the floor, and
(See Appendix A, Division B, Volume 2, A-3.8.3.8.(1)(b)(iv) NBC)
- (iii) on an outward swinging door, have a door closer, spring hinges or gravity hinges, so that the door closes automatically
- (c) have one lavatory conforming to Article 3.8.3.11.,
- (d) have one water closet conforming to the requirements of Article 3.8.3.9. located so that its centre line is 460 mm from the wall with the grab bar and 1030 mm from any obstruction on the other side wall.
- (e) have grab bars conforming to Clause 3.8.3.8.(1)(d),
- (f) have no internal dimension between walls less than 1 700 mm,
- (g) have a coat hook conforming to Clause 3.8.3.8.(1)(e) and a shelf located not more than 1 200 mm above the floor,
- (h) be designed to permit a wheelchair to back in alongside the water closet in the space referred to in Subclause (d), and
- (i) be designed to permit a wheelchair to turn in an open space that has a diameter not less than 1 500 mm.

3.8.3.13. Showers and Bathtubs (See Appendix A, Division B, Volume 2, A-3.8.3.13.(1)(b) and (f) NBC)

- (1) Except within a suite of residential occupancy, if showers are provided in a *building*, at least one shower stall in each group of showers shall be barrier-free and shall
 - (a) be not less than 1 500 mm wide and 900 mm deep,
 - (b) have a clear floor space at the entrance to the shower not less than 900 mm deep and the same width as the shower, except that fixtures are permitted to project into that space provided they do not restrict access to the shower,
 - (c) have a slip-resistant floor surface,
 - (d) have a bevelled threshold not more than 13 mm higher than the finished floor,
 - (e) have a hinged seat that is not spring loaded, or a fixed seat that shall be
 - (i) not less than 450 mm wide and 400 mm deep,
 - (ii) mounted approximately 450 mm above the floor, and
 - (iii) designed to carry a minimum load of 1.3 kN,
 - (f) have a horizontal grab bar conforming to Subclauses 3.8.3.8.(1)(d)(iv), (v) and (vi) that shall be
 - (i) not less than 900 mm long,
 - (ii) mounted approximately 850 mm above the floor, and

- (iii) located on the wall opposite the entrance to the shower so that not less than 300 mm of its length is at one side of the seat, (See Appendix A, Division B, Volume 2, A-3.8.3.13.(1)(f) NBC),
 - (g) have a pressure-equalizing or thermostatic mixing valve controlled by a lever or other device operable with a closed fist from the seated position,
 - (h) have a hand-held shower head with not less than 1 500 mm of flexible hose located so that it can be reached from the seated position and equipped with a support so that it can operate as a fixed shower head, and
 - (i) have fully recessed soap holders that can be reached from the seated position.
- (2) If individual shower stalls are provided for use by residents and patients in *buildings* of Group B, Division 2 institutional occupancy shall conform to the requirements of Clauses (1)(a) to (i) except where
 - (a) common showers are provided in conformance with Clauses (1)(a) to (i), or
 - (b) common bath tubs equipped with hoist mechanisms to accommodate residents and patients are available.
- (3) If a bathtub is installed in a suite of residential occupancy required to be barrier-free, the bathtub and entrance to the bathtub shall
 - (a) comply with the dimensions of Clauses 3.8.3.13.(1)(a) and (b),
 - (b) conform to Article 3.7.2.9.,
 - (c) be equipped with a hand-held shower head and controls conforming to Clause 3.8.3.13(1)(h). but with a hose 1 800 mm long, and
 - (d) have grab bars that are
 - (i) 1 200 mm long, located vertically at the end of the bathtub that is adjacent to the clear floor space, with the lower end between 180 mm and 280 mm above the bathtub rim,
 - (ii) 1 200 mm long located horizontally along the length of the bathtub located 180 mm to 280 mm above the bathtub rim.
 - (iii) be installed to resist a load of not less than 1.3 kN applied vertically or horizontally,
 - (iv) be not less than 30 mm and not more than 40 mm in diameter, and
 - (v) have a clearance of not less than 35 mm and not more than 45 mm from the wall.

3.8.3.14. Counters (See Appendix A, Division B, Volume 2, A-3.8.3.14.(1) NBC)

- (1) Every counter more than 2 m long, at which the public is served, shall have at least one barrier-free section not less than 760 mm long centred over the knee space required by Sentence (3).
- (2) A barrier-free counter surface shall be not more than 865 mm above the floor.
- (3) Except as permitted by Sentence (4), knee space beneath each side of a barrier-free counter intended to be used as a work surface shall be not less than

- (a) 760 mm wide,
 - (b) 685 mm high, and
 - (c) 485 mm deep.
- (4) A counter that is used in a cafeteria or one that performs a similar function in which movement takes place parallel to the counter need not have knee space underneath the counter.

3.8.3.15. Shelves or Counters for Telephones and TTY/TDD Telephone Services (See Appendix A, Division B, Volume 2, A-3.8.3.15. NBC)

- (1) If built-in shelves or counters are provided for public telephones, they shall be level and shall
- (a) be not less than 305 mm deep, and
 - (b) have, for each telephone provided, a clear space not less than 250 mm wide having no obstruction within 250 mm above the surface.
- (2) The top surface of a section of the shelf or counter described in Sentence (1) serving at least one telephone shall be not more than 865 mm above the floor.
- (3) If a wall-hung telephone is provided above the shelf or counter section described in Sentence (2), it shall be located so that the receiver and coin slot are not more than 1 200 mm above the floor.
- (4) Where public telephones are provided, at least one telephone shall be provided with a variable volume control on the receiver.
- (5) At least one built-in teletypewriter telephone (TTY/TDD) shall be provided and located in a publicly accessible location where
- (a) four or more public access telephones are provided, including interior and exterior locations, or
 - (b) the *building area* exceeds 600 m² in a Group A, Group B, Group D, Group E occupancy, or in a hotel or motel, or
 - (c) where a hotel or motel, is required by Sentence 3.8.1.1.(2) to provide a barrier free suite, or
 - (d) where a Tourist Cabin is required by Sentence 3.8.1.1.(2) to provide barrier free suites, at least one built-in teletypewriter telephone (TTY/TDD) must be located in public location, or a portable unit available for use.
- (See Appendix A-3.8.3.15.(5)(d) NSBCR)
- (6) Where public telephones are provided, at least one electrical receptacle shall be provided within 500 mm of one of the public telephones.

3.8.3.16. Drinking Fountains

- (1) If drinking fountains are provided, at least one shall be barrier-free and shall

- (a) have a spout located near the front of the unit not more than 915 mm above the floor, and
- (b) be equipped with controls that are easily operable from a wheelchair using one hand with a force of not more than 22 N or be automatically operable.

3.8.3.17. Sleeping Units in Roofed Accommodation

- (1) Where sleeping units suites are required by Sentence 3.8.1.1.(2), they shall have
 - (a) sufficient space to provide a turning area of not less than 1 500 mm diameter on one side of a bed,
 - (b) sufficient space to provide clearance of not less than 900 mm to allow for functional use of units by persons in wheelchairs,
 - (c) an accessible balcony where balconies are provided,
 - (d) at least one closet that provides
 - (i) a minimum clear opening of 900 mm,
 - (ii) clothes hanger rods located at a height of 1 200 mm, and
 - (iii) at least one shelf located at a height of 1 370 mm,
 - (e) light switches, thermostats and other controls that are specifically provided for use by the occupant shall be mounted not more than 1 375 mm above the floor,
 - (f) electrical receptacles located between 455 mm and 550 mm above the finished floor,
 - (g) a GFI outlet located not more than 1 200 mm above the floor, and
 - (h) an accessible bathroom which shall be designed to provide manoeuvring space up to each type of fixture required to be usable by persons in a wheelchair conforming to the following
 - (i) a floor space of not less than 3.7 m² with no dimension less than 1 700 mm when the door swings out and 4.0 m² with no dimension less than 1 800 mm when the door swings in,
 - (ii) fixtures located to provide maximum manoeuvrability for persons in wheelchairs,
 - (iii) have grab bars conforming to Clause 3.8.3.8.(1)(d),
 - (iv) have a coat hook conforming to Clause 3.8.3.8.(1)(e),
 - (v) a water closet conforming to Article 3.8.3.9.,
 - (vi) contain at least one lavatory conforming to Article 3.8.3.11,
 - (i) washroom accessories conforming to Clause 3.8.3.11.(1)(f), and
 - (j) a lock on the entrance door that is operable with one hand.
- (2) If a bathtub is installed in a suite of residential occupancy required to be barrier-free, the bathtub and entrance to the bathtub shall
 - (a) comply with the dimensions of Clauses 3.8.3.13.(1)(a) and (b),
 - (b) be equipped with a hand-held shower head and controls conforming to Clause 3.8.3.13(1)(h), but with a hose 1 800 mm long, and
 - (c) have grab bars, that

- (i) are 1 200 mm long, located vertically at the end of the bathtub that is adjacent to the clear floor space, with the lower end between 180 mm and 280 mm above the bathtub rim, and
 - (ii) are 1 200 mm long located horizontally along the length of the bathtub located 180 mm to 280 mm above the bathtub rim
 - (iii) be installed to resist a load of not less than 1.3 kN applied vertically or horizontally,
 - (iv) be not less than 30 mm and not more than 40 mm in diameter, and
 - (v) have a clearance of not less than 35 mm and not more than 45 mm from the wall.
- (3) If a shower is installed within a suite of residential occupancy, required to be barrier-free at least one shower stall shall be barrier-free and shall
 - (a) be not less than 1 500 mm wide and 900 mm deep,
 - (b) have a clear floor space at the entrance to the shower not less than 900 mm deep and the same width as the shower, except that fixtures are permitted to project into that space provided they do not restrict access to the shower (See Appendix A, Division B, Volume 2, A-3.8.3.13.(1)(b) NBC),
 - (c) have a slip-resistant floor surface,
 - (d) have a bevelled threshold not more than 13 mm higher than the finished floor,
 - (e) have a hinged seat that is not springloaded or a fixed seat that shall be
 - (i) not less than 450 mm wide and 400 mm deep,
 - (ii) mounted approximately 450 mm above the floor, and
 - (iii) designed to carry a minimum load of 1.3 kN,
 - (f) have a horizontal grab bar that shall be
 - (i) not less than 900 mm long,
 - (ii) mounted approximately 850 mm above the floor, and
 - (iii) located on the wall opposite the entrance to the shower so that not less than 300 mm of its length is at one side of the seat,
 - (iv) be installed to resist a load of not less than 1.3 kN applied vertically or horizontally,
 - (v) be not less than 30 mm and not more than 40 mm in diameter, and
 - (vi) have a clearance of not less than 35 mm and not more than 45 mm from the wall,
 - (g) have a pressure-equalizing or thermostatic mixing valve controlled by a lever or other device operable with a closed fist from the seated position,
 - (h) have a hand-held shower head with not less than 1 500 mm of flexible hose located so that it can be reached from the seated position and equipped with a support so that it can operate as a fixed shower head, and
 - (i) have fully recessed soap holders that can be reached from the seated position.

3.8.3.18. Suites of Residential Occupancies Required to Be Barrier-Free

General

- (1) Where a suite of residential occupancy is required by Sentence 3.8.1.1.(6) to provide barrier free access it shall be served by
- (a) entrances in accordance with Article 3.8.1.2.,
 - (b) barrier-free path of travel to, into, and throughout each required suite in accordance with Article 3.8.1.3.,
 - (c) an accessible balcony if required in accordance with NBC 3.3.1.7. 1.(c) Part 3, Division B Volume 1, and
 - (d) barrier free controls for the operation of *building* services or safety devices, including electrical switches, thermostats and intercom switches, shall be accessible to a person in a wheelchair, operable with one hand, and mounted not more than 1 200 mm above the floor and electrical receptacles shall be located between 400 mm and 550 mm above the finished floor, except as required by clause 3.8.3.18. (3)(f) (bathroom) and subclause 3.8.3.18.(4)(c)(v). (kitchen)

Sleeping Area

- (2) Where a suite of residential occupancy is required by Sentence 3.8.1.1.(6) to provide barrier free access it shall contain at least one sleeping area with
- (a) a minimum floor area 12.25 m²,
 - (b) a least one horizontal room dimension not less than 3.35 m, and
 - (c) at least one closet that provides
 - (i) a minimum clear opening of 900 mm,
 - (ii) clothes hanger rods located at a height of 1 200 mm, and
 - (iii) at least one shelf located at a height of 1 370 mm.

Bathroom

- (3) Where a suite of residential occupancy is required by Sentence 3.8.1.1.(6) to provide barrier free access, a minimum of one accessible bathroom shall be provided with
- (a) a floor space of not less than 3.7 m² with no dimension less than 1 700 mm when the door swings out and 4.0 m² with no dimension less than 1 800 mm when the door swings in,
 - (b) a water closet conforming to Article 3.8.3.9.,
 - (c) a lavatory conforming to Article 3.8.3.11.,
 - (d) where a shower is provided, it shall conform to Clauses 3.8.3.13.(1)(a) to (i),
 - (e) where a tub is provided, it shall conform to Clauses 3.8.3.13.(3)(a) to (d), and
 - (f) a GFI razor outlet located not more than 1 200 mm above the floor, and

Kitchen

- (4) Where a suite of residential occupancy is required by Sentence 3.8.1.1.(6) to provide barrier free access the kitchen shall have

- (a) a minimum 1 200 mm clearance between counters and all opposing base cabinets, counter tops, appliances, or walls except in a U shape kitchen the minimum distance shall be 1 500 mm and
- (b) a minimum clear floor space 750 mm x 1 200 mm shall be provided at each
 - (i) range
 - (ii) cooktop
 - (iii) oven
 - (iv) refrigerator/freezer
 - (v) dishwasher and
 - (vi) other major appliances
- (c) a minimum of one work surface that is
 - (i) 750 mm wide x 600 mm deep,
 - (ii) 810 mm to 860 mm above the floor,
 - (iii) have a clear floor area 750 mm 1 200 mm which may ~~extent~~ [extend] 480 mm under the work surface,
 - (iv) have a knee space a minimum of 750 mm wide, 480 mm deep, and 680 high, and
 - (v) have a minimum of one electrical receptacle shall be located at the front or side of the work surface.
- (d) base cabinets shall have a minimum toe space 150 mm dep and 230 mm high.
- (e) sinks
 - (i) shall be mounted with the rim between 810 mm and 860 mm above the floor,
 - (ii) have a knee space a minimum of 750 mm wide, 250 mm deep, and a toe space 750 mm wide 230 deep and 230 mm high,
 - (iii) have a clear floor area 750 mm 1 200 mm which may ~~extent~~ [extend] 480 mm under the work surface,
 - (iv) have faucets with lever handles, and
 - (v) have insulated hot water and drain pipes where they may abut required clear space.
- (f) upper cabinets shall have a minimum of one shelf not more than 1200 mm above the floor.
- (g) storage cabinets doors and drawers they shall
 - (i) have a handles that is easily graspable, and
 - (ii) be mounted at the top of base cabinets and bottom of upper cabinets.
- (h) all controls shall comply with Clause 3.8.3.18.(1)(d) except as required by subclause 3.8.3.18.(4)(c)(v).

Schedule D

Alternate Compliance Methods for Existing *Buildings*

No.	Code Requirement	Alternate Compliance Method
1	Fire Separations 3.1.3.1. (Part 3, Division B, Volume 1) and Table 3.1.3.1. (Part 3, Division B, Volume 1); 9.10.9. (Part 9, Division B, Volume 1) 2 h fire separation required between some major occupancies.	Except for F1 occupancies, 1 h fire separation is acceptable, if the <i>building</i> is fully sprinklered.
2	Fire Separations 3.1.3. (Part 3, Division B, Volume 1) and Table 3.1.3.1. (Part 3, Division B, Volume 1); 9.10.9. (Part 9, Division B, Volume 1) 1 h fire separation required between some major occupancies.	½ h fire separation is acceptable if the <i>building</i> is fully sprinklered.
3	Noncombustible Construction 3.1.5. (Part 3, Division B, Volume 1) and 9.10.6.1. (Part 9, Division B, Volume 1) All materials used in noncombustible construction must be noncombustible unless otherwise permitted	1. Roofs may be of combustible construction provided the <i>building</i> is fully sprinklered. 2. Up to 10% gross floor area to a maximum of 10% of any one floor area may be of combustible construction provided the <i>building</i> is fully sprinklered.
4	Fire-resistance Rating 3.1.7.1.(1) (Part 3, Division B, Volume 1); 9.10.3.1. (Part 9, Division B, Volume 1) Where a material, assembly of materials or structural member is required to have a fire resistance rating it shall be tested in accordance with CAN/ULC-S101.	A fire-resistance rating may also be used based on 1. HUD No. 8 Guideline on Fire Ratings of Archaic Materials and Assemblies. 2. Fire Endurance of Protected Steel Columns and Beams, DBR Technical Paper No. 194. 3. Fire Endurance of Unit Masonry Walls, DBR Technical Paper No. 207. 4. Fire Endurance of Light-Framed and Miscellaneous Assemblies, DBR Technical Paper No. 222.
5	Rating of Supporting Construction 3.1.7.5. (Part 3, Division B, Volume 1); 9.10.8.3. (Part 9, Division B, Volume 1) Supporting assemblies to have fire resistance rating at least equivalent to that of the supported floor.	Heavy timber construction is permitted to have a fire resistance rating less than would be required by the Code provided the <i>building</i>; (a) is fully sprinklered, and (b) does not exceed 5 storeys in <i>building height</i>.
6	Continuity of Fire Separations 3.1.8.3.(1) (Part 3, Division B, Volume 1) and (2); 9.10.9.2. (Part 9, Division B, Volume 1) Fire separations are required to be continuous above the ceiling space.	Fire separations are not required to be continuous above the ceiling space where (a) the ceiling space is non-combustible construction, (b) both fire compartments are sprinklered, or (c) the ceiling has a minimum rating of 30 minutes.

7	Wired Glass 3.1.8.5.(1) (Part 3, Division B, Volume 1) and 3.1.8.14.(2, Part 3, Division B, Volume 1); 9.10.13.1. (Part 9, Division B, Volume 1) and 9.10.13.5. (Part 9, Division B, Volume 1) 6 mm wired glass in steel frame required in fire separations.	For fixed transoms or sidelights, 6 mm wired glass fixed to a wood frame of at least 50 mm thickness with steel stops is permitted in a required fire separation.
8	Mezzanines 3.2.1.1.(3) to (6) (Part 3, Division B, Volume 1); 9.10.4.1. (Part 9, Division B, Volume 1) Mezzanines enclosing more than 10% above the horizontal plane are considered as storey in <i>building height</i>.	Mezzanines may enclose up to 20% above the horizontal plane and not be considered a storey in <i>building height</i> if the <i>building</i> is fully sprinklered.
9	<i>Building Height</i> 3.2.2.21. to 3.2.2.84. (Part 3, Division B, Volume 1) Noncombustible construction required for <i>buildings</i> over 4 storeys in <i>building height</i>.	<i>Buildings</i> may be of combustible construction up to 5 storeys provided (a) the <i>building</i> is fully sprinklered, (b) the <i>building</i> contains Group C, D, E, F2 or F3 occupancies, and (c) floor assemblies not required to exceed 1 h fire separation requirements may be of heavy timber construction.
10	Spatial Separation 3.2.3. (Part 3, Division B, Volume 1); 9.10.14. (Part 9, Division B, Volume 1) The maximum area of unprotected openings.	The area of unprotected opening is not limited provided (a) the exterior walls have a interior thermo barrier of 12.7 mm, thick gypsum board of lath, and plaster in good condition, (b) the limiting distance is a minimum 1 m, (c) the entire <i>building</i> has a supervised sprinkler system in conformance with Sentence 3.2.4.9.(2), (Part 3, Division B, Volume 1) and (d) the sprinkler system is connected to the fire department in conformance with Sentence 3.2.4.7.(4). (Part 3, Division B, Volume 1)
11	Construction of Exposing <i>Building Face</i> 3.2.3.7. (Part 3, Division B, Volume 1); 9.10.14.5. and 9.10.15.5. (Part 9, Division B, Volume 1) The exposing <i>building face</i> is required to have a fire resistance rating and/or be of noncombustible construction.	Exposing <i>building face</i> is not required to have a fire resistance rating if the <i>building</i> is fully sprinklered. Also, the exposing <i>building face</i> if not required to be of noncombustible construction if it is protected by an exterior sprinkler system conforming to NFPA 13 and has a thermo barrier as specified in No.10(a) of these compliance tables.

12	Roof Covering Rating 3.1.15.2. (Part 3, Division B, Volume 1) Class A, B or C roof covering in conformance with CAN/ULC-S107 required.	For existing roofs not covered by a Class A, B or C roofing a manually operated deluge system in accordance with NFPA 13 is permitted.
13	Interconnected Floor Space 3.2.8. (Part 3, Division B, Volume 1); 9.10.1.2.(6) (Part 9, Division B, Volume 1) Openings that are not protected by shafts or closures shall be protected in conformance with section 3.2. (Part 3, Division B, Volume 1) or sentence 9.10.1.2.(6) (Part 9, Division B, Volume 1)	1. An open stair in <i>buildings</i> of maximum 3 storeys in <i>building height</i> need not comply with Subsection 3.2.8. (Part 3, Division B, Volume 1) provided; (a) it is not a required exit stair, (b) the <i>building</i> contains a Group C or D occupancy, (c) the <i>building</i> is fully sprinklered with fast response sprinklers, (d) corridors opening into the interconnected floor space are separated from the interconnected floor space by a fire separation with the rating required for the corridor, and (e) smoke detectors are installed in the rooms opening into the interconnected floor space.
14	Separation of Suites 3.3.1.1. (Part 3, Division B, Volume 1); 9.10.9.13. and 9.10.9.14. (Part 9, Division B, Volume 1), Suites are required to be separated from adjoining suites by 3/4 h or 1 h rated fire separations.	Existing ½ h fire separations are acceptable in fully sprinklered <i>buildings</i> not exceeding 5 storeys in <i>building height</i>.
15	Corridor Fire Separation 3.3.1.4. (Part 3, Division B, Volume 1); 9.10.9.15. (Part 9, Division B, Volume 1) Public corridors are required to be separated from the remainder of the <i>building</i> by a fire separation having a fire resistance rating of at least 3/4 h.	Existing corridors with ½ h fire resistance ratings, are acceptable in residential occupancies provided the <i>building</i> (a) does not exceed 5 storeys in <i>building height</i>, and (b) is fully sprinklered with fast response sprinklers.
16	Corridor Width 3.3.1.9. and 3.4.3.1. (Part 3, Division B, Volume 1) ; 9.9.3.3. (Part 9, Division B, Volume 1) Public corridors and exit corridors are permitted to have a minimum width of 1100 mm.	Public corridors and exit corridors are permitted with a minimum width of 800 mm provided (a) the occupant load of the <i>building</i> is maximum 20 people, and (b) the <i>building</i> does not exceed 3 storeys in <i>building height</i>.
17	Door Swing 3.3.1.11. and 3.4.6.11.(Part 3, Division B, Volume 1) ; 9.9.6.5. (Part 9, Division B, Volume 1) Doors required to swing in the direction of exit travel.	2nd egress door from a room is not required to swing in the direction of exit travel provided (a) the <i>building</i> is fully sprinklered and the system is supervised in conformance with Sentence

		3.2.4.9.(2), (Part 3, Division B, Volume 1) and (b) the occupant load of the <i>building</i> is maximum 100 people.
18	Stairs, Ramps, Handrails and Guards 3.3.1.14., 3.3.1.16., 3.3.1.18., 3.4.6.4 to 3.4.6.8. (Part 3, Division B, Volume 1); 9.8. (Part 9, Division B, Volume 1)	Existing conditions that do not comply fully with the requirements are permitted if they do not create a hazardous condition and are acceptable to the authority having jurisdiction.
19	Transparent Doors and Panels 3.3.1.19. (Part 3, Division B, Volume 1); 9.6.6.2. (Part 9, Division B, Volume 1) Glass in doors and sidelights are required to be protected by guards and to be safety glass.	Existing glass or transparent panels that do not comply fully with the requirements are permitted if sufficiently discernible or guards are provided in hazardous situations.
20	Dead-end Corridors 3.3.1.9.(7) (Part 3, Division B, Volume 1); 9.9.7.3. (Part 9, Division B, Volume 1) Dead-end corridors are permitted to a maximum length of 6 m.	- Dead-end corridors are permitted to a maximum length of 10 m in Group C occupancies provided - the <i>building</i> is fully sprinklered with fast response sprinklers, and - smoke detectors are installed in the corridor system. - Dead-end corridors are permitted to a maximum of 15 m in length in Group D, E, F2 and F3 occupancies provided - the <i>building</i> is fully sprinklered with fast response sprinklers, and - smoke detectors are installed in the corridor system.
21	Exits 3.4.2.1. (Part 3, Division B, Volume 1); 9.9.8.2. (Part 9, Division B, Volume 1) Floor areas shall be served by not fewer than 2 exits except as permitted by 3.4.2.1.(2) (Part 3, Division B, Volume 1).	Floor areas may be served by a single exit within the limits of 3.4.2.1.(2) (Part 3, Division B, Volume 1) provided - the <i>building</i> does not exceed 3 storeys in <i>building height</i>, - the <i>building</i> is fully sprinklered with fast response sprinklers, and - the <i>building</i> contains an approved fire alarm system with smoke detectors located in accordance with sentence 3.2.4.11. (Part 3, Division B, Volume 1)
22	Reduction of Exit Width 3.4.3.4.(3) (Part 3, Division B, Volume 1); 9.9.6.1. (Part 9, Division B, Volume 1) Swinging doors in their swing shall not reduce the effective width of exit stairs and landings to less than 750 mm.	Existing swinging doors in their swing are permitted to reduce the effective width of exit stairs and landings to a minimum of 550 mm provided - they serve Group C or D occupancies, - the <i>building</i> does not exceed 5

		storeys in <i>building height</i> , and (c) the <i>building</i> is fully sprinklered.
23	Fire Separation of Exits 3.4.4.1. (Part 3, Division B, Volume 1); 9.9.4. (Part 9, Division B, Volume 1) Exits are required to be separated from the remainder of the floor area by a fire separation having a fire-resistance rating of not less than 3/4 h.	- Existing fire separations of ½ h, are acceptable provided the <i>building</i> is fully sprinklered with fast response sprinklers and does not exceed 3 storeys in <i>building height</i>. <i>Buildings</i> not exceeding 5 storeys in <i>building height</i> may have exits that are separated by a 3/4 h fire separation provided the <i>building</i> is fully sprinklered.
24	Exits Through Lobbies 3.4.4.2. (Part 3, Division B, Volume 1); 9.9.8.5. (Part 9, Division B, Volume 1) Rooms adjacent to the lobby are required to be separated by a fire separation.	Rooms adjacent to the lobby are not required to be separated by a fire separation provided; - the floor area is sprinklered with fast response sprinklers, and - smoke detectors are installed in the adjacent rooms
25	Rooms Opening into an Exit 3.4.4.4.(7) (Part 3, Division B, Volume 1); 9.9.5.9. (Part 9, Division B, Volume 1) Service rooms and ancillary rooms are not permitted to open directly into an exit.	Service rooms and ancillary rooms may open directly into an exit provided - the <i>building</i> is fully sprinklered, - the room is sprinklered with fast response sprinklers, - the door assembly has a fire protection rating of at least 20 min., - the <i>building</i> does not exceed 3 storeys in <i>building height</i>, and - weatherstripping is installed on the door to prevent the passage of smoke.
26	Illumination of Exit Signs 3.4.5.1.(2) (Part 3, Division B, Volume 1); 9.9.10.5. (Part 9, Division B, Volume 1) Exit signs are required to be illuminated continuously while the <i>building</i> is occupied.	In provincial or municipal designated heritage <i>buildings</i> where exit signage may compromise historic appearances, or authenticity of displays, exit signs may be installed to light only on an emergency condition, such as by the fire alarm system or due to power failure.
27	Clearance from Exit Doors 3.4.6.10. (1) (Part 3, Division B, Volume 1); 9.9.6.6. (Part 9, Division B, Volume 1) Stair risers shall not be closer than 300 mm from an exit door.	Except as permitted in Sentences 3.4.6.10.(2) or 9.9.6.6.(2), existing exit doors shall not extend beyond the first riser.
28	Fire Escapes 3.4.7. (Part 3, Division B) (Volume 1); 9.9.2.1. (Part 9, Division B, Volume 1) Fire escapes are required to conform to Article	Existing fire escapes that do not completely conform to Article 3.4.7.1. are acceptable provided they are acceptable to the

	3.4.7. (Part 3, Division B, Volume 1).	authority having jurisdiction and (b) the <i>building</i> is fully sprinklered.
29	Fire Escape Construction 3.4.7.2. (Part 3, Division B, Volume 1).; 9.9.2.1. (Part 9, Division B, Volume 1).	Existing combustible fire escapes are permitted if the <i>building</i> is permitted to be of combustible construction by Part 3, (Part 3, Division B, Volume 1) Part 9 (Part 9, Division B, Volume 1) or by these Compliance Tables.
30	Protection of Fire Escapes 3.4.7.4. (Part 3, Division B, Volume 1); 9.9.2.3. (Part 9, Division B, Volume 1) Openings in the exterior wall adjacent to the fire escape are required to be protected by closures.	Existing openings in the exterior wall adjacent to the fire escape are not required to be protected by closures provided (a) the <i>building</i> is fully sprinklered, and (b) a sprinkler head is located within 1.5 m of the opening required to be protected by Article 3.4.7.4. (Part 3, Division B, Volume 1)
31	Vertical Service Space 3.6.3.1. (Part 3, Division B, Volume 1) Vertical service spaces are required to be separated from the adjacent floor area by a rated fire separation.	Existing vertical service spaces that do not completely conform to the rated fire separation requirements are acceptable provided the <i>building</i> is fully sprinklered.
32	Height and Area of Rooms 3.7.1. (Part 3, Division B, Volume 1); 9.5. (Part 9, Division B, Volume 1) The height and area of rooms are required to comply to minimum dimension requirements.	Existing rooms are not required to comply to the minimum dimension requirements of Subsection 3.6.1. (Part 3, Division B, Volume 1) or Section 9.5. (Part 9, Division B, Volume 1)
33	Window Areas 9.7.1.2. (Part 9, Division B, Volume 1) Windows in dwelling units are required to comply to minimum dimensions.	Existing windows are not required to comply with the minimum dimensions of Article 9.7.1.2. (Part 9, Division B, Volume 1)
34	Washrooms Required to be Barrier-Free 3.8.2.3. (1) NSBCR Except as permitted by Sentence (2), a washroom in a storey to which a barrier-free path of travel is required in accordance with Article 3.8.2.1., shall be barrier-free in accordance with the appropriate requirements in Articles 3.8.3.8. to 3.8.3.13. NSBCR	Except in Assembly occupancies and Group D Business and personal services occupancies intended to offer medical or therapeutic services, a barrier free washroom need not be provided in an existing <i>building</i> with a <i>building area</i> less than 120 m ² .
35	Entrances 3.8.1.2.(1) NSBCR (1) In addition to the barrier-free entrances required by Sentence (2), not less than 50% of the pedestrian entrances of a <i>building</i> referred to in Sentence 3.8.1.1.(1) shall be barrier-free and shall lead from (a) the outdoors at sidewalk level, or	Where an existing <i>building</i> has (a) a <i>building area</i> less than 120 m ² , (1292 sq. ft.), and (b) the slope from the entrance level floor at the entrance door to a street or public way is greater than 1 in 10, and

	(b) a ramp that conforms to Article 3.8.3.4. and leads from a sidewalk.	(c) no entrance is more than 1 m to the property line, and (d) no alternate access to an entrance from a street or public way is possible; (See Appendix Note No. 35) the owner may use a stair with (a) a maximum rise of 150 mm (6"), and (b) a minimum run of 280 mm (11"), and (c) tactile landings, and (d) contrasting colour nosings, and ~~(e)~~ [(e)] and unobstructed width of 1 m.
36	Mechanical Systems Part 6 and Part 7.	Existing mechanical systems in <i>buildings</i> are not required to fully comply to the requirements of Parts 6 or 7 provided (a) it is not an unsafe condition and (b) it is acceptable to the authority having jurisdiction.

Schedule E

Part 10 - Energy Efficiency Measures Nova Scotia Building Code Regulations

Division A

See Objectives and Sub Objectives added under 3.1.1.24. NSBCR

Division B

Part 1 - Acceptable Solutions

1.3.1.2. Referenced Documents

Table 1.3.1.2. amended

1.3.1.2. Applicable Editions

- (1) Where documents are referenced in this Code, they shall be the editions designated in Column 2 of Table 1.3.1.2.

**Table 1.3.1.2.
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)**

Issuing Agency	Document Number	Title of Document	Code Reference
ASTM	ASTM E283	Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen	10.3.3.12.

CGSB	CAN/CGSB-63.14-M89	Plastic Skylights	10.3.2.8.(1) 10.3.3.3.(1)
CGSB	CAN/CGSB-82.1-M89	Sliding Doors	10.3.1.3.(1) 10.3.3.13.(2)
CGSB	CAN/CGSB-82.5-M88	Insulated Steel Doors	10.3.2.1.(1) 10.3.3.11.(2) 10.3.3.13.
CSA	CGA P.2-1991	Testing Method for Measuring Annual Fuel Utilization Efficiencies of Residential Furnaces and Boilers	10.3.1.2.
CSA	CGA P.8-97	Thermal Efficiencies of Industrial and Commercial Gas-Fired Package Furnaces	10.3.4.6.(1)
CSA	ANSI Z21.47-2003/ CSA 2.3-2003	Gas-Fired Central Furnaces	10.3.4.6.(1)
CSA	ANSI Z83.8-2002/ CSA 2.6-2002	Gas Unit Heaters and Gas-Fired Duct Furnaces	10.3.4.6.(1)
CSA	CAN/CSA-P.3-2004	Testing Method for Measuring Energy Consumption and Determining Efficiencies of Gas-Fired Water Heaters	10.3.4.6.(1)
CSA	ANSI Z21.10.3-2004/ CSA 4.3-2004	Gas Water Heaters - Volume III, Storage Water Heaters With Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous	10.3.4.6.(1)
CSA	CAN/CSA-B211-00	Energy Efficiency of Oil-Fired Storage Tank Water Heaters	10.3.4.6.(1)
CSA	CSA B212-00	Energy Utilization Efficiencies of Oil-Fired Furnaces and Boilers	10.3.4.6.(1)
CSA	CAN/CSA-A440.2-00	Energy Performance Evaluation of Windows and Sliding [Sliding] Glass Doors	10.3.1.3.(1)
CSA	CAN/CSA-C191-04	Performance of Electric Storage Tank Water Heaters for Domestic Hot Water Service	10.3.4.6.(1)
CSA	CSA C368.1-M90	Performance Standard for Room Air Conditioners	10.3.4.4.(3)
CSA	CAN/CSA-C390-98	Energy Efficiency Test Methods for Three-Phase Induction Motors	10.3.4.12.
CSA	CAN/CSA-C654-M91	Fluorescent Lamp Ballast Efficacy Measurements	10.3.4.7. A-10.3.4.7.
CSA	CAN/CSA-C656-05	Performance Standard for Split-System and Single Package Central Air Conditioners and Heat Pumps	10.3.4.4.(3) 10.3.4.6.
CSA	CAN/CSA-C743-02	Performance Standard for Rating Packaged Water Chillers	10.3.4.4.
CSA	ARI 310/380-2004 / CAN/CSA-C744-04	Standard for Packaged Terminal Air Conditioners and Heat Pumps	10.3.4.4.(3)
CSA	CSA C745-03	Energy Efficiency of Electric Storage Tank Water Heaters and Heat Pump Water Heaters	10.3.4.6.(1)
CSA	CAN/CSA-C746-98	Performance Standard for Rating Large Air Conditioners and Heat Pumps	10.3.4.4.(3)

CSA	CAN/CSA-C13256-1-01	Water-Source Heat Pumps —Testing and Rating for Performance — Part 1 Water-to-Air Heat and Brine-to-Air Heat Pumps (Adopted ISO 13256-11998, first edition, 1998-08-15, with Canadian deviations)	10.3.4.4.(3) 10.3.4.6.
SMACNA	SMACNA	, “HVAC Duct Construction Standards - Metal and Flexible”	10.3.4.5.(1) 10.3.4.5.(2)
Column 1	Column 2	Column 3	Column 4

Division B

Part 3 - Fire Protection, Occupant Safety and Accessibility

3.1.5. 22. Combustible Solar Collector Systems

- (1) A combustible solar collector system is permitted to be installed above the roof of a *building* required to be of noncombustible construction.

Division B

Part 10 - Part Resource Conservation

10.1. General

10.1.1. Application

10.1.1.1. Scope

- (1) The scope of this Part shall be as described in Article 1.3.1.2. of Division A NBCC.

10.1.1.2. Application

- (1) This Part applies to resource conservation in the design and construction of *buildings*.
- (2) This Part shall come into effect on and after December 31, 2009.

10.2. Energy Efficiency

10.2.1. General

10.2.1.1. Energy Efficiency Design

- (1) Sentences (2) to (4) apply to construction for which a permit has been applied for on or after December 31, 2009.
- (2) The energy efficiency of a *building* or part of a *building* of residential occupancy that is within the scope of Part 9 and is intended for occupancy on a continuing basis during the winter months shall,
 - (a) conform to the thermal insulation requirements of Subsection 10.3.2.,
 - (b) conform to the thermal design requirements of Subsection 10.3.3. for Residential buildings, or

- (c) be designed in accordance with a performance protocol acceptable to the authority having jurisdiction that will achieve at least the minimum equivalent level of energy conservation performance required by Part 10. (See Appendix A-10.2.1.1.(2) NSBCR and Appendix A, Division B, Volume 2, A-9.1.1.1. NBC)
- (3) The energy efficiency of a building or part of a building shall conform to the design requirements of Subsection 10.3.4. if the building or part of the building,
 - (a) is within the scope of Part 9, and
 - (b) does not contain a residential occupancy.
- (4) Sentence (1) does not apply to,
 - (a) farm buildings,
 - (b) buildings intended primarily for manufacturing or commercial or industrial processing,
 - (c) non heating season, or intermittently occupied *buildings*,
(See Appendix A, Division B, Volume 2, A-9.1.1.1.(1) NBC)
 - (d) heritage *buildings*
(See Appendix Note A-10.3.4.1. NSBCR)

10.2.2. Motion Sensors

10.2.2.1. Motion Sensors

- (1) Lighting installed to provide the minimum illumination levels required by this Code may be controlled by motion sensors except where the lighting is installed in an exit.
- (2) Where motion sensors are used to control minimum lighting in a public corridor or corridor providing access to exit for the public, the motion sensors shall be installed with switch controllers equipped for fail-safe operation and illumination timers set for a minimum 15-minute duration.
- (3) A motion sensor shall not be used to control emergency lighting.

10.3. Energy Efficiency for *Buildings* Within the Scope of Part 9

10.3.1. General

10.3.1.1. Application

- (1) Except as provided in Sentence (2), this Section applies to the energy efficiency of buildings within the scope of Part 9 intended for occupancy on a continuing basis during the winter months.
- (2) This Section does not apply to,
 - (a) farm *buildings*,

- (b) buildings intended primarily for manufacturing or commercial or industrial processing,
 - (c) non heating season, or intermittently occupied *buildings*,
 - (d) heritage *buildings*
- (See Appendix Note A-10.3.4.1. NSBCR)

10.3.1.2. Equipment Efficiency for *Buildings* of Residential Occupancy

- (1) The minimum annual fuel utilization efficiency of a space-heating and domestic hot water *appliances* serving a building of residential occupancy shall conform to Table 10.3.1.2.

**Table 10.3.1.2. *Space-heating* and domestic hot water *appliances*
Minimum Annual Fuel Utilization Efficiency
Forming Part of Sentence 10.3.1.2.(1)**

Column 1	Column 2
<i>Space-heating</i> and domestic hot water <i>appliances</i> Fuel Source	Minimum Annual Fuel Utilization Efficiency
Natural gas	90%
Propane	90%
Oil - Hot Air Oil - Hot Water	85% 85%

10.3.1.3. Residential Windows and Sliding Glass Doors

- (1) The energy rating and the overall coefficient of heat transfer required for windows and sliding glass doors in a residential occupancy shall be determined in conformance with CAN/CSA-A440.2, “Energy Performance Evaluation of Windows and Sliding Glass Doors”. (See Appendix A, Division B, Volume 2, A-9.7.2.1.(1) NBC)

10.3.2. Thermal Insulation for *Buildings* of Residential Occupancy

10.3.2.1. Required Insulation

- (1) All walls, ceilings, floors, windows and doors that separate heated space from unheated space, the exterior air or the exterior soil shall have thermal resistance ratings conforming to this Subsection.
- (2) Insulation shall be provided between heated and unheated spaces and between heated spaces and the exterior, and around the perimeter of concrete slabs-on-ground.
- (3) Reflective surfaces of insulating materials shall not be considered in calculating the thermal resistance of building assemblies.

- (4) Except as permitted in Articles 10.3.2.3., 10.3.2.4., 10.3.2.6., 10.3.2.7., 10.3.2.8. and 10.3.2.9., the minimum thermal resistance of insulation shall conform to Table 10.3.2.1.

**Minimum Thermal Resistance of Insulation to be Installed
Forming Part of Sentence 10.3.2.1.(4)**

	Building Element Exposed to the Exterior or to Unheated Space	Minimum RSI (R) Values Required ³ .
1	Ceiling below attic or roof space	7.00 (40)
2	Roof assembly without attic or roof space	5.46 (31)
3	Wall other than foundation wall (including walls between heated and unheated spaces)	4.23 (24)
4	ICF wall above grade ¹ .	3.75 (21.3)
5	ICF wall below grade enclosing heated space (full height insulation) ¹ .	3.75 (21.3)
6	Foundation walls enclosing heated space (full height insulation)	3.52 (20)
7	Floors over unheated spaces including Overhanging (cantilevered) Floors	5.46 (31)
8	Floor joist header space	4.23 (24)
9	Frost Wall (with slab-on-ground) ²	1.76 (10)
10	Slab-on-ground perimeter insulation (see Sentence 10.3.3.8.(1)) ² .	1.76 (10)
11	Under Slab-on-ground containing heating pipes, tubes, ducts or cables ² .	1.76 (10)
12	Under Slab-on-ground not containing heating pipes, tubes, ducts or cables ² .	1.76 (10)
13	Basement floor slabs located not more than 1 m below grade ² .	1.76 (10)
14	Basement floor slabs located more than 1 m below grade	nil

1. ICF walls provide an effective insulating value of not less than R 21.3. Walls of this construction have inherently effective air barriers and minimal thermal bridging characteristics.
2. This value may be reduced to R 4 at the thermal break between the slab and wall.
3. "Insulation values" shown are for the insulation only.

10.3.2.2. Elements Acting as a Thermal Bridge

- (1) Except for a foundation wall, the insulated portion of a wall that incorporates wood stud framing elements that have a thermal resistance of less than RSI 0.90 shall be insulated to restrict heat flow through the studs by a material providing a thermal resistance at least equal to 25 per cent of the thermal

resistance required for the insulated portion of the assembly in Sentence 10.3.2.1.(4).

- (2) Except as provided in Sentence (3), the thermal resistance of the insulated portion of a building assembly in Sentence 10.3.2.1.(4) that incorporates metal framing elements, such as steel studs and steel joists, that act as thermal bridges to facilitate heat flow through the assembly, shall be 20 per cent greater than the values shown in Table 10.3.2.1., unless it can be shown that the heat flow is not greater than the heat flow through a wood frame assembly of the same thickness.
- (3) Sentence (2) does not apply to building assemblies incorporating thermal bridges where the thermal bridges are insulated to restrict heat flow through the thermal bridges by a material providing a thermal resistance at least equal to 25 per cent of the thermal resistance required for the insulated portion of the assembly in Sentence 10.3.2.1.(4).

10.3.2.3. Thermal Resistance Values for Roof and Ceiling Assemblies

- (1) The thermal resistance values in Table 10.3.2.1. for exposed roofs or ceilings may be reduced near eaves to the extent made necessary by the roof slope and required ventilation clearances.

10.3.2.4. Insulation of Foundation Walls

- (1) Foundation walls enclosing heated space shall be insulated from the underside of the subfloor of the floor above, down to the finished floor slab.
- (2) The insulation required by Sentence (1) may be provided by a system installed,
 - (a) on the interior of the foundation wall,
 - (b) on the exterior face of the foundation wall, or
 - (c) partially on the interior and partially on the exterior, provided the thermal performance of the system is equivalent to that permitted in Clause (a) or (b).
- (3) Insulation applied to the exterior of a slab-on-ground floor shall extend down at least 600 mm below the adjacent exterior ground level or shall extend down and outward from the floor or wall for a total distance of at least 600 mm. (See Appendix Note A-10.3.3.8. NSBCR)
- (4) If a foundation wall is constructed of hollow masonry units, one or more of the following shall be used to control convection currents in the core spaces,
 - (a) filling the core spaces,
 - (b) at least one row of semi-solid blocks at or below grade, or
 - (c) other similar methods.

- (5) Masonry walls of hollow units that penetrate the ceiling shall be sealed at or near the ceiling adjacent to the roof space to prevent air within the voids from entering the attic or roof space by,
 - (a) capping with masonry units without voids, or
 - (b) installation of flashing material extending across the full width of the masonry.

10.3.2.5. Enclosed Unheated Space

- (1) Where an enclosed unheated space is separated from a heated space by glazing, the unheated enclosure may be considered to provide a thermal resistance of RSI 0.16.

10.3.2.6. Thermal Resistance of Windows

- (1) Except as permitted in Sentence (2), where a storm window is not provided, all windows that separate heated space from unheated space shall have,
 - (a) an overall coefficient of heat transfer of not more than $1.8 \text{ W/ m}^2\text{°C}$, or
 - (b) an energy rating of not less than,
 - (i) 25 for operable windows, and
 - (ii) 35 for fixed windows.
- (2) A basement window that incorporates a loadbearing structural frame shall be double glazed with a low-E coating.

10.3.2.7. Minimum Thermal Resistance of Doors

- (1) Except for doors on enclosed unheated vestibules and cold cellars, and except for glazed portions of doors, all doors that separate heated space from unheated space shall have a thermal resistance of not less than RSI 0.7 where a storm door is not provided.
- (2) All sliding glass doors that separate heated space from unheated space shall have
 - (a) an overall coefficient of heat transfer of not more than $1.8 \text{ W/ m}^2\text{°C}$, or

Clause 10.3.2.7(2)(a) amended: N.S. Reg. 326/2009.

 - (b) an energy rating of not less than 25.

10.3.2.8. Minimum Thermal Resistance of Skylights

- (1) All skylights that separate heated space from unheated space shall have
 - (a) an overall coefficient of heat transfer of not more than $2.6 \text{ W/ m}^2\text{°C}$, or
 - (b) a U value of not more than 2.7.

10.3.2.9. Log Wall Construction and Post, Beam and Plank Construction

- (1) Except as provided in Sentences (2) and (3), log wall construction and post, beam and plank construction shall have a minimum thermal resistance of RSI 2.1 for the total assembly.

- (2) The thermal resistance value in Sentence (1) for the total wall assembly may be reduced to not less than RSI 1.61 if,
 - (a) the thermal resistance of insulation for the exposed roof or ceiling required in Table 10.3.2.1. is increased by an amount equivalent to the reduction permitted in this Sentence, and
 - (b) for log walls, the logs have tongue-and-groove or splined joints.
- (3) Where milled log walls are installed, the thermal resistance value in Sentence (1) for the total wall assembly does not apply if,
 - (a) the mean thickness of each log is not less than 150 mm,
 - (b) the thermal resistance of insulation for the exposed roof or ceiling required in Table 10.3.2.1. is increased by RSI 0.53, and
 - (c) the logs have tongue-and-groove or splined joints.

10.3.3. Thermal Design for *Buildings* of Residential Occupancy Within the Scope of Part 9

10.3.3.1. Application

- (1) This Subsection applies to the thermal design of buildings to which Clause 10.2.1.1.(2)(b) applies.

10.3.3.2. General Requirements

- (1) The materials for, and the installation of, thermal insulation, air barrier and vapour barrier protection shall conform to Section 9.25.
- (2) Foamed plastic thermal insulation shall be protected as described in Article 9.10.17.10.
- (3) Crawl spaces shall conform to Section 9.18.
- (4) Roof spaces shall conform to Section 9.19.
- (5) Ventilation requirements shall conform to Section 9.32.
- (6) Heating and air-conditioning requirements shall conform to Section 9.33.

10.3.3.3. Thermal Resistance

- (1) Except as provided in Articles 10.3.3.4. to 10.3.3.8., and except for doors, windows, skylights and other closures, the thermal resistance of each building assembly through any portion that does not include framing or furring shall conform to Table 10.3.3.3.

**Table 10.3.3.3.
Minimum Thermal Resistance of *Building* Assemblies
Forming Part of Sentence 10.3.3.3.(1)**

	Building Element Exposed to the Exterior or to Unheated Space	Minimum RSI (R) Values Required ^{3.}
1	Ceiling below attic or roof space	7.00 (40)
2	Roof assembly without attic or roof space	5.46 (31)
3	Wall other than foundation wall (including walls between heated and unheated spaces]	4.23 (24)
4	ICF wall above grade ^{1.}	3.75 (21.3)
5	ICF wall below grade enclosing heated space (full height insulation) ^{1.}	3.75 (21.3)
6	Foundation walls enclosing heated space (full height insulation)	3.52 (20)
7	Floors over unheated spaces including Overhanging (cantilevered) Floors	5.46 (31)
8	Floor joist header space	4.23 (24)
9	Frost Wall (with slab-on-ground) ²	1.76 (10)
10	Slab-on-ground perimeter insulation (see Sentence 10.3.3.8.(1)) ²	1.76 (10)
11	Under Slab-on-ground containing heating pipes, tubes, ducts or cables ^{2.}	1.76 (10)
12	Under Slab-on-ground not containing heating pipes, tubes, ducts or cables ^{2.}	1.76 (10)
13	Basement floor slabs located not more than 1 m below grade ^{2.}	1.76 (10)
14	Basement floor slabs located more than 1 m below grade	nil

1. ICF walls provide an effective insulating value of not less than R 21.3. Walls of this construction have inherently effective air barriers and minimal thermal bridging characteristics.
2. This value may be reduced to R 4 at the thermal break between the slab and wall.

10.3.3.4. Metal Framing Elements Acting as Thermal Bridge

- (1) Except as provided in Article 10.3.3.5., the thermal resistance of the insulated portion of a building assembly that incorporates metal framing elements, such as steel studs and steel joists, that act as thermal bridges to facilitate heat flow through the assembly, shall be 20 per cent greater than the values shown in Table 10.3.3.3., unless it can be shown that the heat flow is not greater than the heat flow through a wood frame assembly of the same thickness.

10.3.3.5. Insulated Thermal Bridges

- (1) Article 10.3.3.4. does not apply for building assemblies incorporating thermal bridges where the thermal bridges are insulated to restrict heat flow through

the thermal bridges by a material providing a thermal resistance at least equal to 25 per cent of the thermal resistance required for the insulated portion of the assembly in Article 10.3.3.3.

10.3.3.6. Reduction of Thermal Resistance

- (1) The thermal resistance of a building assembly may be reduced by not more than 20 per cent from that required in Articles 10.3.3.3. and 10.3.3.4., and the amount of glazing may be increased to more than permitted in Sentence 10.3.3.10.(2), where it can be shown that the total calculated heat loss from the building enclosure does not exceed the heat loss that would result if the enclosure were constructed in conformance with the minimum thermal resistance requirements in Articles 10.3.3.3. and 10.3.3.4. and with the maximum amount of glazing permitted in Sentence 10.3.3.10.(2), provided no allowance is made for solar heat gains or for the orientation of the glazing as described in Sentence 10.3.3.10.(4).

10.3.3.7. Thermal Resistance Values for Roof and Ceiling Assemblies

- (1) The thermal resistance values in Articles 10.3.3.3. and 10.3.3.4. for roof or ceiling assemblies that separate heated space from unheated space or the exterior may be reduced near the eaves to the extent made necessary by the roof slope and required ventilation clearances, except that the thermal resistance at the location directly above the inner surface of the exterior wall shall be at least $2.1 \text{ m}^2\text{C/W}$.

10.3.3.8. Foundation Wall Insulation

- (1) Insulation applied to the exterior of a slab-on-ground floor shall extend down at least 600 mm below the adjacent exterior ground level or shall extend down and outward from the floor or wall for a total distance of at least 600 mm. (See Appendix Note A-10.3.3.8. NSBCR)

10.3.3.9. Enclosed Unheated Space

- (1) Where an enclosed unheated space, such as a sun porch, enclosed verandah or vestibule, is separated from a heated space by glazing, the unheated enclosure may be considered to provide thermal resistance of $0.16 \text{ m}^2\text{C/W}$, or the equivalent of one layer of glazing.

10.3.3.10. Windows and Glazing

- (1) Except as provided in Sentences (2) and (3), windows and all glazing that separates heated space from unheated space or the exterior shall conform to Article 10.3.2.6.
- (2) Except as provided in Sentences (3) and (4), the total area of glazing, including glazing for doors and skylights, that separates heated space from unheated space or the exterior shall not exceed 20 per cent of the floor area of the storey served by the glazed areas and shall not exceed 40 per cent of the total area of the walls of that storey that separates heated space from unheated space or the

exterior. (In the case of a sloping wall, the area of the opaque portion of the wall is calculated as its projected area on a vertical plane.)

- (3) Where the thermal resistance of glazing is different from that required in Sentence (1) and Article 10.3.3.9., the area of such glazing for the purpose of applying Sentence (2) may be assumed as being equal to the actual area multiplied by the ratio of the required thermal resistance divided by the actual thermal resistance of the glazing.
- (4) Except as provided in Sentence (5), the area of glazing that contains clear glass or that has a shading coefficient of more than 0.70 that is unshaded in the winter and faces a direction within 45° of due South may be assumed to be 50 per cent of its unshaded area in calculating the maximum area of glazing in Sentences (2) and (3) provided the building is designed with a system that is capable of distributing the solar heat gain from such glazed areas throughout the building. For the purpose of determining whether or not the glazing is shaded in the winter, the shading shall be calculated using the noon sun angles of December 21.
- (5) Sentence (4) shall not apply where the building is designed to be cooled unless the glazing described in Sentence (4) is shaded in the summer with exterior devices. For the purpose of determining whether or not the glazing is shaded in the summer, the shading shall be calculated using the noon sun angles of June 21.

10.3.3.11. Doors

- (1) Air curtains shall not be used in place of exterior doors. (See Appendix A, A-10.3.3.11(1) NSBCR)
- (2) Except for doors used primarily to facilitate the movement of vehicles or handling of material, infiltration around doors shall conform to the appropriate requirements in Article 10.3.3.12.
- (3) Except for doors on enclosed unheated vestibules, all doors that separate heated space from the outside shall conform to Articles 10.3.2.7.

10.3.3.12. Air Infiltration

- (1) Windows that separate heated space from unheated space or the exterior shall be designed to limit the rate of air infiltration to not more than 0.775 L/s for each metre of sash crack when tested at pressure differential of 75 Pa in conformance with ASTM E283, "Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen".

- (2) Manually operated exterior sliding glass door assemblies that separate heated space from unheated space or the exterior shall be designed to limit air infiltration to not more than 2.5 L/s for each square metre of door area when tested in conformance with Sentence (1).
- (3) Except where the door is weather-stripped on all edges and protected with a storm door or by an enclosed unheated space, exterior swing type door assemblies for dwelling units, individually rented hotel rooms and suites shall be designed to limit the rate of air infiltration to not more than 6.35 L/s for each square metre of door area when tested in conformance with Sentence (1).
- (4) Door assemblies other than those described in Sentences (2) and (3), that separate heated space from unheated space or the exterior shall be designed to limit the rate of air infiltration to not more than 17.0 L/s for each metre of door crack when tested in conformance with Sentence (1).
- (5) Caulking material to reduce air infiltration shall conform to the requirements in Subsection 9.27.4.
- (6) The junction between the sill plate and the foundation, joints between exterior wall panels and any other location where there is a possibility of air leakage into heated spaces in a building through the exterior walls, such as at utility service entrances, shall be caulked, gasketed or sealed to restrict such air leakage.
- (7) Air leakage between heated space and adjacent roof or attic space caused by the penetration of services shall be restricted in conformance with the requirements of Subsection 9.25.3.

10.3.4. Buildings of Non-residential Occupancy

10.3.4.1. Application

- (1) Except where exempted by 10.2.1.1.(4), this Subsection applies to the energy efficiency of buildings or parts of buildings described in Sentence 10.2.1.1.(3). (See Appendix Note A-10.3.4.1.(1) NSBCR)

10.3.4.2. Thermal Resistance of the *Building Envelope*

- (1) Except as permitted in Sentences (2) and (3), the minimum thermal resistance of all walls, ceilings and floors that separate heated space from unheated space, the exterior air or the exterior soil shall conform to Table 10.3.4.2.A.
- (2) Where the top of a foundation wall is less than 1 200 mm above the adjoining ground level, those portions of the foundation wall that are above ground may be insulated to the level required for the below grade portion of the foundation wall.

Table 10.3.4.2.A. Minimum Thermal Resistance of *Building Assemblies*

Forming Part of Sentence 10.3.4.2.(1)

<i>Building Assembly</i>	Minimum RSI (R) Value Required
Opaque wall assembly	2.63 (15)
Wall assembly adjacent to unconditioned space	1.61 (9)
Below grade wall	2.11 (12)
Roof assembly	3.91 (22)
Floor assembly over unconditioned space	4.52 (26)
Column 1	Column 2

Notes to Table 10.3.4.2.A.

1. The thermal resistance determined for the building assembly shall take into account the thermal bridging in the assembly.
2. "Insulation values" shown are for insulation only.
3. For the purposes of this Table the effects of thermal bridging are waived for
 - (a) intermediate structural connections of continuous steel shelf angles (or similar structural element) used to support the building facade provided there is a thermal break between the remaining contact surface of the supporting element and the building structure. This provision is intended to substantially reduce thermal bridging effects caused by the continuous bearing between structural elements supporting building facade and the building frame (ie. steel shelf angle attached to perimeter floor slab to support brick veneer), or
 - (b) structural connections of load bearing elements where a thermal break cannot be achieved.
4. In addition to the exceptions permitted above, the effects of thermal bridging are also waived for
 - (a) exposed structural projections of buildings where the total cross-sectional area of the exposed element does not exceed 2% of the exterior building envelope area and the cross-sectional area of the exposed structural element is measured where it penetrates the insulation component of the building envelope. For example, the total cross-sectional area of cantilevered concrete balconies and other projections penetrating the insulation component of the building envelope cannot exceed 2% of the exterior building envelope area,
 - (b) ties in masonry construction,
 - (c) insulation clips in masonry construction,
 - (d) flashing, and
 - (e) top exposed portion of foundation walls provided the exposure does not exceed 200 mm measured from the top of the foundation wall to the top of exterior wall insulation which meets the minimum insulation RSI-Value for wall below grade stipulated in the appropriate Alternate Component Package Tables. (See Appendix Notes Table 10.3.3.3. Figure 1 NSBCR)

- (3)** The minimum thermal resistance of a slab-on-ground shall conform to Table 10.3.4.2.B.

Table 10.3.4.2.B.
Minimum Thermal Resistance for Slab-On-Ground Insulation
Forming Part of Sentence 10.3.4.2.(3)

Type of Slab-On-Ground	Position of Insulation	Length of Insulation, mm	Minimum RSI Value(1)
Unheated	Horizontal	600	3.17
		1200	1.94
	Vertical	600	1.41
		1200	0.7
Heated	Horizontal	600	3.52
		1200	2.29
	Vertical	600	1.76
		1200	1.06
Column 1	2	3	4

Notes to Table 10.3.4.2.B.

(1) "RSI value" shown is for insulation only.

- (4) The maximum overall coefficient of heat transfer for windows that separate heated space from unheated space shall conform to Table 10.3.4.2.C.

Table 10.3.4.2.C.
Maximum Overall Coefficient of Heat Transfer for Windows
Forming Part of Sentence 10.3.4.2.(4)

Window-to-Wall Ratio	Maximum Overall Coefficient of Heat Transfer Required, W/ mC
less than 0.2	3.01
0.2 to 0.4	2.28
more than 0.4	1.7
Column 1	Column 2

- (5) Except for swinging glass doors, the minimum thermal resistance of doors that separate heated space from unheated space shall be not less than RSI 0.7.

10.3.4.3. Air Infiltration

- (1) Where a *building* component or assembly separates interior conditioned space from exterior space, interior space from ground or environmentally dissimilar interior spaces, the component or assembly shall contain an air barrier system conforming to the applicable requirements of Part 5 or Subsection 9.25.3.

10.3.4.4. Heating, Ventilating and Air-Conditioning

- (1) A heating, ventilating and air-conditioning system that serves more than one heating, ventilating and air-conditioning zone shall conform to ANSI/ASHRAE/IESNA 90.1 "Energy Standard for *Buildings* Except Low-Rise Residential *Buildings*". (See Appendix Note Tables 10.3.4.4(1) to Table 10.3.4.4(7) NSBCR)
- (2) Sentences (3) to (11) and Article 10.3.4.5. apply to a heating, ventilating and air-conditioning system that serves a single heating, ventilating and air-conditioning zone.
- (3) The energy efficiency of equipment in a heating, ventilating and air-conditioning system that serves a single heating, ventilating and air-conditioning zone shall conform to
 - (a) CAN/CSA-C656-05 Performance Standard for Split-System and Single Package Central Air Conditioners and Heat Pumps
 - (b) CAN/CSA-C743-02 Performance Standard for Rating Packaged Water Chillers
 - (c) ARI 310/380-2004 /CAN/CSA-C744-04 / Standard for Packaged Terminal Air Conditioners and Heat Pumps
 - (d) CAN/CSA-C746-98 Performance Standard for Rating Large Air Conditioners and Heat Pumps
 - (e) CAN/CSA-C13256-1-01 Water-Source Heat Pumps —Testing and Rating for Performance Part 1 Water-to-Air Heat and Brine-to-Air Heat Pumps (Adopted ISO 13256-11998, first edition, 1998-08-15, with Canadian deviations)
- (4) An air-conditioning system with a cooling capacity of 40 kW or more shall have an economizer,
 - (a) controlled by appropriate high limit shut-off control, and
 - (b) equipped with either barometric or powered relief sized to prevent excess pressurization of the building.
- (5) Outdoor air dampers for economizer use shall be provided with blade and jamb seals.
- (6) A heat recovery ventilator with a recovery effectiveness of 50% or more at the outside winter design temperature shall be provided where the quantity of the outdoor air supplied to the air duct distribution system is,

- (a) more than 1 400 L/s, and
 - (b) more than 70% of the supply air quantity of the system.
- (7) Where a heat recovery ventilator is installed, the system shall have provisions to bypass or control the heat recovery ventilator to permit operation of the air economizer.
- (8) A heating, ventilating and air-conditioning system shall be controlled by a manual changeover or dual set point thermostat.
- (9) Except for a system requiring continuous operation, a heating, ventilating and air-conditioning system that has a cooling or heating capacity greater than 4.4 kW and a supply fan motor rated for more than 0.5 kW shall be provided with a time clock that,
- (a) is capable of starting and stopping the system under different schedules for seven different day-types per week,
 - (b) is capable of retaining programming and time setting during a loss of power for a period of 10 hours or more,
 - (c) includes an accessible manual override that allows temporary operation of the system for up to two hours,
 - (d) is capable of temperature setback down to 13°C during off-hours, and
 - (e) is capable of temperature setup to 32°C during off-hours.
- (10) Where separate heating and cooling equipment serves the same temperature zone, thermostats shall be interlocked to prevent simultaneous heating and cooling.
- (11) A heating, ventilating and air-conditioning system with a design supply air capacity greater than 5000 L/s shall have optimum start controls

10.3.4.5. Ducts, Plenums and Piping

- (1) A duct or a plenum that is not protected by an insulated exterior envelope or that is exposed to an unheated space shall be,
- (a) sealed to a Class A seal level in accordance with the SMACNA, “HVAC Duct Construction Standards - Metal and Flexible”, to minimize air leakage, and
 - (b) insulated to provide a thermal resistance of not less than RSI 1.4.
- (2) A supply or exhaust duct or plenum that is located in a conditioned space shall be sealed to a Class C seal level in accordance with the SMACNA, “HVAC Duct Construction Standards - Metal and Flexible”, to minimize air leakage.
- (3) Except for piping within prefabricated equipment, piping used for steam, hot water heating or cooling shall be insulated in accordance with Table 10.3.4.5.

Table 10.3.4.5.
Minimum Thickness of Pipe Insulation (1)
Forming Part of Sentences 10.3.4.5.(3) and 10.3.4.6.(2)

Use of pipe	Nominal pipe size not more than 40 mm	Nominal pipe size more than 40 mm
Steam	40	50
Hot water heating	25	40
Domestic hot water	12	25
Cooling	12	25
Column 1	Column 2	Column 3

Notes to Table 10.3.4.5.

- (1) Insulation material shall have a thermal conductivity of not more than 0.42 W/ m°C.
- (4) Insulation exposed to weather shall be protected by a covering such as aluminum, sheet metal, painted canvas or plastic.
- (5) An exhaust duct with a design capacity of more than 140 L/s on a heating, ventilating and air-conditioning system that does not operate continuously shall be equipped with a gravity or motorized damper that will automatically shut when the system is not in operation.
- (6) An air duct distribution system shall be balanced in the following sequence
 - (a) Minimize throttling losses.
 - (b) If the fan is rated for more than 0.75 kW, adjust the fan speed to meet design flow conditions.
- (7) A hydronic system shall be proportionately balanced to minimize throttling losses.

10.3.4.6. Service Water Heating

(See Appendix Note A-Table 10.3.4.6.(1))

- (1) Water heating equipment, hot water supply boilers used solely for heating potable water and hot water storage tanks shall meet the minimum efficiency values in
 - (a) CSA C745-03 Energy Efficiency of Electric Storage Tank Water Heaters and Heat Pump Water Heaters
 - (b) CAN/CSA-P.3-2004 Testing Method for Measuring Energy Consumption and Determining Efficiencies of Gas-Fired Water Heaters

- (c) ANSI Z21.10.3-2004 / CSA 4.3-2004 Gas Water Heaters - Volume III, Storage Water Heaters With Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous
 - (d) CAN/CSA-B211-00 Energy Efficiency of Oil-Fired Storage Tank Water Heaters
- (2) Domestic hot water heating piping shall be insulated in accordance with Table 10.3.4.5. if it is,
- (a) recirculating system piping,
 - (b) located within the first 2.5 m of outlet piping in a constant temperature non-recirculating storage system,
 - (c) an inlet pipe located between the storage tank and a heat trap in a non-recirculating storage system, or
 - (d) a pipe that is externally heated by methods such as a heat trace or impedance heating.
- (3) A hot water storage tank shall be provided with a temperature control to permit adjustment of the water storage temperature.
- (4) An automatic time switch or other control that can be set to switch off the usage temperature maintenance system during extended periods when hot water is not required shall be installed in a domestic hot water system that is designed to maintain usage temperatures in hot water pipes such as recirculating hot water systems or heat trace.
- (5) If a recirculating pump is used to maintain storage tank water temperature, the pump shall be equipped with a control to limit its operation to a period from the start of the heating cycle to a maximum of five minutes after the end of the heating cycle.
- (6) In a washroom located in a public facility, a device shall be provided to control the maximum temperature of water delivered from a lavatory faucets to not more than 43°C.
- (7) A vertical pipe riser that serves a storage water heater or a storage tank shall have heat traps on both the inlet and outlet piping as close as practical to the tank if,
- (a) the riser is in a non-recirculating system, and
 - (b) the storage water heater or the storage tank does not have integral heat traps.

10.3.4.7. Lighting

- (1) Except as provided in Sentence (2), Articles 10.3.4.7. to 10.3.4.11. apply to,
- (a) interior spaces of a building,

- (b) exterior building features, including facades, illuminated roofs, architectural features, entrances, exits, loading docks and illuminated canopies, and
 - (c) exterior building ground lighting provided through the building's electrical service.
- (2) Articles 10.3.4.7. to 10.3.4.11. do not apply to emergency lighting that is automatically turned off during the normal use of the building.
- (3) Fluorescent light ballasts shall meet or exceed the minimum ballast efficacy factors. (See Appendix Note A-10.3.4.7.(3) NSBCR)
- (4) Except as provided in Sentence (5), luminaires designed for use with one or three linear fluorescent lamps greater than 30 W each shall use two-lamp tandem-wired ballasts in place of single-lamp ballasts when two or more luminaires are in the same space and on the same control device.
- (5) The tandem wiring required by Sentence (4) is not required for,
 - (a) recessed luminaires located more than 3 m apart, measured centre to centre,
 - (b) surface mounted or pendant luminaires that are not continuous,
 - (c) luminaires that use single-lamp high-frequency electronic ballasts,
 - (d) luminaires that use three-lamp high-frequency electronic or three-lamp electromagnetic ballasts, and
 - (e) luminaires on emergency circuits.

10.3.4.8. Interior Lighting

- (1) The interior lighting power allowance for a building is the sum of the lighting power allowances, in watts, of all *building* area types and shall include all permanently installed general, task and furniture lighting systems and luminaires.
- (2) The interior lighting power allowance shall be determined by multiplying the lighting power density given in Table 10.3.4.8. by the gross lighted areas of the *building* area type.

Table 10.3.4.8.
Interior Lighting Power Densities
Forming Part of Sentence 10.3.4.8.(2)

<i>Building</i> Area Type	Lighting Power Density, W/m ²
Automotive Facility	10
Fast Food	15

Dormitory	11
Health Care Clinic	11
Manufacturing Facility	14
Office	11
Parking Garage	3
Police Station without detention quarters/Fire Station	11
Post Office	12
Retail	16
Transportation	11
Warehouse	9
Workshop	15
Column 1	Column 2

- (3) The installed interior lighting power shall not exceed the interior lighting power allowance.
- (4) Except as provided in Sentence (5), the installed interior lighting power shall include all power used by luminaires, including lamps, ballasts, current regulators and control devices.
- (5) The following lighting equipment and applications shall not be considered when determining the installed interior lighting power or the interior lighting power allowance
 - (a) lighting that is integral to equipment or instrumentation and is installed by its manufacturer,
 - (b) lighting specifically designed for use only during medical or dental procedures and lighting to medical equipment,
 - (c) lighting that is integral to both open and glass-enclosed refrigerator and freezer cases,
 - (d) lighting that is integral to food warming and food preparation equipment,
 - (e) lighting for plant growth or maintenance,
 - (f) lighting in spaces specifically designed for use by visually impaired persons,
 - (g) lighting in retail display windows if the display area is enclosed by ceiling-height partitions,
 - (h) lighting in interior spaces that have been specifically designated as a heritage building,
 - (i) lighting that is an integral part of advertising or directional signage,

- (j) exit signs,
 - (k) lighting that is displayed for sale, and
 - (l) educational lighting demonstration systems.
- (6) Trade-offs among *building* area types are permitted provided that the total installed interior lighting power does not exceed the interior lighting power allowance.

10.3.4.9. Interior Lighting Controls

- (1) Except as provided by Sentence (2), interior lighting in a building that exceeds 500 m² in building area shall be controlled with an automatic control device to shut off building lighting in all spaces.
- (2) Sentence (1) does not apply to,
- (a) lighting intended for 24-hour operation,
 - (b) emergency lighting, or
 - (c) lighting for spaces where an automatic shut-off would endanger safety or security
- (3) The automatic control device required in Sentence (1) shall operate on,
- (a) a scheduled basis using a time-of-day operated control device that turns lighting off at specific programmed times,
 - (b) an occupant sensor that shall turn lighting off within 30 minutes of an occupant leaving a space, or
 - (c) a signal from another control or alarm system that indicates the area is unoccupied.
- (4) Where the automatic control device conforms to Clause 10.3.4.9.(3)(a), an independent program schedule shall be provided for each floor.
- (5) Each space enclosed by partitions that extend to the ceiling shall have at least one control device to independently control the general lighting within the space.
- (6) Each manual operated control device shall be readily accessible and located so the occupants can see the controlled lighting.
- (7) Except as required by Sentences (8) and (9) and except for reasons of safety or security, an individual control device shall,
- (a) be capable of being activated,
 - (i) either manually, or
 - (ii) automatically by sensing an occupant,
 - (b) control a floor area having an area not more than 240 m², and
 - (c) be capable of overriding at any time of-day scheduled shut-off control for not more than 4 h.

- (8) Except in spaces with multi-scene control, a control device that automatically turns lighting off within 30 minutes of all occupants leaving a space shall be provided in,
 - (a) conference rooms,
 - (b) meeting rooms, and
 - (c) employee lunch and break rooms.
- (9) A separate control device shall control,
 - (a) display lighting,
 - (b) accent lighting,
 - (c) case lighting,
 - (d) task lighting,
 - (e) non-visual lighting, and
 - (f) demonstration lighting.

10.3.4.10. Exterior Lighting

- (1) Except as provided in Sentence (2), this Article applies to exterior areas conforming to Sentence 10.3.4.7.(1).
- (2) If the lighting is equipped with a control device independent of the control of other lighting, Sentence (1) does not apply to,
 - (a) specialized signal, directional, and marker lighting associated with transportation,
 - (b) advertising signage or directional signage,
 - (c) lighting integral to equipment or instrumentation and installed by its manufacturer,
 - (d) temporary lighting,
 - (e) lighting for industrial production, material handling, transportation sites, and associated storage areas, and
 - (f) lighting used to highlight features of public monuments and heritage *buildings*.
- (3) The exterior lighting power allowance for the exterior areas appurtenant to a building shall be determined by multiplying the lighting power density given in Table 10.3.4.10. by the areas or lengths of lighted exterior spaces.

Table 10.3.4.10.
Exterior Lighting Power Densities
Forming Part of Sentence 10.3.4.10.(3)

Uncovered parking lots and drives	1.6 W/m ²
Walkways less than 3 m wide	3.3 W/linear m

Walkways 3 m or greater, plaza areas, special feature areas	2.2 W/m ²
Stairways	10.8 W/m ²
<i>Building</i> main entries	98 W/linear m of door width
Other doors	66 W/linear m of door width
Canopies (free standing and attached and overhangs)	13.5 W/m ²
Outdoor sales open areas (including vehicle sale lots)	5.4 W/m ²
Street frontage for vehicle sales lots in addition to “open area” allowance	66 W/linear m
<i>Building</i> facades	2.2 W/m ² for each illuminated wall or surface or 16.4 W/linear m for each illuminated wall or surface length
Automated teller machines and night depositories	270 W per location plus 90 W per additional ATM per location
Entrances and gatehouse inspection stations at guarded facilities	13.5 W/m ² of uncovered area
Loading areas for law enforcement and emergency service vehicles	5.4 W/m ² of uncovered area
Drive-up windows	400 W per drive-through
Parking near 24-hour retail entrances	800 W per main entry
Column 1	Column 2

- (4) The total exterior lighting power allowance for the exterior areas appurtenant to a building is the sum of the individual power allowances determined from Sentence (3) plus an additional unrestricted allowance of 5% of that sum.
- (5) The installed exterior lighting power shall not exceed the exterior lighting power allowance.
- (6) All exterior building grounds luminaires that operate at greater than 100 watts shall contain lamps having a minimum efficacy of 60 lm/W unless the luminaire is controlled by a motion sensor.

10.3.4.11. Exterior Lighting Controls

- (1) Except as provided in Sentence (2), lighting for exterior applications shall have automatic controls capable of turning off exterior lighting when,
 - (a) sufficient daylight is available, or
 - (b) the lighting is not required during night time hours.
- (2) Sentence (1) does not apply to,
 - (a) lighting for covered vehicle entrances or exits from a building,
 - (b) parking structures, and
 - (c) where required for safety, security, or eye adaptation.
- (3) Lighting designated for dusk-to-dawn operation shall be controlled by a time switch or photosensor.
- (4) Lighting not designated for dusk-to-dawn operation shall be controlled by a time switch.

10.3.4.12. Electric Motors

- (1) Electric motors shall conform to the Nova Scotia Energy Efficient Appliance Act, based on CSA-C390-M. (See Appendix Note A-10.3.4.12. NSBCR)

10.4. Objectives and Functional Statements

3.9.1. Objectives and Functional Statements

3.9.1.1. Attribution to Acceptable Solutions

For the purposes of compliance with this Code as required in Clause 1.2.1.1.(1)(b) of Division A NBC, the objectives and functional statements attributed to the acceptable solutions in this Part shall be the objectives and functional statements listed in Table 3.9.1.1. as amended by NSBCR 3.1.1.24. and 3.1.1.25..

**Table 3.9.1.1.
Objectives and Functional Statements Attributed to the
Acceptable Solutions in Part 3 Forming part of Sentence 3.9.1.1.(1)**

Acceptable Solutions	Objectives and Functional Statements
Part 10	F131-OR

NOVA SCOTIA POWER INCORPORATED

**CIVIL, STRUCTURAL AND ARCHITECTURAL
DESIGN CRITERIA**

Design Criteria No.: DC-160867-10-120-001

Rev. 0

Prepared by:



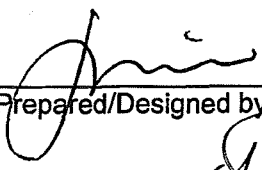
AMEC Americas Limited
Power and Process
Suite 700
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Oakville, ON L6H 6X7

December 2008

Client: Nova Scotia Power Incorporated
Project: Tufts Cove 6 Waste Heat Recovery

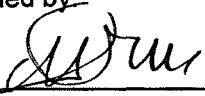
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Design Criteria No. DC-160867-10-120-001 Rev. 0

APPROVALS

Prepared/Designed by: 

2008.12.23

Date

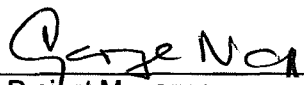
Checked by: 

24 DEC 2008

Date

Approved by: N/A

Date

Approved by:  Project Manager –

Date

Approved by: NSPI Project Manager –

Date

Professional Stamp

Client: Nova Scotia Power Incorporated
Project: Tufts Cove 6 Waste Heat Recovery

Civil, Structural and Architectural Design Criteria
Design Criteria No. DC-160867-10-120-001 Rev. 0

REVISION HISTORY

Rev.	Description	Prepared By	Checked By	Approved By	Date
A	Issued for Squad Check	SM			2008-12-18
0	Issued for use	SM	MD	GN	2008-12-23

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Project: Tufts Cove 6 Waste Heat Recovery

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1.0 SCOPE

1.1 INTENT

This Design Criteria establishes the Civil, Structural, and Architectural requirements and practices to be followed in the execution of the Tufts Cove 6 - Heat Recovery Project.

The Design Criteria will govern the detail design of all:

- Underground Services (Buried Piping)
- Infill
- Site Demolition
- Buildings
- Foundations
- Equipment and equipment supporting structures
- Pipe racks, utility racks, utility trenches, and service platforms
- Lifting structures, such as traveling cranes, electric or manual monorails
- Retaining walls
- Liquid retaining structures

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2.0 CODES AND STANDARDS

2.1 GENERAL

The design and materials of all structures shall be in accordance with the latest edition, supplements and all addenda thereto, of the following standards, codes and specifications, except as modified or otherwise stated herein:

- National Building Code of Canada and Structural Commentaries
- Nova Scotia Occupational Health and Safety Act and Regulations

2.2 BURIED PIPING

- Storm Pipe – PVC - CAN/CSA- B182.2-M95 SDR 35 and Reinforced Circular Concrete Pipe to CAN/CSA-A257, ASTM C76 designed for flexible rubber joints to ASTM C443, CAN/CSA-A257
- Water Pipe – AWWA – C110 Ductile Iron and Fittings to Halifax Water Commission Specifications
- Intake Pipe – HDPE – DR 32.5 50 PSI- ASTM D 1248
- Outfall Pipe Hyprescon –AWWA C301,C302,C303
- HDPE Sewage force main to Halifax Regional Municipality Specifications, CAN/CSA-B137.3-05, Rigid Poly (Vinyl Chloride) (PVC) Pipe for Pressure Sewers. Joints to ANSI/AWWA C207
- Manholes and Catch Basins to Halifax Regional Municipality Specifications – ASTM C 478M Specification for Precast Concrete Manholes and Catchbasins.

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2.3 INFILL

- Rock infill –clean quarry rock without deleterious materials to 18” in size
- Core stone – clean quarry rock maximum size 500 lbs
- Armour stone- clean quarry rock max size 2000 lbs
- Crushed Rock mattress- clean quarry rock without deleterious materials to 12” in size
- Caisson Ballast- well graded clean quarry rock to 6” in size.
- Finish surface gravels to Nova Scotia Department of Transportation Specifications
- Granulars – Test methods ATSM C117-04 Test Methods for Material Finer than 0.075mm Sieve in Mineral Aggregates by Washing
- ATSM C127- Test Method for Specific Gravity and Absorption of Coarse Aggregates ASTM C136-06- Test Method for Sieve Analysis of Fine and Coarse Aggregates
- CAN/CGSB -8.1-88 Sieves Testing Woven Wire Inch Series
- ASTM D-2938 Test Method for Unconfined Strength of Intact Rock Core Specimen
- ASTM C-535 Test Method for Resistance to Degradation of Large Size Coarse Aggregate by Abrasion and Impact in Los Angeles Machine.
- ASTM C-88 Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate
- ATSM D-3398- Test Method for Index of Aggregate Particle Shape and Texture.
- ATSM D-698-07e1 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kn-m³).
- ASTM D1557-07 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (2700 kn-m³).
- ASTM D 4318-05 Test Method for Liquid Limit, Plastic Limit, and Plasticity of Soils.
- ASTM D1883-07- Test Method for CBR (California Bearing Ratio) of laboratory Compacted Soils

2.4 SITEWORK DEMOLITION AND REMOVAL

- CSA-S350-M1980(R2003) Code of Practice for Safety in Demolition of Structures
- Nova Scotia Department of Environment Construction and Demolition Debris Disposal Guidelines

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2.5 ENVIRONMENTAL CONTROLS

- Erosion and Sediment Control Handbook for Construction Sites Nova Scotia Department of Environment
- Nova Scotia Watercourse Alteration Specifications – Nova Scotia Department of Environment
- EPS 1-6C-80-1 Environment Code of Good Practice for General Construction, Environment Canada

2.6 STRUCTURAL STEEL

- CISC Handbook of Steel Construction
- CSA-S16.1 Limit States Design of Steel Structures
- CSA S136 Cold Formed Steel Structural Members
- CSA W59 Welded Steel Construction (Metal-Arc Welding)
- CSA S136 Cold Formed Steel Structural Members” and “Commentary
- CSA W59-M Welded Steel Construction (Metal Arc Welding)
- G40.20-M General Requirements for Rolled or Welded Structural Quality Steels
- G40.21-M Structural Quality Steels
- Canadian Welding Bureau (CWB)

2.7 STAINLESS STEEL

- ASTM A 167 Corrosion-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
- ASTM A 177 High Strength Chromium-Nickel Steel Sheet and Strip
- ASTM A 240 Corrosion Resisting Chromium and Chromium-Nickel Steel Plate, Sheet and Strip for Fusion-Welded Unfired Pressure Vessels
- ASTM A 276 Hot-Rolled and Cold-Finished Corrosion Resisting Steel Bars
- ASTM A 193 Alloy Steel Bolting Materials for High-Temperature Service

2.8 ALUMINIUM

- ASTM B 221 Extruded Aluminums Material
- ASTM B 210 Drawn Aluminums Material

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2.9 CONCRETE

- CSA CAN3-A23.1 Concrete Materials and Methods of Concrete Construction.
- CSA CAN3-A23.2 Methods of Test for Concrete.
- CSA CAN3-A23.3 Design of Concrete Structures.
- CSA CAN3-A23.4 Pre-cast Concrete – Materials and Construction.
- CSA G30.18 M92 Deformed Reinforced Bars

2.10 MASONRY

- CSA CAN3-S034-M Masonry Design for Buildings
- CSA A165.1 Concrete Block Masonry Units
- CSA A179 Mortar and Grout for Unit Masonry
- CSA A371 Masonry Construction For Buildings

2.11 TIMBER

- CAN/CSA-O86.1M Engineering Design in Wood
- CAN/CSA-S406 Construction of Preserved Wood Foundations

2.12 TANKS

- API 650 Welded Steel Tanks for Oil Storage
- AWWA D100 Welded Steel Tanks for Water Storage.

2.13 FOUNDATIONS

- Canadian Foundation Engineering Manual – Canadian Geotechnical Society

2.14 WOOD & CARPENTRY

- CSA 080.1 Preservative Treatment of All Timber Products by Pressure Processes
- CSA CAN/CSA-0325.0 Construction Sheathing

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2.15 STEEL SHEETING

- ASTM A 123/A 123M Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A 153/A 153M Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- ASTM A 653/A 653M Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

2.16 AIR/ VAPOUR BARRIERS

- CGSB CAN/CGSB-51.34-M (Amended 1988) Vapour Barrier, Polyethylene Sheet for Use in Building Construction

2.17 MEMBRANE ROOFING

- ASTM D2178 Asphalt Glass Felt Used in Roofing and Waterproofing
- CGSB 37-GP-52M Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric
- CGSB CAN/CGSB-37.54 Polyvinyl Chloride Roofing and Waterproofing Membrane
- CGSB 37-GP-55M Application of Sheet Applied Flexible Polyvinyl Chloride Roofing Membrane
- CGSB 37-GP-56M Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing

2.18 INSULATION

- ULC CAN/ULC-S702 Mineral Fibre Thermal Insulation for Buildings
- ULC CAN/ULC-S704 Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced
- ULC CAN/ULC-S705.1 Thermal Insulation – Spray-Applied Rigid Polyurethane Foam, Medium Density, Material – Specification
- ULC CAN/ULC-S705.2 Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density, Installer's Responsibilities – Specification

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2.19 SEALANTS

- CGSB 19-GP-5M Sealing Compound, One Component, Acrylic Base, Solvent Curing
- CGSB CAN/CGSB 19.24-M Multicomponent, Chemical-Curing Sealing Compound

2.20 WINDOWS & GLAZING

- CSA CAN/CSA-440 Windows
- CSA CAN/CSA-A440.1 User Selection Guide to CSA Standard CAN/CSA-A440-00, Windows
- CGSB CAN/CGSB-12,1-M Tempered or Laminated Safety Glass
- CGSB CAN/CGSB-12.3-M Flat, Clear Float Glass
- CGSB CAN/CGSB-12.8 Insulating Glass Units
- CGSB CAN/CGSB-12.11 M Wired Safety Glass

2.21 STEEL DOORS

- CGSB CAN/CGSB-82.5-M Insulated Steel Doors

2.22 GYPSUM BOARD

- ASTM C 36/C 36M Gypsum Wallboard
- ASTM C 442/C 442M Gypsum Backing Board, Gypsum Coreboard, and Gypsum Shaftliner Board
- ASTM C 630/C 630M Water-Resistant Gypsum Backing Board
- ASTM C 931/C 931M Exterior Gypsum Soffit Board
- ASTM C 1395/C 1395M Gypsum Ceiling Board
- ASTM C 1396/C 1396M Gypsum Board
- CSA CAN/CSA-A82.27-M Gypsum Board
- CSA A82.31-M Gypsum Board Application

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3.0 CLIMATIC DATA

Dartmouth, Nova Scotia

Description	Data
Location	Dartmouth, Nova Scotia, Canada
Design Temperatures - Jan Dry 2.5% Jan Dry 1% July Dry 2.5% July Wet 2.5%	- 16°C - 18°C +26°C +20°C
Degree Days Below 18°C	4200
Moisture Index	1.4
Driving Rain Wind Pressure (DRWP) 1/5	280 Pa
Rain - 15 Min. rain 24 Hour Rain (1/50) Annual Rain Annual Total Precipitation(In Water Equivalents)	18 mm 144 mm 1250 mm 1500 mm
Hourly Wind Pressure – 1/10 1/50	0.40 KPa 0.58 KPa
Ground Snow Load S_s (1/50) S_r (1/50)	1.6 KPa 0.6 KPa
Seismic Data 2% / 50 years (0.000404 per annum)	S_a (0.2) = 0.23 S_a (0.5) = 0.13 S_a (1.0) = 0.069 S_a (2.0) = 0.019 PGA (g) = 0.12

4.0 GEOTECHNICAL DATA

4.1 GEOTECHNICAL REPORT

Detailed soils information, design and installation data are contained in:

- “Final Report on the Geotechnical Investigation for Tufts Cove Unit 6” prepared by ADI Limited. Dated October 2007

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4.2 FROST PROTECTION

To minimize frost related deformations, and foundation damage, the prepared foundation strata and fill materials under footings shall be protected from frost action both during and following construction. Frost Penetration Depth is 1.2 m.

4.3 BEARING PRESSURES

Design soil bearing pressure from foundation loads shall not exceed the allowable values listed below.

- Micro Piles grouted into rock with an ultimate bond strength between grout and rock of 2.0 MPa, for both tension and compression loading.
- Spread footings with an ultimate bearing capacity of 125 kPa.

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5.0 MATERIALS

All materials shall comply with the latest editions of relevant Canadian Standards.

5.1 CONCRETE

Concrete mix shall be designed in accordance with CSA A23.1. The minimum specified 28-day compressive strength of concrete shall be as follows:

Lean mix backfill	10 MPa
Mass concrete	20 MPa
Structural concrete	30 MPa

Cement shall comply with CSA-A5-M, Type GU (Normal). Aggregates shall be in accordance with CSA A23.1. (Type MS or HS if sulphates are in the ground or produced by plant process.)

Water reducing admixtures, Super plasticizers (water reducing high range admixture), and accelerating admixtures shall meet the requirements of CAN 3-A266. Calcium chloride and any admixture containing calcium chloride shall not be used.

Reinforcing bars shall be deformed billet steel bars to CSA G30.18 M92 with minimum yield strength of 400 MPa. Splicing of reinforcing bars shall be in accordance with CSA-A23.3. All splices shall be Class B.

Welded wire fabric shall be flat sheets to CSA G30.5.

The minimum thickness of concrete floors shall be as given below:

- Concrete floors on metal deck: 150 mm
- Concrete floors on removable forms: 140 mm
- Concrete floors on grade: 200 mm

Thickness of concrete is measured from top of concrete to top of supporting steel. When removable forms are used underside of concrete shall be flush with the bottom of the top flange of supporting steel.

Metal deck formwork shall be designed to support the weight of wet concrete and minimum construction load of 2.5 kPa or 3.0 kN/m knife edge load at mid-span, whichever is most severe.

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Concrete structures shall not exceed 70 m in length without expansion joints. Expansion joints and construction joints shall extend completely through the member, and shall be set and maintained vertical. In no case shall reinforcing bars or other embedded items be continued across expansion joints without special provision being made for the expansion.

Crack control joints shall be provided in slabs and walls more than 25 m. long at intervals of not more than 15 m.

Forms, false work, and construction joints shall be in accordance with CSA A23.1 or CSA A23.4, as applicable. Provision shall be made for the transfer of shear and other forces through the construction joints. Construction joints in slabs, girders, and beams shall be avoided. In cases where this is not possible, the joints in floors shall be located near the mid span of slabs, beams, or girders unless a beam intersects a girder in that location. In such cases, the joint in the girder shall be offset a distance at least equal to the depth of the beam.

Finished main floor elevations to be minimum 200 mm above finished grade (350 mm above finished grade for electrical rooms).

5.2 EMBEDDED METALS

5.2.1 Anchor Bolts

Anchor bolts shall be ASTM A36 or ASTM A320, Grade 260. Nuts shall be American Standard Hexagon Heavy Series conforming to ASTM A563.

All anchor bolts M20 and larger in diameter shall be cast into the concrete.

Anchor bolts smaller than M20 can be drilled into the concrete. Anchors shall be expansion type bolts or chemically set adhesive bolts.

5.2.2 Miscellaneous Steel

Embedded miscellaneous steel shall conform to CSA-G40.21M Grade 260 minimum. Floor and wall sleeves shall be galvanized steel.

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5.3 STRUCTURAL STEEL

The grade of steel to be used is as follows:

WWF shapes, W shapes and HSS	G40.21 grade 350 W
Angles, Channels, Tees, Bars and Plates	G40.21 grade 300 W
Cold Formed Sections	S136M grade 350 W

High strength ASTM A325 bolts shall be used for structural steel connections. Bolted steel connection shall typically be bearing type. Minimum 19 mm Dia bolts shall be used, unless otherwise specified. For design purpose thread interception shall be assumed.

All connections subject to vibration, fatigue, load reversal; cyclic loading shall be designed as friction type.

For bolted moment connections and those in direct tension, high strength bolts in bearing with threads included in the shear plane shall be used. Tightening of such connections shall be either Turn-of-Nut method (preferred) or by DTI (Direct Tension Indicators).

Gusset plates shall be 10 mm minimum thickness. The minimum number of bolts in any connection shall be two.

Unless otherwise indicated on the design drawings all beam end connections shall be capable of developing a reaction equal to half the full uniformly distributed load capacity of the member, allowing for tension and/ or compression as applicable. Beam end reactions shall be shown on the engineering drawings when they exceed the UDL reaction determined above. All beam connections except the seat types shall preferably be double angle connections. Connections designed to carry bending moments shall be noted as such on the drawings, along with the moment values.

Minimum depth of girts and purlins shall be 150 mm and for beams and columns shall be 200 mm. Minimum depth of secondary members (platforms, opening framing) shall be 150 mm.

Grating and chequered floor plating shall not be regarded as providing lateral restraint to the compression flange of beams, unless welded to the supporting beams.

All main building columns, struts, or bracing carrying permanent load or equipment shall be treated as main compression members. For initial design the slenderness ratio of main compression members shall be approximately 120. Wind bracing or crane bracing shall be treated as secondary compression members, the slenderness

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ratio of which shall be approximately 150. The slenderness ratio of tension bracing shall not exceed 240. However the final acceptable slenderness ratios shall be guided by the applicable code – CSA-S16.1. Vertical bracing members shall be designed as tension/ compression members wherever possible.

Crane rail shall conform to ASTM A1.

Welding electrodes shall conform to CSA W48.1 and shall be of E480XX classification.

5.4 STEEL SHEET PILING

Steel sheet piling shall conform to CSA-G40.21M Grade 350W. High strength ASTM A325 bolts shall be used for sheet pile connections, where possible. Minimum 19 mm Dia bolts shall be used.

5.5 COLD TEMPERATURE STEEL

Steel exposed to low temperature service and subject to loading where the possibility of brittle failure is a significant design consideration, shall conform to the requirements of ASTM A516, ASTM A572-S5 Grade 50, ASTM A588-S5 and shall yield the following impact properties for Charpy V-notch tests on transverse specimens:

- Minimum average impact energy of 20 J at –45°C for 300 W/WT
- Minimum average impact energy of 27 J at –45°C for 350 W/WT

All the cold temperature steel shall be clearly indicated on the drawings.

5.6 MISCELLANEOUS METALS

Steel chequered floor plate shall be skid resistant raised pattern conforming to CSA-G40.21M Grade 350W. The floor plate shall be 8 mm thick exclusive of the raised pattern.

ASTM - A53 grade steel shall be used for handrails.

Steel grating shall be welded type (serrated where required) with minimum 32 mm x 5 mm bearing bars. All grating shall be galvanized and edge banded.

Stair treads shall be welded steel bar grating with non-slip (chequered plate) nosing with 25 mm by 4.8 mm or 32 mm by 4.8 mm bearing bars as required.

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The weight of removable flooring sections shall not exceed 25 kg.

5.7 METAL DECK

Metal deck formwork for elevated slabs shall have a minimum depth of 38 mm and minimum thickness of 0.76 mm (22 gauge) with Z275 zinc coating. When floors are subjected to vibrating loads composite metal deck shall be used to prevent separation. Metal decking should not be designed for diaphragm action. Lateral loads shall be resisted by a positive bracing system.

5.8 PAINT

Shop paint structural steel, piping and architectural in accordance with NSPI standards.

5.9 GROUT

Grout for both building and equipment foundations shall be flowable, non-shrink, non-metallic, premixed cementitious grout with minimum compressive strength of 35 MPa at 28 days.

Minimum of grout thickness shall be 25 mm for:

- Small equipment with sole plates less than 0.5 m², with no grout hole
- Medium equipment with sole plates 0.5 m² to 1.5 m², with a grout hole
- Small column bases less than 0.3 m²
- Saddles of horizontal vessels and exchangers

Minimum of grout thickness shall be 40 mm for:

- Medium equipment and no grout hole
- Large equipment with sole plates larger than 1.5 m²
- Column bases over 0.3 m²

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5.10 MASONRY

Hollow concrete masonry units shall be Type H/15/A/M and solid concrete masonry units shall be Type S/15/A/M both containing lightweight aggregate and conforming to the requirements of CSA-A165.1.

Mortar shall be Type S using masonry cement in accordance with CSA-A179.

Grout for reinforced masonry shall have a 28-day compressive strength of 20 MPa. Reinforcing bars as in section 5.1.

5.11 METAL ROOF & WALL PANELS

Exterior face of roof sheet

- 0.76 mm (22 ga.) thick galvanized steel.

Interior liner face of roof sheet:

- 0.76 mm (22 ga.) thick galvanized steel.

Exterior face of wall sheet:

- 0.607 mm (24 gauge) thick galvanized steel.

Interior liner face of wall sheet:

- 0.607 mm (24 gauge) thick galvanized steel.

5.12 INSULATED PREFORMED METAL WALL & ROOF PANELS

Preformed metal panels for insulated roof systems shall have minimum thickness as follows:

Exterior face of roof sheet

- 0.607 mm (24 gauge) thick galvanized steel.

Interior liner face of roof sheet:

- 0.607 mm (24 gauge) thick galvanized steel.

Preformed metal panels for insulated wall systems shall have minimum thickness as follows:

Exterior face of wall sheet:

- 0.018 mm (26 gauge) thick galvanized steel.

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Interior liner face of wall sheet:

- 0.018 mm (26 gauge) thick galvanized steel.

5.13 PRESSED STEEL DOORS & FRAMES

1. Exterior doors shall be fabricated from 16 gauge galvanized pressed steel, insulated with thermal break, providing minimum thermal value of RSI 2.12 and with openings for glass or louvres and snap-in type stops when shown. Typical single door size shall be 900 mm (3'-0" nominal) x 2150 mm (7'-0" nominal) x 45 mm (1 3/4") thick. Finish shall be paint as per paint specification.
2. Exterior door frames shall be insulated with thermal break fabricated from 14 gauge galvanized steel. Finish shall be paint. Finish shall be paint as per paint specification .
3. Hinged large exterior doors shall be fabricated from minimum 16 ga. galvanized pressed steel (see manufacturer's recommendations), insulated, providing minimum thermal value of RSI 2.12 and with openings for glass and snap-in type stops when shown. Door frames shall be insulated with thermal break fabricated from minimum 14 gauge galvanized steel (see manufacturer's recommendations). Finish shall be paint as per specification. Doors and frames shall be complete with hardware and weatherstrips as specified. Doors, frames and related items shall be cut, reinforced, drilled, and tapped at the factory for the specified hardware.

5.14 WINDOWS

Windows shall consist of thermally broken aluminium frames.

5.15 GLAZING

Safety glass: to CAN/CGSB-12.1, transparent, 6 mm thick

1. Type: tempered
2. Class B - float

Wired glass: to CAN/CGSB-12.11, 6mm thick

1. Type 1 - Polished both sides (transparent)
2. Wire mesh styles – Rectangular

Insulating glass units: to CAN/CGSB-12.8, triple unit, 30 mm overall thickness.

1. Glass thickness: 6mm each light
2. Inter-cavity space thickness: 6mm
3. Glass coating: low "E"

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6.0 LOADS

6.1 DESIGN LOADS

Loads and forces used for design shall be as defined in NBCC, and as specified below.

6.1.1 Dead Loads

Dead load of structure consists of:

- The weight of the structure itself
- The weight of all materials incorporated into the structure to be supported permanently including piping, insulation, fireproofing, partitions, etc.

Dead load of equipment consists of the empty weight of all stationary machinery, equipment, and vessels permanently supported by the structure, including ladders and platforms, insulation, fireproofing and other attachments.

Dead load of service utilities consists of pipes with associated valves, fittings, instrumentation and controls, cable trays and cables, insulation, fireproofing and other attachments.

Fluid loads are gravity loads of liquid or solid materials in equipment, tanks and piping during operation or hydro-test. They shall be considered the same way as dead load.

Unless specified otherwise, the minimum specified loads shown shall be used.

Backfill	Vertical	20.0 kN/m ³
Concrete	Mass concrete	23.0 kN/m ³
	Reinforced concrete	23.5 kN/m ³
Steel		77.0 kN/m ³
Wood	Wet	7.8 kN/m ³
	Dry	6.3 kN/m ³
Metal Cladding	Single skin	0.1 kN/m ²
	w/liner and insulation	0.3 kN/m ²
Masonry (Normal wt.)	190 mm block	2.5 kN/m ²
	240 mm block	3.0 kN/m ²
	290 mm block	3.6 kN/m ²
Fibreglass (FRP)		15.0 kN/m ³

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6.1.2 Live Loads

Live loads are the superimposed loads on the structures due to:

- Intended use and occupancy (including storage, crane and vehicles)
- Snow, ice and rain
- Earth and hydrostatic pressure
- Equipment load (e.g. turbine gravity and dynamic loads)
- Maintenance loads
- Temporary construction load.
- Cable pulling load
- Other emergency and upset condition loads

Surge loads are lateral loads caused by the surging action of fluid and fluidized solids contained in the process vessels and piping.

The specified live loads on an area of floor, platform, walkway or roof shall not be less than specified below:

Use of Area	Minimum Load kN/m ² Unfactored
Assembly areas, lunch rooms	4.8
Control rooms and computer rooms	7.2
Electrical rooms (MCC)	12.0
Offices with storage	4.8
Offices without storage	2.4
Elevated concrete slabs	4.8
Mechanical room	7.2
Platforms – equipment laydown	7.2
Platforms – no laydown or storage	4.8
Walkways	4.8
Stairs and landings	4.8
Slab on grade	9.6
Laydown areas	12.0

In addition to the uniform live loads, floor and roof members shall be designed for an unfactored, live point load of 10 kN, acting simultaneously with uniform loads. 10 kN shall act on primary members only, and shall not be compounded.

Where stationary equipment may be rolled on floor during construction or during maintenance and where forklifts are used, floor shall be designed for such loadings. The effect of impact shall be taken into consideration.

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Davits (as required) shall be designed for the weight of the heaviest piece of equipment that they may be required to lift, plus the weight of rigging equipment, plus impact load, but not less than a total load of 5 kN. Design shall be based on use of a single sheave pulley block. All davits shall be legibly marked with the actual maximum permissible lifted load.

Overhead crane loads shall be included in criteria based on lifting capability.

Vertical load due to impact shall be 25 percent of the lifted load and the design lateral load shall be 20 percent of the weight of the moving equipment.

6.1.3 Thermal Loads

All equipment support structures and elements shall be designed to accommodate the loads or strains produced by thermal expansion or contraction.

The following friction coefficients shall be used:

Steel to Concrete	0.50
Steel to Steel	0.30
Teflon to Teflon	0.10
Lubricated steel on steel	0.15
Concrete to Earth	0.45

6.1.4 Wind Loads

Wind loads shall be calculated in accordance with the governing building code and NBCC Part 4 using the information given under climatic data.

6.1.5 Seismic Loads

Seismic loads shall be calculated in accordance with the governing building code and NBCC Part 4 using the information given under climatic data.

The seismic loads shall not be used in conjunction with wind loads.

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6.1.6 Maintenance Loads

Structures and foundations supporting heat exchangers subject to bundle pulling shall be designed for a longitudinal force applied at the centroid of the tube bundle.

This force shall be equal to 100% of the bundle weight but not less than 9kN unless specified otherwise. The shear force due to bundle pulling shall be assumed to be transmitted solely through the fixed end support. Where several exchangers are parallel to a frame, bundle forces shall be assumed to act individually.

Design loads for standard vehicles shall be in accordance with CSA S6. Wheel loads for non-standard vehicles will be as shown on vehicle data sheet.

6.1.7 Surge Loads

Design surge load shall be determined in collaboration with Process Engineering and other related disciplines.

6.1.8 Vibration and Impact Loads

The effects of vibration, impact and fatigue shall be considered in the design of structures supporting vibrating equipment.

The allowable range of stresses for fatigue shall be in accordance with CSA CAN3-S16.1-M.

Structures supporting small and medium size equipment that may produce impact shall be designed with the load factors in accordance with the applicable Provincial code and the following:

Motors and balanced rotating equipment		1.25
Reciprocating machinery		1.50
Vibrating screens	Vertical impact	2.00
	Horizontal impact	1.50
Hangers supporting floors		1.50

Dynamic analysis will be carried out for structures required to support equipment with large dynamic loads.

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6.1.9 Crane and Monorail Loads

Bridge crane wheel loads shall be as specified by the crane manufacturer.

Impact loads from cranes shall be in accordance with the NBCC and OBC. For detailed design procedures refer to Guide for the Design and Construction of Mill Buildings, AISE Technical Report No. 13, and Crane Supported Steel Structures: Design Guide by CISC.

6.1.10 Vehicle Loads

Design loads for standard vehicles shall be CS-600 Loading in accordance with CSA CAN3-S6-M.

Wheel loads for non-standard vehicles such as forklifts, haul trucks, dozers, wheel loaders, pallet lifters, etc. shall be as per manufacturers published data.

6.1.11 Piperack/ Utility Rack Loads

Friction Loads

Friction forces, caused by hot lines sliding across the pipe support during start-up and shutdown, are assumed to partially resist adjacent cold lines. In the absence of more accurate data from the pipe stress engineer, the nominal unbalanced friction force acting on a pipe support is assumed as follows:

- 30% of the total pipe weight tributary to a pipe support for one line
- 20% of the total pipe weight tributary to a pipe support for two or three lines
- 10% of the total pipe weight tributary to a pipe support for four or more lines

Special consideration may be required for non-typical pipe racks such as pipe racks with few large hot lines mixed with small cold lines, where counter-balancing friction is not present.

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Anchor Forces

Thermal expansion is controlled by anchoring the pipe to its support at designated locations. The anchors may be directional anchors, which restrict movement in one or more directions while allowing movement in another, or they may be completely fixed anchors.

If the anchor locations, forces and moments have not been established by the stress analysis group when the pipe supports are to be designed, assume an anchor force equal to 35 N/mm (200 lbs/in) of nominal pipe size or 10 kN maximum per anchor. For pipe racks 10 kN shall be applied at the centre of every cross beam at every piping level. Pipe anchor loads shall be checked when anchor load information is available from the stress analysis group.

Wind Load

Wind on piping or bus duct for rack design shall be determined as follows:

$$W_p = q \times C_f \times C_g \times d \times l \times \Sigma m$$

Where:

W_p = Total wind load on pipes in kN

C_f = 0.8

C_g = 2.0

q = reference wind pressure in kN/m²

d = average pipe diameter/bus duct height including insulation in m

m = wind coefficient equal to $1.43^{(1-n)}$ where n =number of pipes/cable-bus.

In determining the average pipe diameter only pipes larger than half the size of the average of the four largest pipes shall be considered.

N	1	2	3	4	5	6	7	8	9	10	11	12
M	1.00	.70	.49	.34	.24	.17	.12	.08	.06	.04	.03	.02
Σm	1.00	1.70	2.19	2.53	2.77	2.94	3.06	3.14	3.20	3.24	3.27	3.29

$\Sigma m = 3.3$ shall be used for $n > 12$.

Snow and Ice Loads

Snow accumulation is assumed to occur only on the highest tier of the rack. A uniform load numerically equal to the ground snow load shall be applied. If ice accumulation is a concern, ice loads are applied to all rack levels. Maximum snow and ice loads are assumed to occur simultaneously.

Client: Nova Scotia Power Incorporated
Project: Tufts Cove 6 Waste Heat Recovery

Civil, Structural and Architectural Design Criteria
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6.2 STRUCTURAL DESIGN

All structures, foundations and all the elements except lifting equipment shall be designed to have strength, stability, and serviceability in accordance with the NBCC, and appropriate CSA Standards listed in Section 2.

APPLICABLE LOADS FOR LOADING CONDITIONS					
LOADS	ERECTION	TESTING	EMPTY (SHUTDOWN)	OPERATION	
				NORMAL	ABNORMAL (UPSET)
DEAD (FIXED) LOADS					
Dead Load of Structure	X	X	X	X	X
plus fireproofing		X	X	X	X
Dead Load of Equipment	X	X	X	X	X
plus internals, fireproofing insulation		X	X	X	X
plus content		X		X	X
Dead Load of Piping plus	X	X	X	X	X
plus content		X	X	X	X
CONSTRUCTION LOADS					
Forces caused by erection	X				
LIVE (MOVEABLE) LOADS					
Platform and walkway loads		X	X	X	X
Material storage		X	X	X	X
PROCESS LOADS					
Shutdown fluid loads					X
Thermal forces				X	X
Vibrating equipment forces				X	X
Impact forces				X	X
Normal surge forces				X	
Abnormal surge forces					X
MAINTENANCE LOADS					
Test fluid loads		X			
Pull force			X		
ENVIRONMENTAL LOADS					
Snow, ice or rain	X	X	X	X	X
Wind load	X	X	X	X	X
Seismic load	X	X	X	X	X

Load combinations and load factors shall be in accordance with the NBCC and applicable provincial codes.

When excluding loads, other than dead loads, results in a more critical loading condition, then such exclusion shall be considered.

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Project: Tufts Cove 6 Waste Heat Recovery

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Unless recommended otherwise by the manufacturer/owner, following load factors shall be used with limit state design to comply with Occupational Health and Safety Act, General Safety Regulation:

- Load factor of 3 for general lifting devices
- Load factor of 6 for lifting devices to be used for supporting and transporting workers

The stability and sliding resistance for all loading conditions including erection and shutdown conditions shall be in accordance with the NBCC and applicable provincial codes.

Corrosion / Erosion Allowance

Structural elements subject to severe corrosion, erosion or wear conditions shall utilize protective coatings as per project specification, special materials or material thickness allowance of min 3 mm.

Client: Nova Scotia Power Incorporated
 Project: Tufts Cove 6 Waste Heat Recovery

Civil, Structural and Architectural Design Criteria
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7.0 SERVICEABILITY

The following areas shall be addressed:

- Stability of structures and parts of structures
- Horizontal and vertical deflections of structures and members
- Crack opening in reinforced concrete beams
- Vibrations in reciprocating and rotating equipment
- Any area that could render the structure unserviceable without structural damage

The following deflection limits are recommended:

Vertical deflection of beams under live load:	
operating condition	L/360
test condition	L/200
crane and trolley beams under 225 kN (No Impact)	L/600
crane and trolley beams over 225 kN (No Impact)	L/800
use and occupancy	L/360
roof of buildings	L/240
Vertical deflection of grating and floor plate under pedestrian live load	6 mm
Horizontal deflection under wind and thermal loads:	
pipework and equipment supporting structures	H/200
administration and non-process buildings	H/500
process buildings with cranes	H/400
process buildings without cranes	H/325
Horizontal deflection of crane and trolley beams	H/600

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Project: Tufts Cove 6 Waste Heat Recovery

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8.0 ACCESS AND CLEARANCES

Adequate access and clearances for maintenance and fire fighting shall be provided. Platforms, ladders and stairways shall be the minimum consistent with access and safety requirements and shall comply with Provincial requirements.

Minimum clearances are as follows:

Vertical Clearance	
For Haul roads and Access roads	6.7 m
For Crane Access	6.7 m
Under Piperacks	3.6 m
Over platforms and walkways	2.2 m
In buildings	2.2 m
Horizontal	
From edge of roadway to any structure	2.0 m
From edge of roadway to pressure equipment	5.0 m
Minimum width of Walkways	0.75m

Clearance is defined as the net clear horizontal or vertical dimension between the plane of maximum protrusion and the corresponding reference plane or surface. In providing the above minimum clearances, make allowances for fireproofing, piping, heating and ventilating ducts, insulation and structural member size, wherever applicable.

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9.0 CIVIL DESIGN CRITERIA

9.1 UNDERGROUND PIPING

9.1.1 General

The underground piping will consist of extensions of existing storm and water services, a sewage force main to the connection manhole at the Halifax trunk sewer, and cooling water intake and outfall pipes.

9.1.2 Storm Water Systems

The storm water systems will consist of area catch basins to collect surface and roof run off and discharge it to the harbour. These will connect into and redirect existing systems and roof drains. The Rational method will be used to size the piping systems. The pipes will be sized for the five year storm event. The site will be graded to provide positive drainage away from the foundations and a major drain to the harbour.

9.1.3 Water Systems

The water system will consist of the extension of the existing fire loop, relocation of the insulating structure (planter) and relocation of the 4" building service. One new hydrant will be installed. Systems will be designed, installed, chlorinated and tested to the Halifax Regional Water Commission standards. The water pipe will 6" diameter ductile iron pipe Class 52 with sacrificial zinc anodes on all fittings.

9.1.4 Sewage Lift Station and Force Main

The existing control building is service by a sanitary sewage holding tank. With the completion of the Halifax harbour clean up project, a trunk sewer is now located at the southeast corner of the project site. The tank will be replaced with a sewage lift station with dual grinder pumps in a manhole structure with control panel and a small diameter PVC force main sized to handle the current flow. The force main will be installed to discharge to the HRM collector sewer.

9.1.5 Oily Water Treatment

Equipment subject to oily water waste or leakage will be connected by way of drains to the existing oil water separator. Should connection to the existing system prove impractical then a secondary oil water separator will be installed in a convenient

Client: Nova Scotia Power Incorporated
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location. The system will be sized based on an 80% target of removal of Total Suspended Solids during a storm event.

A new outdoor transformer foundation, complete with curb and sump (similar to existing) will be constructed for the new transformer. The sump will be piped to the existing oil water separator which is connected to existing transformer sumps. The capacity of the oil water separator will be checked to ensure it has the capacity to handle the full volume of transformer oil, fire extinguishing water, and rain accumulation. Checking will be done based on failure of only one transformer, this being the maximum size transformer, new or existing.

9.1.6 Cooling Water Intake and Outfall

The cooling water intake will be designed to provide a flow of 52,100 USPM with an intake velocity not to exceed 0.5fps at the screen location. The intake structure will be set below elevation 89' to provide an average intake design temperature of 64 degrees Fahrenheit. The intake screen will be designed to provide minimal maintenance requirements and optimum inflow characteristics. The intake will have trash screens and racks to keep the debris out of the pump system. The outfall will be positioned to flow south as far from the intake pipes as reasonable. The intake piping will be dual 63" HDPE pipes from the intake to the wet well. The pipe from the pump system to the power plant and the power plant to the outfall will be Hyprescon.

9.2 INFILL

Harbour infill for the expansion of the current site will consist of rock infill to the harbour bottom and steel sheet piling cells and precast concrete caissons. The rock infill will consist of grade layers with geo-membrane separations to prevent migration of fines. Slopes will be designed in accordance to geotechnical recommendations. Armour stone protection will be designed to current wave force conditions of Halifax Harbour. Sheet piling to CAN/CSA-G40.21. Sheet piles will extend to competent material as determined by the geotechnical report and be placed in circular cells and backfilled with granular material. Caissons will be precast reinforced concrete placed on a crushed rock mattress and backfilled with caisson ballast which will consist of well graded material maximum 6" in size. The caissons will be provided with PVC drain holes. The caissons are anticipated to be relatively small and can be precast on shore and set in place with a crane.

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Project: Tufts Cove 6 Waste Heat Recovery

Civil, Structural and Architectural Design Criteria
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10.0 ARCHITECTURAL DESIGN CRITERIA

10.1 GENERAL

Occupancy classification requirements shall be in accordance with NBCCC.

10.2 REQUIRED BUILDING ENCLOSURE PROPERTIES

10.2.1 Separation of Environments

Environmentally sensitive separation shall be provided between interior and exterior space, interior space from the ground and environmentally dissimilar spaces.

10.2.2 Resistance to Deterioration

Building assemblies that separate dissimilar environments shall be compatible with adjoining materials and resistant to any mechanisms of deterioration that would be reasonably expected, given the nature, function and exposure of the materials.

10.2.3 Thermal Resistance

Roofs and exterior walls shall be insulated such that the minimum insulating value meets the requirements of the National Model Energy Code.

10.2.4 Properties to Resist Heat Transfer

Materials and components installed to provide resistance to heat transfer shall be installed and positioned to minimize surface condensation on or within the component or assembly, prevent convection air flow through and around the material and minimize ice damming on sloped roofs.

10.2.5 Resistance to Air Leakage and Vapour Diffusion

Walls and roof shall be constructed so as to contain air and vapour barriers. Floor slabs shall have a vapour barrier below.

10.2.6 Protection from Precipitation

The building envelope shall be designed to provide watertight assemblies.

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Project: Tufts Cove 6 Waste Heat Recovery

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10.2.7 Sealing and Drainage

Materials, components, assemblies, joints in materials, junctions between components and junctions between assemblies exposed to precipitation shall be sealed to prevent ingress of precipitation or drained to direct precipitation to the exterior.

10.2.8 Snow and Ice Fall Protection

Building details shall minimize the hazards associated with snow sliding off roofs and icicle buildup at building eaves. If sloped metal roofs exist they shall have continuous ice guards along eaves placed 600 mm inward from the outer edge.

10.2.9 Protection from Surface Water

The building shall be located, site graded, catch basins installed or foundation walls constructed so that surface water will not accumulate against or enter into the building or damage moisture-susceptible materials.

10.2.10 Protection from Ground Moisture

Where a building element separates interior space from the ground, materials, components or assemblies shall be installed to prevent moisture transfer into the space.

10.3 REQUIRED BUILDING COMPONENT PROPERTIES

10.3.1 Roofing

Roofs shall be protected with membrane roofing, including flashing, installed to drain and shed rain effectively and prevent water due to ponding or ice damming from entering the roof.

10.3.2 Cladding

Exterior walls shall be protected with sheet steel finish cladding, including flashing, liner panels, trim, air barrier, vapour barrier and other special purpose accessory pieces required for the cladding system being used, to restrict the entry of rain and snow into the wall assembly.

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10.3.3 Exterior Personnel Doors & Windows

Exterior doors and windows shall be metal, designed and installed to resist heat transfer, and prevent air and water infiltration. Glazing in doors and windows shall be factory-sealed double glazed units complete with air space.

Doors shall have properties suitable for the intended use.

10.3.4 Interior Finishes

Floor, wall, ceiling and built-in component's materials and finishes shall have properties suitable for the intended use of the space. Areas requiring waterproof finish shall consist of epoxy finishes providing water resistance. Finished flooring shall have a surface that is smooth, even and free from roughness or open defects.

Floors in process/plant areas shall be sealed or coated concrete floors. Hardeners will be specified as required by NSPI.

Interior wall construction shall be suitable for the intended use of the space.

END OF DESIGN CRITERIA

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Request IR-11:

Reference Capital Cost Breakdown Table

Buildings and Auxiliary Systems

Waste Water and Sewage system design changed

- a) The NSPI explanation quotes "reduced operational cost". Please provide the change in operational costs due to this increased capital expenditure.
- b) Was this reduction in operating costs included in the updated npv economic analysis?
- c) Please provide a npv analysis showing that this incremental increased capital expenditure is economically justified.

Response IR-11:

- a) The system is designed with a maximum waste water discharge of 30 gpm, with an anticipated average discharge of 10-15 gpm. The operating cost of the Tufts Cove Waste Water Treatment Plant is \$2.5 /1000 gal. If the original design was followed, the TUC yearly operating costs would have increased by approximately \$19,000 per year.
- b) No. Notwithstanding the yearly operating increase of \$19,000, the Tufts Cove Plant's Waste Water Treatment Plant is currently operating at or near 100 percent capacity. A capital investment of over \$180,000 would be required to process the increased loading.

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Response IR-11: (cont'd)

c) The incremental investment has a payback of approximately 3.5-5.25 years.

	Average Discharge (Low Range)	Average Discharge (High Range)
Gallons per Minute	10	15
Minutes per Hour	60	60
Hours per Day	24	24
Days per Year	365	365
	5,256,000	7,884,000
Operating Cost of Water Treatment Plant \$2.5/ 1000 Gal	0.0025	0.0025
Avoided Cost per Year	13,140	19,710
Incremental Capital Cost	68,324	68,324
Payback Period (Years)	5.20	3.47

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Request IR-12:

Reference Capital Cost Breakdown Table

Building and Auxiliary Systems

Auxiliary Systems

- a) Why are auxiliary systems more extensive than planned?
- b) Why have building dimensions increased?
- c) What increase in capital costs occurred as a result of insurance requirements?
- d) Was this increase due to a change in insurance requirements since the original design, or due to insufficient funds in the original estimate?
- e) If the increase was due to a change in insurance requirements, please provide documentation on the change including when NSPI became aware of the change.

Response IR-12:

- a-b) Auxiliary systems are more extensive than planned because the building was increased in size to accommodate the selected steam turbine generator and condenser. This resulted in a longer crane and more heating and ventilation required.

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1 Response IR-12: (cont'd)

2
3 The original design plan involved a down draft turbine with the condenser placed under
4 the turbine. This design is similar to other turbines in Nova Scotia Power generating
5 plants. The turbine selected has an axial flow with the condenser placed in line with the
6 turbine. This turbine design is more commonly used in the 50 MW size range and
7 delivery of the turbine supported the project plan which would have been extended by
8 over 12 months if a down draft turbine design was maintained. This would have delayed
9 commissioning of the unit.

10
11 c) Capital costs increased by \$12,400 as a result of insurance requirements.

12
13 d) The change was due to an increase in the number of sprinkler heads and rework required
14 for the drain system to better control potential lube oil fires. This was realized when the
15 detailed engineering was refined to closely align with fire fighting systems being
16 upgraded in the other NSPI plants.

17
18 e) Upgrades to the fire prevention and fire fighting systems in the thermal power stations are
19 ongoing. Insurers have reviewed the modifications at each plant and NSPI engineers
20 designing these systems made the Tufts Cove 6 project team aware of areas of concern to
21 the insurers in January 2009. Design changes were not developed for Tufts Cove 6 until
22 the building layout was being finalized in December 2009.

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Request IR-13:

Reference Capital Cost Breakdown Table

Steam Turbine Generator and Major Components

Turbine Bypass System

- a) Please provide documentation on the external noise levels that this project must meet. Include in your response the relevant permit from the applicable permitting authority.
- b) Please provide documentation showing the relevant noise levels with 35% bypass and 100% bypass compared to the permitted levels.
- c) When did NSPI realize that the original design would not pass the permitted external noise levels?
- d) Has the permitted external noise level changed since the original project design? If so, please provide documentation including the date of the change.
- e) Please explain why this was not a foreseeable event that should have been included in the original cost estimate.
- f) Please provide the estimated operating cost saving due to this design change.

CI# 28098 TUC 6 Waste Heat Recovery Project
Authority to Overspend (ATO) (NSUARB P-128.07)
NSPI Responses to UARB Information Requests

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1 Response IR-13:

2
3 a) Please refer to Attachment 1, Nova Scotia Environment Approval #2009-066761
4 (Construction); Clause 7 – Sound Levels.

5
6 b) The relative noise level was not the significant cause of the turbine bypass system cost
7 increases, as it is contained within the building and does not affect the noise emissions at
8 the property boundary. The advantage of a 100 percent bypass is that Unit #6 will not
9 rely on the High Pressure Atmospheric Vent Valves during "Hot" Unit starts. These
10 vents are outside of the building and noise from the vents will add to the total noise level
11 at the property boundaries where the permit levels are specified. Minimizing the use of
12 vents is a key design consideration in Tufts Cove efforts to minimize noise impact on the
13 residential neighborhood.

14
15 c) It became apparent during the detailed engineering phase of this project that the
16 atmospheric vents would be utilized for "Hot" starts unless a 100 percent bypass system
17 was installed. Extended or frequent use of atmospheric vents would not meet the
18 requirements of the Plant's Noise Permit.

19
20 d) No. The permitted noise levels have not changed.

21
22 e) At the time of the May 2008 application, the detailed engineering required to determine
23 Steam Piping warming requirements and Boiler Start-Up conditions was not yet
24 complete.

25
26 f) The operating cost savings are approximately \$3000 per year. More significant is that
27 without a 100 percent bypass system, Unit #6 would need to rely heavily on the
28 atmospheric vents. Extended use of these vents would require excessive amounts of
29 demineralised water, exceeding the water treatment plant's capacity.

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**APPROVAL**

Province of Nova Scotia
Environment Act, S.N.S. 1994-95,

468 - 7564

APPROVAL HOLDER: Nova Scotia Power Incc
APPROVAL NO: 2009-066761 (Construction)
SITE PID: 00063677
EXPIRY DATE: November 30, 2010

Pursuant to Part V of the *Environment Act*, S.N.S. 1994-95, c.1 as amended from time to time, approval is granted to the Approval Holder subject to the Terms and Conditions attached to and forming part of this Approval, for the following activity:

The construction of Unit #6, a combined cycle heat recovery steam turbine for a thermal power generation facility and associated works, at or near 315 Windmill Dr. Dartmouth, Halifax Regional Municipality in the Province of Nova Scotia.

Administrator: Don FeldmanEffective Date: July 2, 2009

TERMS AND CONDITIONS

Nova Scotia Environment

Project: Combined Cycle Heat Recovery Steam Turbine(Construction)
Tufts Cove Generating Station (Unit #6)

Site: 315 Windmill Road, Dartmouth

PID: # 00063677

Approval No: 2009-066761

File No: 92100-30-/BED-066761

Reference Documents:

- a) Application for Industrial Approval for Construction with supporting documentation dated May 7, 2009.

Terms and Conditions:

This Approval is subject to the following terms and conditions:

1. Definitions:

- a) "Act" means the *Environment Act* S.N.S. 1994-1995, c.1 and includes all regulations made pursuant to the Act
- b) "Department" means the Central Region Office of Nova Scotia Environment located at the following address:

Nova Scotia Environment
Environmental Monitoring and Compliance Division
Central Region, Bedford Office,
Suite 224, 1595 Bedford Highway,
Bedford, Nova Scotia, B4A 3Y4.

Phone: (902) 424-7773

Fax: (902) 424-0597

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- c) The "Facility" means the combined cycle heat recovery steam generator (Unit #6) for a thermal power generating plant and associated works. This Approval does not cover the operation of any of the components outlined in the Application for Approval except those used for environmental mitigation during construction.
- d) The "Minister" means the Minister of Nova Scotia Environment.
- e) "Regional Manager" means the manager of the Central Region Office of Nova Scotia Environment or the Regional Manager's designate.
- f) "Administrator" means a person appointed by the Minister for the purposes of this Act, and includes an acting administrator.

2. Scope of Approval

- a) This Approval (the "Approval") relates to Nova Scotia Power Incorporated (the "Approval Holder") and their application and supporting documentation, as listed in the reference documents above, to construct the Facility, situated at the Tufts Cove Generating Station, 315 Windmill Road, Dartmouth, Halifax Regional Municipality (the "Site").
- b) This Approval is restricted to the construction of the Facility as defined in clause 1c).
- c) This Approval will expire on November 30, 2010 unless otherwise revoked, amended, or renewed.
- d) The scope of the Approval is restricted to the construction of the Facility only, which includes the installation environmental controls and cooling water intake and discharge structures.
- e) This Approval does not apply to the architectural, electrical, roadways, and structural components of the project.

3. Conditions of Environmental Assessment

The Approval Holder shall comply with all terms and conditions of the Environmental Assessment Approval issued on May 4, 2009 in accordance with the *Environmental Assessment Regulations*, pursuant to Part IV of the *Environment Act* for Tufts Cove Unit #6, Waste Heat Recovery Project, Nova Scotia Power Incorporated at the Tufts Cove Generating Station, Dartmouth.

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4. General Terms and Conditions

- a) The Approval Holder shall construct the Facility in accordance with provisions of the:
 - i) *Environment Act* S.N.S. 1994-1995, c.1, as amended from time to time;
 - ii) Regulations, as amended from time to time, pursuant to the above Act;
- b) The Approval Holder is responsible for ensuring that they construct the Facility on lands which they own or have a lease or written agreement with the landowner or occupier. The Approval Holder shall be responsible for ensuring that the Department has, at all times, a copy of the most recent lease or written agreement with the landowner or occupier. Breach of this condition may result in cancellation or suspension of the Approval.
- c) If there is a discrepancy between the reference documents and the terms and conditions of this Approval, the terms and conditions of this Approval shall apply.
- d) The Minister or Administrator may modify, amend or add conditions to this Approval at anytime pursuant to Section 58 of the Act.
- e) This Approval is not transferable without the consent of the Minister or Administrator.
- f)
 - (i) If the Minister or Administrator determines that there has been non-compliance with any or all of the terms and conditions contained in this Approval, the Minister or Administrator may cancel or suspend the Approval pursuant to subsections 58(2)(b) and 58(4) of the Act, until such time as the Minister or Administrator is satisfied that all terms and conditions have been met.
 - (ii) Despite a cancellation or suspension of this Approval, the Approval Holder remains subject to the penalty provisions of the Act and regulations.
- g) The Approval Holder shall notify the Department prior to any proposed extensions or modifications of the Facility, including the active area, process changes or waste disposal practices which are not granted under this Approval. An amendment to this Approval will be required before implementing any change. Extensions or modifications to the Facility may be subject to the Environmental Assessment Regulations.

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- h) Pursuant to Section 60 of the Act, the Approval Holder shall submit to the Administrator any new and relevant information respecting any adverse effect that actually results, or may potentially result, from any activity to which the Approval relates and that comes to the attention of the Approval Holder after the issuance of the Approval.
- i) The Approval Holder shall immediately notify the Department of any incidents of non-compliance with this Approval.
- j) The Approval Holder shall bear all expenses incurred in carrying out the environmental monitoring required under the terms and conditions of this Approval.
- k) Unless specified otherwise in this Approval, all samples required to be collected by this Approval shall be collected, preserved and analysed, by qualified personnel, in accordance with recognized industry standards and procedures.
- l) Unless written approval is received otherwise from the Administrator, all samples required by this Approval shall be analysed by a laboratory that meets the requirements of the Department's "Policy on Acceptable Certification of Laboratories" as amended from time to time.
- m) The Approval Holder shall submit any monitoring results or reports required by this Approval to the Department. Unless specified otherwise in this Approval, All monitoring results shall be submitted within 30 days following the month of monitoring.
- n) The Approval Holder shall ensure that this Approval, or a copy, is kept on Site at all times and that personnel directly involved in the Facility operation are made fully aware of the terms and conditions which pertain to this Approval.
- o) All phases of construction shall be overseen by a qualified professional engineer, licensed to practice in the Province of Nova Scotia, or technologist who works under the supervision of an engineer.
- p)
 - (i) Written certification by a professional engineer is required stating that all construction or installation has been conducted in accordance with the terms and conditions of this Approval and has met the minimum requirements of the drawings and specifications.
 - (ii) This certification must be provided to the Department, within 6 weeks following project completion.

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- (iii) The certification must confirm that all as-built drawings and any other relevant documentation have been turned over to the Approval Holder by the engineer.
 - (iv) The certification must include all field and laboratory tests conducted on the installed Facility such as plant construction, commissioning and quality testing, and any other testing reports produced during the construction.
- q) The Approval Holder shall designate in writing, to the Department, a contact for this Approval.

5. Construction of Facility and Liquid Effluent Discharge

- a) Erosion and sediment control measures are to be installed as required, such that watercourses or water resources adjacent to and downstream of the construction site are protected from siltation. It is recommended to follow control measures as outlined in the "Erosion and Sedimentation Control Handbook for Construction Sites, 1988". The Act prohibits release of a material that may cause an adverse effect.
- b) The terms and conditions contained in this Approval and the drawings provided and listed in the reference section of this Approval and the requirements of 5 a) form the minimum guidelines for erosion and sedimentation control for the construction area. The Approval Holder is not limited to these control measures and every effort must be taken to ensure minimum disturbance and siltation of any watercourse.
- c) Adequate erosion and sedimentation controls shall be installed prior to the commencement of construction.
- d) The Approval Holder shall ensure the following liquid effluent levels are met and that the effluent is monitored at the frequency and locations indicated.

- i) **Total Suspended Solids**

Clear Flows (Normal Background Conditions):

- 1) Maximum increase of 25 mg/l from background levels for any short term exposure (24 hour or less)
- 2) Maximum average increase of 5 mg/l from background levels for longer term exposure (inputs lasting between 24 hours and 30 days)

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High Flow (Spring Freshets and Storm Events)

- 1) Maximum increase of 25 mg/l from background levels at any time when background levels are between 25 mg/l and 250 mg/l
- 2) Shall not increase more than 10% over background levels when background is > 250 mg/l

ii) pH

- 1) Maximum 5 to 9 in grab sample
- 2) Maximum 6 to 9 as a Monthly Arithmetic Mean

iii) Monitoring Locations

- 1) The Approval Holder shall sample at the following locations:

As directed by the Department

iv) Sampling Frequency

- 1) The Approval Holder shall sample at the following frequency:

Monthly or as directed by the Department

- e) The Approval Holder shall sample for the parameters and at the frequency indicated to ensure the following liquid effluent levels from any discharge from the Site are met:

Liquid Effluent Discharge Limits

Parameters	Maximum in a Grab Sample	Monitoring Frequency
Toxicity	Non-Acutely Lethal	Monthly or as directed by the Department
Total Petroleum Hydrocarbons	1.0 mg/l	Monthly or as directed by the Department
Total BTEX (benzene, toluene, ethyl benzene and xylene)	0.36 mg/l	Monthly or as directed by the Department

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- f) Non-compliance with the effluent discharge limits noted in condition 5(d) and 5(e) shall be immediately reported to the Department.
- g)
 - (i) The monitoring station(s) for the liquid effluent shall be any discharge point on Site from which construction effluent may be released.
 - (ii) The Department reserves the right to modify the monitoring locations, parameters and frequency, and to require remedial measures depending on the information obtained.
- h) All areas exposed during construction or control structures such as berms, ditches, etc., shall be stabilized immediately.
- i) When dewatering of construction areas is required, the water shall not be discharged directly to a watercourse or water resource or harbour, nor to a conveyance (a ditch, culvert, manhole) that may lead to a watercourse or water resource or harbour without prior treatment to meet limits established in condition 5(d) and 5(e).
- j) All excavated material, including aggregate, soil or dredge spoil shall be stored or disposed of in a manner that will not result in sedimentation of adjacent and downstream watercourses or water resources or harbour.
- k) Temporary erosion and sedimentation controls are to remain in place until Site stability is established. Approval for the removal of such controls must be obtained from the Department. All erosion and sedimentation control measures shall be monitored daily throughout the construction period and maintained as necessary.
- l) The Approval Holder shall maintain a record of the estimated volume of discharge and results of analysis and forward these to the Department upon request.
- m) Any excavation or control structure at the Site which is found to contain wastewater with free product or hydrocarbon sheen shall be removed from the Site by a licensed contractor or treated to comply with limits established in condition 5(d) and 5(e) prior to release.

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6. Particulate Emissions (Dust)

- a) Particulate emissions shall not exceed the following limits at or beyond the Site property boundaries:

Annual Geometric Mean 70 $\mu\text{g}/\text{m}^3$

Daily Average (24 hr.) 120 $\mu\text{g}/\text{m}^3$

- b) The use of used oil as a dust suppressant is strictly prohibited. The generation of dust from the Site shall be suppressed as required.
- c) Monitoring of particulate emissions shall be conducted at the request of the Department. The location of the monitoring station(s) for particulate will be established by a qualified person retained by the Approval Holder and submitted to the Department for approval, this may include point(s) beyond the property boundary of the Site.
- d) When requested, suspended particulate matter shall be measured by the EPA standard; EPA/625/R-96/010a; Sampling of Ambient Air for Total Suspended Particulate Matter (SPM) and PM_{10} . Using High Volume (HV) Sampler.

7. Sound Levels

- a) Sound levels measured at the Site property boundaries shall not exceed the following equivalent sound levels (Leq):

Leq 65 dBA 0700-1900 hours (Days)
 60 dBA 1900-2300 hours (Evenings)
 55 dBA 2300-0700 hours (Nights)

- b) Monitoring of sound levels shall be conducted at the request of the Department. The location of the monitoring station(s) for sound will be established by a qualified person retained by the Approval Holder and submitted to the Department for approval, this may include point(s) beyond the property boundary of the Site.

9. Soil and Dredge Spoil Management

- a) The Approval Holder shall follow the soils and dredge spoil management plan outlined in their Application. Harbour infilling shall be completed with only clean, uncontaminated and non-acid generating aggregate.

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- b) The Approval Holder shall maintain daily records of the disposition of all soils and dredge spoils including disposal/storage locations (with location sketch), tonnage and results of any analyses.
- c)
 - (i) The Approval Holder shall analyse one composite sample for every 100 m³ of dredge spoil material which is excavated.
 - (ii) Dredge spoils shall be analysed for the total metals, benzene, toluene, ethyl benzene and xylene (BTEX) and total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (pah's).
 - (iii) All dredge spoils which result in analyses which exceed the applicable Canadian Council of the Ministers of the Environment (CCME) and the Atlantic Tier I risk based screening level guidelines shall be disposed of at an approved off-Site soil disposal facility.
- d) Stockpiles of soil or dredge spoil contamination encountered during the course of construction shall be covered with an impermeable cover while not actively adding or removing materials from portions of the stockpile.
- e) New pipeline service trenches shall be constructed with impermeable checks to limit the migration of contaminants along the trench.
- f) The Approval Holder shall be required to implement specific soil or dredge spoil management programs if so directed by the Department.
- g) The Approval Holder shall be required cease construction, in whole or in part, if so directed by the Department.

10. Groundwater Monitoring

- a) The Approval Holder shall monitor the existing three (3) groundwater monitoring stations outlined on Figure No.1, Project 20617B, MGI, Proposed Monitor Well Locations, Dec. 2002 on a monthly basis for the parameters listed below:
 - i) Metal scan, including vanadium, nickel, zinc, copper and arsenic,
 - ii) Total Petroleum Hydrocarbons,
 - iii) BTEX (benzene, toluene, ethyl benzene and xylene),

- 10 -

- iv) PAH's(Polycyclic aromatic hydrocarbons), including those listed in the most current CCME Canadian Environmental Quality Guidelines, Canadian Water Quality Guidelines for the Protection of Aquatic Life and,
- v) Static water level
- b) The Approval Holder shall submit details of a proposal for installation of additional monitoring wells and an expanded monitoring program at the request of the Department.

11. Contingency Plans, Spills and Releases

- a) All spills or releases of dangerous goods, waste dangerous goods, or petroleum hydrocarbon shall be reported to the Department in accordance with the Act (Part VI) and the *Emergency Spill Regulations*.
- b) Spills or releases shall be cleaned up immediately.
- c) An adequate quantity of spill/release response material is to be maintained on Site at all times.
- d) The Approval Holder shall maintain and update a contingency plan and emergency response plan to address discharges of dangerous goods, fires or other emergency situations at the Site. The contingency plan shall be developed and updated in accordance with the Department's for Contingency Planning Guidelines dated September, 2004, as amended from time to time and made available to the Department upon request.
- e) The Approval Holder shall ensure that all personnel are trained to address environmental emergencies in a manner consistent with the Facility's approved contingency and emergency response plan(s) and that the necessary materials and equipment are available at all times for such purpose.

12. Complaint Response

- a) The Approval Holder shall have standard procedures to address complaints associated with the Facility which shall include;
 - (i) An immediate investigate of the cause of the complaint and the undertaking of immediate and appropriate action, if necessary, to correct the problem.

- 11 -

- (ii) A record or description of operations at the time of the complaint, including weather conditions, wind direction, smoke plumes, etc.
- (iii) a record of all complaints and documentation of the date, time, name, address and telephone number of the individual lodging the complaint. The record shall also state any cause of the complaint and the action taken to correct the problem.
- (iv) Records referenced in condition 12 shall be made available to the Inspector upon request.

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Request IR-14:

Reference Capital Cost Breakdown Table

Steam Turbine Generator and Major Components

Cooling loads and pump models

- a) Why are cooling loads greater than expected?
- b) Why were more expensive pump models selected based on performance and reduced maintenance costs?
- c) Please provide the estimated reduced maintenance costs.
- d) Was this reduced maintenance costs included in the updated economic analysis?
- e) Please provide a full NPV economic analysis of the justification for the total increase in capital spending for the more expensive pump models.

Response IR-14:

- a) The Generator and Lube Oil Coolers represent the majority of the plant's auxiliary cooling requirements. Preliminary cooling loads were based on typical information provided by several turbine/generator suppliers. The suppliers incorrectly assumed heat transfer loads based on using cooling water directly from Halifax harbour rather than through a closed loop system. A closed loop cooling system is required to isolate sea water from the equipment in order to prevent fouling by mussels and other marine growth

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1 Response IR-14: (cont'd)

2
3 and because of sea water's corrosive effect on metals. As a result, Mitsubishi cooling
4 requirements were higher than expected. The closed loop cooling operates at
5 approximately seven degrees Fahrenheit warmer than the sea water due to the heat
6 transfer efficiency of the general service cooling water heat exchangers. This resulted in
7 larger diameter pipe runs and slightly larger circulating pumps and larger coolers for the
8 Lube Oil and Generator. Please refer to Attachment 1.

9
10 b) Reliability and ease of maintenance are fundamental in a quality design. Through
11 detailed engineering and discussions with both the pump suppliers and plant maintenance
12 staff, a number of decisions were made relating to both the style of the pumps and their
13 metallurgy.

14
15 With respect to the Boiler Feed Pumps, a decision was made to specify BB3 pumps
16 (Multi Stage Axial Split) rather than the BB4 pumps (Ring Style) as originally specified.
17 Through the pump selection evaluation it was confirmed that BB3 pumps have
18 demonstrated improved reliability over BB4 pumps and are less complex to maintain as
19 they have a split casing. The Boiler Feed Water Pumps' capacity and head were both
20 increased after the detailed engineering was completed and all parasitic loads were
21 finalized.

22
23 Engineering review recommended that the Cooling Water Pumps be manufactured
24 utilizing metallurgy more consistent with current designs for salt water service. As a
25 result of detailed engineering and final condenser selection and design, the Cooling
26 Water Pumps required both an increase in capacity and head. This accounted for the
27 majority of the increased Cooling Water Pump costs.

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1 Response IR-14: (cont'd)

2
3 c) The avoided future maintenance costs have not been quantified. The increase in pump
4 costs was primarily due to an increase in system design and performance requirements.
5 The cost of the pump style and material upgrades are less than 20 percent of the costs
6 associated with increased system performance.

7
8 d) No. The increase in pump costs was primarily due to an increase in system and design
9 performance requirements, not the reductions in cost for maintenance and reliability.

10
11 e) A full NPV economic analysis is not practical as most of the cost was related to increased
12 system performance requirements. The pumps, as originally specified, were based on
13 preliminary engineering and would not function under the current design.

Technical Correspondence Sheet



A heat exchanger is required for the auxiliary cooling water supply to isolate sea water from the treated water circuit. We believe this heat exchanger is outside MPSA scope of supply but there is a need for MPSA to ensure the air and oil coolers are designed for cooling water temperatures that are slightly higher than the sea water.

NSP expects to use a shell and tube type exchanger which will result in a 5 to 6 F increase in design temperature required for the cooling water supply to the lube oil and air coolers.

Is this consistent with MPSA's understanding and design?

MPSA Response:

1. As you are probably aware and as previously communicated, this is not Mitsubishi's understanding as the contract Schedule "A" Works, Paragraph 2.5.1.2 clearly specifies demineralized water at 64 deg.F for the oil coolers and the generator air cooler.
2. This NSPI design basis change request information was forwarded to MHI and MELCO for an impact study and evaluation.
3. In an E-mail Dated December 11, 2008, NSPI provided the following Water Quality Information:

Water Quality

Raw Water Analysis										
	pH units	Conductivity us/cm	TOC mg/L	Sulfate mg/L	Sodium mg/L	Chloride mg/L	Silica mg/L	Ca mg/L	Mg mg/L	Fe mg/L
City Water	7	75-85	1.4	14	7.4	7	3.1	5.4	0.5	<0.02

4. In an E-mail Dated December 15, 2008, NSPI forwarded an e-mail from AMEC to MPSA further specifying that ***"the design temperature for MHI coolers should be 24 °C (75 F)"***.
5. Based on the impact analysis performed, MPSA hereby offers the following options:

Option 1

NSPI accept the proposed generator temperature rise limit change from Class B to Class F which allows MELCO to maintain the current generator frame size and design (Reference attached MELCO Technical Correspondence Sheet HWLT01-G003-01, **filename: HWLT01-G003-01.tif**). The design specified heat transfer area of the generator oil coolers will be increased. The additional price associated with Option 1 is \$25,000.00 CAD.

Option 2

If NSPI does not accept the proposed generator temperature rise limit change from Class B to Class F, this would require a change in the generator frame size and design which affects many things such as generating efficiency, utility, delivery time, content of guarantee, contract price, etc.. MPSA does not consider Option 2 to be a viable option for the project considering the overall project schedule as it represents a significant impact which would require further evaluation and contract as well as schedule negotiations.

Technical Correspondence Sheet



MPSA kindly requests NSPI to provide confirmation regarding the proposed generator temperature rise limit change from Class B to Class F by no later than January 15, 2009.

Your cooperation regarding this matter is greatly appreciated. Please do not hesitate to contact me if you have any questions or concerns. Thank You.

Sincerely,

Jerry Taflampas
Project Manager
Mitsubishi Power Systems Americas, Inc.
100 Colonial Center Parkway, Suite 500
Lake Mary, FL 32746
Phone: 407-688-6386
Fax: 407-688-6487
E-mail: jtaflampas@mpshq.com

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Request IR-15:

Reference Capital Cost Breakdown Table

Steam Turbine Generator and Major Components

CW Piping Layout

- a) Please explain the original design versus the split design.
- b) Please explain the limitations of the original design on the operating range.
- c) Please provide the operating range of the new design.
- d) Is the quoted \$1,126,903 the full capital cost increase due to this design change or is there an impact on other plant components, e.g. engineering design? If so, please provide details on the impact and the full capital cost increase of this design change.
- e) Please provide a full npv economic analysis of the justification for the total incremental increase in capital spending, i.e. as provided in the response to part d.
- f) Please explain why NSPI developed the original design with limitations on the operating range and why the requirement to change the design to cover the full operating range could not have been foreseen by NSPI.

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Response IR-15:

- a) The original design was for a single waterbox supplying cooling water to each condenser tube. The split design includes a segmented waterbox allowing the plant operator to run half of the condenser during reduced loads or winter conditions.
- b) Due to the unit load variations required to follow intermittent energy and the temperature variation in the cooling water, there are times when the operator would run half of the condenser to control turbine condenser vacuum within the Original Equipment Manufacturer (OEM) operating parameters. The original design would not allow for this functionality and this limitation was determined through detailed engineering after the final turbine selection. The original design was adequate for full load operation over normal operating conditions, but was not appropriate for minimum load during winter conditions. An additional benefit of the split condenser is that maintenance can be performed while on line.
- c) The operating range is from 12MW to 50MW during all seasons.
- d) The quoted capital cost increase includes additional fiberglass piping, 36" motorized butterfly valves, as well as the condenser itself.
- e) The decision to split the condenser and therefore increase the complexity of the CW piping was not based on technically equal alternatives with different costs. Rather, it was the necessary technical solution that emerged after modeling the system with the technical constraints of the turbine, energy flows from the combustion turbines at various loads and the full range of sea water temperatures. It is critical to the design that the steam turbine be able to run in winter conditions with only one LM 6000 operating.

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1 Response IR-15: (cont'd)

2
3 f) The original design was based on modeling software using engineering principals and
4 provided full operating range for the plant. The modeling identified a need to limit
5 CW cooling for minimum load conditions but stated this could be achieved by turning
6 off one of the pumps. Please refer to Attachment 1, Gryphon International
7 Engineering Services Inc. Report 1552RP0-02.

8
9 Detailed engineering using OEM data indicated that even with only one CW pump
10 running, the condenser as contemplated would develop excessive vacuum and a split
11 design would be more technically suitable for the operating conditions. Please refer
12 to Attachment 2, Technical Correspondence with Mitsubishi Power Systems.

NOVA SCOTIA POWER	REPORT				
	Gryphon File No. 1552RP02_02	Gryphon Project No. 1552			
NOVA SCOTIA POWER INC. TUFTS COVE GENERATING STATION TUFTS COVE 6 WASTE HEAT RECOVERY PROJECT ADDENDUM (to Report 1552RP01) HEAT BALANCES FOR UNFIRED PLANT DESIGN PART-LOAD OPERATION CONSIDERATIONS  GRYPHON International Engineering Services Inc. Suite 404, Corbloc, 80 King Street St. Catharines, Ontario L2R 7G1					
Rev.	Description	Date	By	Ckd	App'd
02	Final Issue	Mar 13-08	JwN	JwN	JwN
01	Issued for Review	Mar 7-08	JMCL	JwN	JwN

Rev: PA, PB, PC – Issued for Review; BA, BB, BC – Issued for Bid;

DA, DB, DC – Design Release; 00, 01, 02 – Issued for Construction/Issued for Record/Final

**NOVA SCOTIA POWER INC.
TUFTS COVE GENERATING STATION
TUFTS COVE 6 WASTE HEAT RECOVERY PROJECT**

**ADDENDUM - HEAT BALANCES FOR UNFIRED PLANT DESIGN
PART-LOAD OPERATION CONSIDERATIONS**

1.0 INTRODUCTION

Nova Scotia Power Inc. (NSPI) currently have installed two LM6000 PC E-Sprint gas turbine generators (GTG) at Tufts Cove, Nova Scotia. The GTG units are currently operated in peaking duty in simple-cycle mode and are designated as Tufts Cove Unit 4 and 5 respectively. NSPI have commenced an evaluation to consider upgrading the Tufts Cove GTG facility to a combined-cycle (CC) configuration, which would include the two (2) existing LM6000PC Sprint gas turbines, each with a new unfired heat recovery steam generator of the once-through steam generator (OTSG) type, and one (1) new condensing steam turbine generator with a sea water cooled condenser. NSPI have designated this potential upgrade project as the Tufts Cove 6 Waste Heat Recovery Project.

A Heat Balance Report **1552RP01 Heat Balances – Unfired Plant Design** was provided to NSPI for an unfired combined-cycle power plant design employing the two existing LM6000PC gas turbines, while operating at Base Load.

This **Addendum to Report 1552RP01** has been designated as report **1552RP02**, and was prepared per NSPI's subsequent request to examine the power plant's potential heat rate profile from Minimum Load to Base Load. Based on the annual average temperature (in the interest of brevity), this Addendum report¹ provides:

- Unfired combined cycle plant performance summaries and heat balance diagrams for one gas turbine operating between 30% and 100% load.
- Unfired combined cycle plant performance summaries and heat balance diagrams for two gas turbines operating between 30% and 100% load.
- Plant Heat Rate v.s. Load Curves for one gas turbine and two gas turbines running
- A brief discussion on the implications of ramping from low-load to base-load and beyond (duct-firing).

NSPI can use this document to assist in evaluating how the combined-cycle plant might perform with the LM6000(s) operated at part load, as may be required for load-regulation, load-following and/or spinning reserve within the NSPI system.

¹ The design and performance information provided herein is conceptual in nature. It is our understanding that NSPI will be executing the project utilizing an EPC approach, including the design of the cycle and selection of equipment. Accordingly, the performance presented herein may vary from that provided by an EPC Contractor.

2.0 BASIS OF PERFORMANCE

Please refer to Section 2.0 of Heat Balance Report 1552RP01 Heat Balances – Unfired Plant Design for a more complete description of the basis of the combined-cycle power plant design and performance.

The part-load plant performance was evaluated at the annual average ambient conditions as follows:

Ambient Dry Bulb Temperature:	45	°F
Ambient Relative Humidity:	77	%
Cooling Water Temperature:	47	°F

Part-load gas turbine performance was based on new and clean expected average engine data provided by GE's APPS v3.6.0 software, with 2% output degradation, and 2% heat rate degradation as per report 1552RP01.

GE APPS performance data is provided in Appendix A at the annual average ambient conditions, at load increments of 10% between 30% load and base load.

It is noted that at the annual average temperature, LM6000PC Sprint performance data shows SPRINT in operation above 76.5% load, and SPRINT off below 76.5% load.

The GE APPS based gas turbine performance data has been incorporated in Thermoflex v 17.0 software as a "user-defined gas turbine".

The configuration and sizing of all equipment is the same as described in report 1552RP01.

With one gas turbine operating, the system is assumed to be operated employing HP inlet steam pressure control, with the HP pressure controlled suitably for a permissible combination of pressure and temperature at the steam turbine inlet based on the achievable steam temperature with the gas turbine running at part-load. The HP steam temperature is assumed to be controlled by the OTSG at approximately 30 °F lower than the gas turbine exhaust temperature. The LP steam pressure is controlled to the design pressure of 70 psia at the inlet to the external LP steam admission control valve. The LP steam temperature is assumed to be controlled to 340 °F at the OTSG outlet.

With two gas turbines operating, the HP steam system is assumed to be operated in HP sliding pressure mode, while the HP steam temperature is assumed to be controlled by the OTSG at approximately 30 °F lower than the gas turbine exhaust temperature. The LP steam pressure is controlled to the design pressure of 70 psia at the inlet to the external LP steam admission control valve. The LP steam temperature is assumed to be controlled to 340 °F at the OTSG outlet.

With one gas turbine operating, the CW flow has been reduced by 50% by shutting off cooling water pumps.

The reduction in auxiliary power consumption at reduced plant output has been estimated and is included in the performance summaries and heat balances.

Transformer and line losses have not been included.

3.0 HEAT BALANCES

Thermodynamic cycle performance and heat balances have been calculated using Thermoflex 17 software.

The gas turbine performance data includes 2% output and 2% heat rate degradation, which represents the degradation as of the NSPI performance measurements in year-2007 as described in Section 2.2 of report 1552RP01. All other performance data for the steam cycle is provided at a new and clean expected level.

Appropriate degradation should be applied when utilizing this performance data in an economic analysis.

3.1 Part Load Performance Data and Heat Balances with One Gas Turbine Operating

A performance summary with one gas turbine in operation at loads between 30% and 100% is provided in Table 1 hereafter.

A curve showing Net Plant Heat Rate versus Net Plant Output for one gas turbine in operation is provided in Figure 1.

Part load heat balances with one gas turbine operating at the annual average ambient conditions are provided in Appendix B.

NOVA SCOTIA POWER INC.
TUFTS COVE 6 WASTE HEAT RECOVERY PROJECT
TABLE 1 HEAT BALANCE SUMMARY - 1 GT AT PART LOAD

Project: 1552
Date: 5-Mar-08
Issue: 01

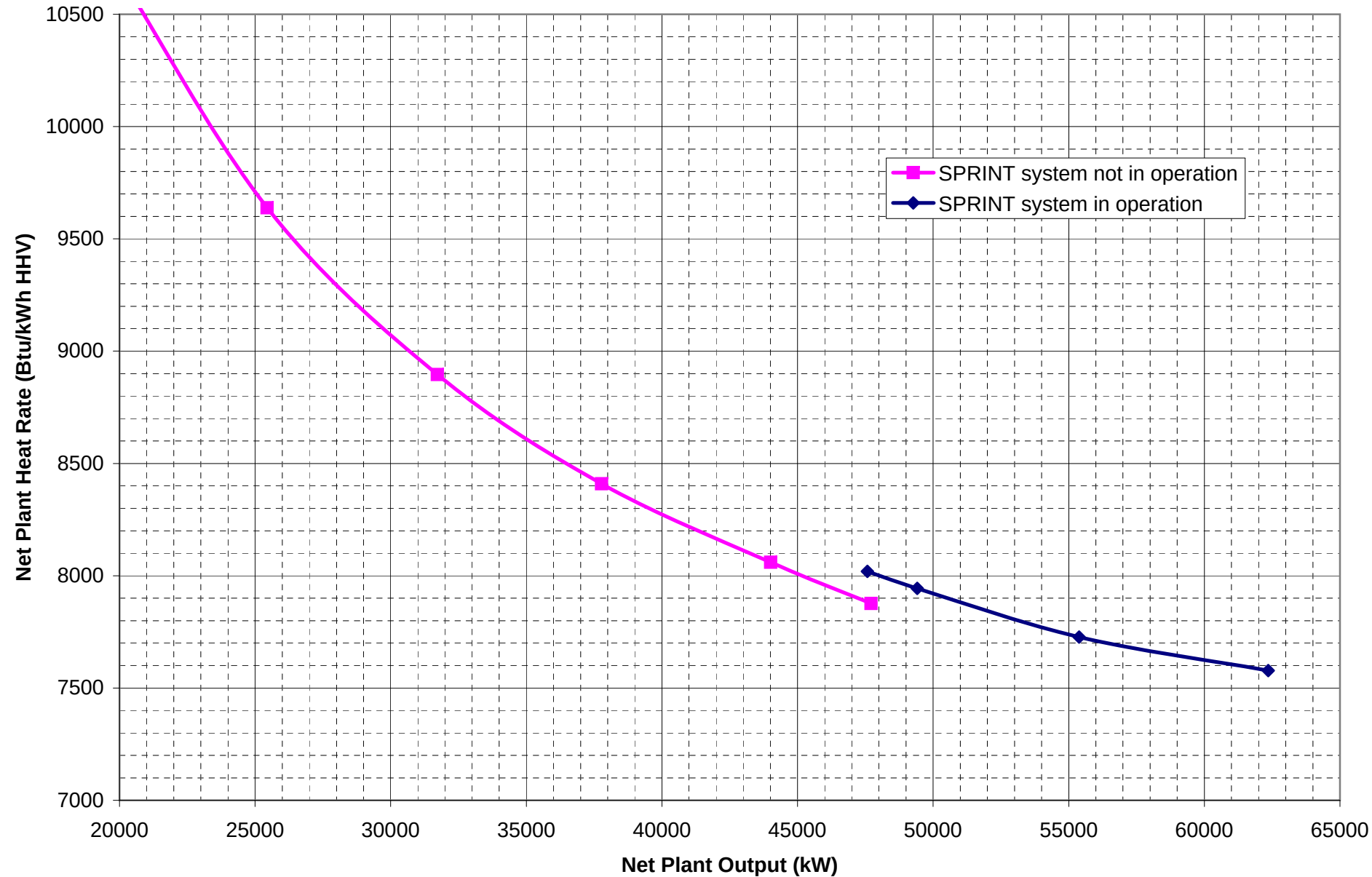
GT Load		100%	90%	80%	77%	76%
Ambient Dry Bulb Temp.	°F	45	45	45	45	45
Ambient Relative Humidity	%	77	77	77	77	77
Inlet Air Temperature After Heating	°F	45	45	45	45	45
<u>Electrical Output</u>						
GTG-01 Output	kW	49208	44292	39372	37717	37645
GTG-02 Output	kW	0	0	0	0	0
STG Output	kW	14630	12494	11410	11203	11410
Aux. Power Consumption	kW	1485	1407	1371	1343	1341
Transformer & Line Loss	kW	0	0	0	0	0
Net Plant Output	kW	62353	55379	49411	47577	47714
<u>Fuel Consumption</u>						
GT-01 Nat. Gas (HHV)	MMBtu/hr HHV	472.512	427.904	392.526	381.534	375.808
GT-02 Nat. Gas (HHV)	MMBtu/hr HHV	0.000	0.000	0.000	0.000	0.000
Total Nat. Gas (HHV)	MMBtu/hr HHV	472.512	427.904	392.526	381.534	375.808
Net Plant Heat Rate	Btu/kWh HHV	7578	7727	7944	8019	7876
Net Plant Efficiency (based on HHV)	%	45.03	44.16	42.95	42.55	43.32
<u>OTSG Parameters (per unit)</u>						
GT Exhaust Flow	lb/hr	1072000	1051600	999700	976700	982400
GT Exhaust Temperature	°F	842	792	780	781	787
Exhaust Temperature into OTSG	°F	842	792	780	781	787
HP Steam: Pressure	psia	631	626	625	624	625
Temperature	°F	809	759	749	749	754
Flow	lb/hr	99180	85750	78880	77580	78970
LP Steam: Pressure	psia	73	73	73	73	73
Temperature	°F	341	341	341	341	341
Flow	lb/hr	29740	30330	29170	28470	28310
HP FW Supply Temperature	°F	82	81	81	81	81
LP FW Supply Temperature	°F	99	86	79	78	79
Stack Temperature	°F	242	248	248	246	245
<u>Steam Turbine Parameters</u>						
HP Inlet Steam Pressure	psia	615	615	615	615	615
HP Inlet Steam Temperature	°F	805	756	746	746	751
HP Inlet Steam Flow	lb/hr	99180	85750	78880	77580	78970
LP Admission Steam Pressure	psia	31	27	25	25	25
LP Admission Steam Temperature	°F	323	321	321	321	321
LP Admission Steam Flow	lb/hr	29740	30330	29170	28470	28310
Exhaust Pressure	psia	0.43	0.39	0.38	0.38	0.38
Exhaust Pressure	in. HgA	0.87	0.80	0.78	0.77	0.77
Exhaust Enthalpy	Btu/lb	959.2	951.0	951.3	951.2	951.8
<u>Miscellaneous Cycle Parameters</u>						
GT Water Injection for NOx Control (per unit)	lb/hr	17506	14298	12124	11479	14489
GT SPRINT Flow (per unit)	lb/hr	8308	8308	8308	8308	0
Cooling Water Supply Temperature	°F	47.02	47.02	47.02	47.02	47.02
Cooling Water Return Temperature	°F	62.15	60.55	59.63	59.40	59.55
Cooling Water Delta T	°F	15.13	13.53	12.61	12.38	12.53
Cooling Water Flow	USGPM	15600	15600	15600	15600	15600

NOVA SCOTIA POWER INC.
TUFTS COVE 6 WASTE HEAT RECOVERY PROJECT
TABLE 1 HEAT BALANCE SUMMARY - 1 GT AT PART LO

Project: 1552
Date: 5-Mar-08
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GT Load		70%	60%	50%	40%	30%
Ambient Dry Bulb Temp.	°F	45	45	45	45	45
Ambient Relative Humidity	%	77	77	77	77	77
Inlet Air Temperature After Heating	°F	45	45	45	45	45
<u>Electrical Output</u>						
GTG-01 Output	kW	34453	29533	24615	19696	14779
GTG-02 Output	kW	0	0	0	0	0
STG Output	kW	10864	9504	8326	6935	5888
Aux. Power Consumption	kW	1308	1261	1223	1185	1150
Transformer & Line Loss	kW	0	0	0	0	0
Net Plant Output	kW	44009	37776	31718	25446	19517
<u>Fuel Consumption</u>						
GT-01 Nat. Gas (HHV)	MMBtu/hr HHV	354.692	317.666	282.169	245.262	210.229
GT-02 Nat. Gas (HHV)	MMBtu/hr HHV	0.000	0.000	0.000	0.000	0.000
Total Nat. Gas (HHV)	MMBtu/hr HHV	354.692	317.666	282.169	245.262	210.229
Net Plant Heat Rate	Btu/kWh HHV	8060	8409	8896	9639	10771
Net Plant Efficiency (based on HHV)	%	42.33	40.57	38.35	35.40	31.68
<u>OTSG Parameters (per unit)</u>						
GT Exhaust Flow	lb/hr	941000	894900	840100	790000	723000
GT Exhaust Temperature	°F	786	761	743	712	695
Exhaust Temperature into OTSG	°F	786	761	743	712	695
HP Steam: Pressure	psia	624	573	522	471	420
Temperature	°F	753	729	709	680	663
Flow	lb/hr	75630	68110	61690	53800	47820
LP Steam: Pressure	psia	73	72	72	72	71
Temperature	°F	341	342	342	343	343
Flow	lb/hr	27150	25240	22880	20860	18070
HP FW Supply Temperature	°F	82	84	86	91	94
LP FW Supply Temperature	°F	76	68	62	54	48
Stack Temperature	°F	244	245	245	248	248
<u>Steam Turbine Parameters</u>						
HP Inlet Steam Pressure	psia	615	565	515	465	415
HP Inlet Steam Temperature	°F	750	726	706	676	660
HP Inlet Steam Flow	lb/hr	75630	68110	61690	53800	47820
LP Admission Steam Pressure	psia	24	22	19	17	15
LP Admission Steam Temperature	°F	321	321	321	320	320
LP Admission Steam Flow	lb/hr	27150	25240	22880	20860	18070
Exhaust Pressure	psia	0.38	0.38	0.38	0.38	0.38
Exhaust Pressure	in. HgA	0.77	0.77	0.77	0.78	0.77
Exhaust Enthalpy	Btu/lb	953.1	955.8	959.4	964.6	970.0
<u>Miscellaneous Cycle Parameters</u>						
GT Water Injection for NOx Control (per unit)	lb/hr	13098	10807	8767	6801	4978
GT SPRINT Flow (per unit)	lb/hr	0	0	0	0	0
Cooling Water Supply Temperature	°F	47.02	47.02	47.02	47.02	47.02
Cooling Water Return Temperature	°F	59.04	57.97	56.98	55.85	54.86
Cooling Water Delta T	°F	12.02	10.95	9.96	8.83	7.84
Cooling Water Flow	USGPM	15600	15600	15600	15600	15600

Figure 1 Net Plant Heat Rate Vs. Output (1 Gas Turbine Operating)
Tufts Cove 6 Waste Heat Recovery Project



3.2 Part Load Performance Data and Heat Balances with Two Gas Turbines Operating

A performance summary with two gas turbines in operation at loads between 30% and 100% is provided in Table 2 hereafter.

A curve showing Net Plant Heat Rate versus Net Plant Output for two gas turbines in operation is provided in Figure 2.

Part load heat balances with two gas turbines operating at the annual average ambient conditions are provided in Appendix C.

NOVA SCOTIA POWER INC.
TUFTS COVE 6 WASTE HEAT RECOVERY PROJECT
TABLE 2 HEAT BALANCE SUMMARY - 2 GTS AT PART LOAD

Project: 1552
Date: 5-Mar-08
Issue: 01

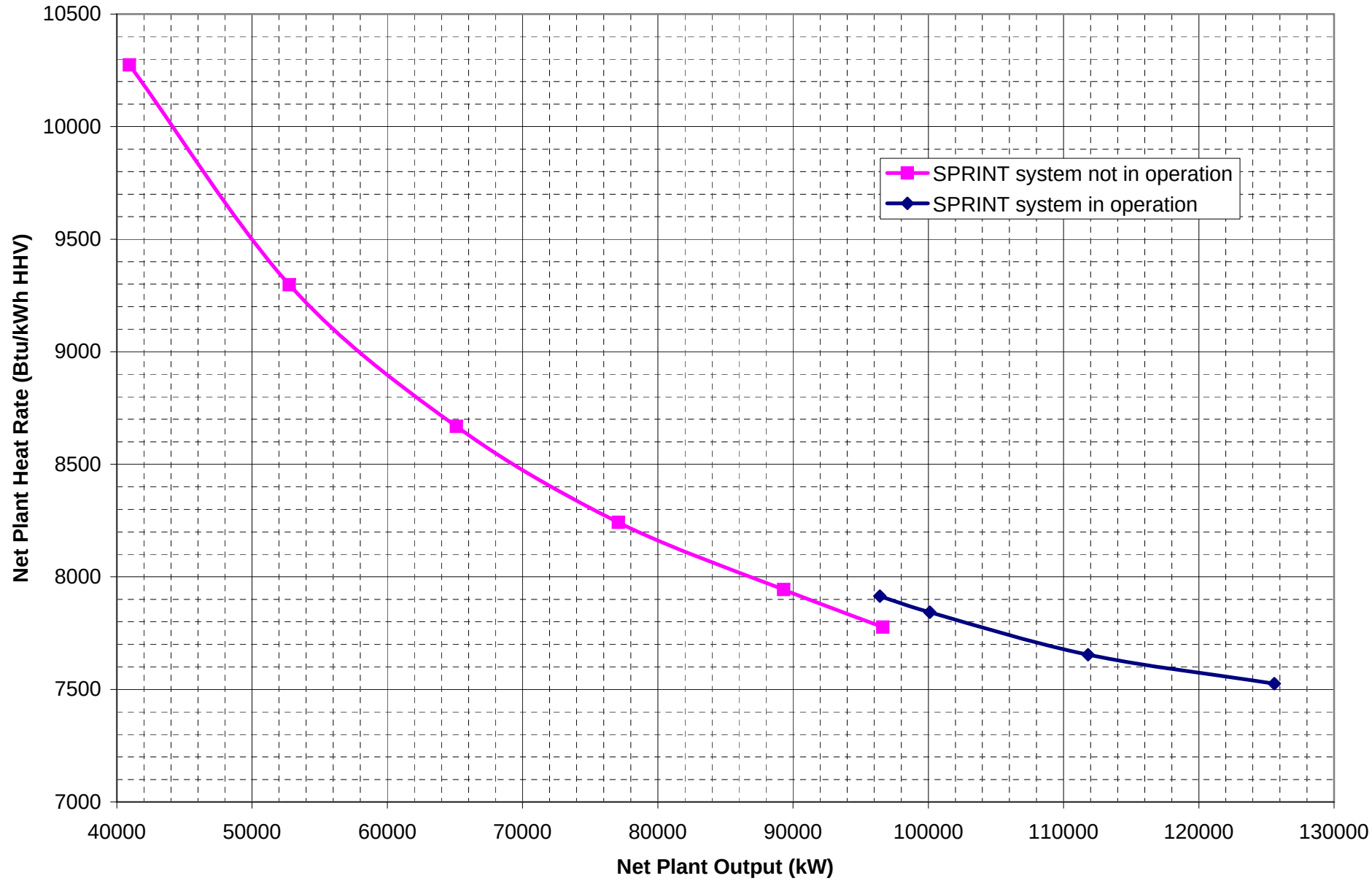
GT Load		100%	90%	80%	77%	76%
Ambient Dry Bulb Temp.	°F	45	45	45	45	45
Ambient Relative Humidity	%	77	77	77	77	77
Inlet Air Temperature After Heating	°F	45	45	45	45	45
<u>Electrical Output</u>						
GTG-01 Output	kW	49208	44292	39372	37717	37645
GTG-02 Output	kW	49208	44292	39372	37717	37645
STG Output	kW	29352	25371	23476	23079	23455
Aux. Power Consumption	kW	2187	2143	2116	2097	2096
Transformer & Line Loss	kW	0	0	0	0	0
Net Plant Output	kW	125581	111812	100104	96416	96649
<u>Fuel Consumption</u>						
GT-01 Nat. Gas (HHV)	MMBtu/hr HHV	472.512	427.904	392.526	381.534	375.808
GT-02 Nat. Gas (HHV)	MMBtu/hr HHV	472.512	427.904	392.526	381.534	375.808
Total Nat. Gas (HHV)	MMBtu/hr HHV	945.024	855.808	785.051	763.068	751.616
Net Plant Heat Rate	Btu/kWh HHV	7525	7654	7842	7914	7777
Net Plant Efficiency (based on HHV)	%	45.34	44.58	43.51	43.11	43.87
<u>OTSG Parameters (per unit)</u>						
GT Exhaust Flow	lb/hr	1072000	1051600	999700	976700	982400
GT Exhaust Temperature	°F	842	792	780	781	787
Exhaust Temperature into OTSG	°F	842	792	780	781	787
HP Steam: Pressure	psia	640	554	515	508	516
Temperature	°F	809	759	749	749	754
Flow	lb/hr	99010	87620	81710	80530	81680
LP Steam: Pressure	psia	76	75	74	74	74
Temperature	°F	341	341	342	342	342
Flow	lb/hr	29750	28190	26020	25180	25270
HP FW Supply Temperature	°F	81	79	78	78	78
LP FW Supply Temperature	°F	99	88	82	81	82
Stack Temperature	°F	244	246	244	243	242
<u>Steam Turbine Parameters</u>						
HP Inlet Steam Pressure	psia	615	533	495	488	496
HP Inlet Steam Temperature	°F	805	755	745	745	750
HP Inlet Steam Flow	lb/hr	198000	175200	163400	161100	163400
LP Admission Steam Pressure	psia	65	57	53	52	53
LP Admission Steam Temperature	°F	335	332	332	332	332
LP Admission Steam Flow	lb/hr	59490	56380	52040	50360	50540
Exhaust Pressure	psia	0.49	0.44	0.42	0.41	0.42
Exhaust Pressure	in. HgA	1.00	0.91	0.85	0.84	0.85
Exhaust Enthalpy	Btu/lb	962.1	956.5	955.9	956.0	956.5
<u>Miscellaneous Cycle Parameters</u>						
GT Water Injection for NOx Control (per unit)	lb/hr	17506	14298	12124	11479	14489
GT SPRINT Flow (per unit)	lb/hr	8308	8308	8308	8308	0
Cooling Water Supply Temperature	°F	47.02	47.02	47.02	47.02	47.02
Cooling Water Return Temperature	°F	62.10	60.54	59.61	59.38	59.53
Cooling Water Delta T	°F	15.08	13.52	12.59	12.36	12.51
Cooling Water Flow	USGPM	31238	31238	31238	31238	31238

NOVA SCOTIA POWER INC.
TUFTS COVE 6 WASTE HEAT RECOVERY PROJECT
TABLE 2 HEAT BALANCE SUMMARY - 2 GTS AT PART L

Project: 1552
Date: 5-Mar-08
Issue: 01

GT Load		70%	60%	50%	40%	30%
Ambient Dry Bulb Temp.	°F	45	45	45	45	45
Ambient Relative Humidity	%	77	77	77	77	77
Inlet Air Temperature After Heating	°F	45	45	45	45	45
<u>Electrical Output</u>						
GTG-01 Output	kW	34453	29533	24615	19696	14779
GTG-02 Output	kW	34453	29533	24615	19696	14779
STG Output	kW	22473	20053	17871	15326	13281
Aux. Power Consumption	kW	2073	2033	1998	1957	1914
Transformer & Line Loss	kW	0	0	0	0	0
Net Plant Output	kW	89307	77086	65104	52761	40925
<u>Fuel Consumption</u>						
GT-01 Nat. Gas (HHV)	MMBtu/hr HHV	354.692	317.666	282.169	245.262	210.229
GT-02 Nat. Gas (HHV)	MMBtu/hr HHV	354.692	317.666	282.169	245.262	210.229
Total Nat. Gas (HHV)	MMBtu/hr HHV	709.384	635.332	564.338	490.525	420.458
Net Plant Heat Rate	Btu/kWh HHV	7943	8242	8668	9297	10274
Net Plant Efficiency (based on HHV)	%	42.95	41.40	39.36	36.70	33.21
<u>OTSG Parameters (per unit)</u>						
GT Exhaust Flow	lb/hr	941000	894900	840100	790000	723000
GT Exhaust Temperature	°F	786	761	743	712	695
Exhaust Temperature into OTSG	°F	786	761	743	712	695
HP Steam: Pressure	psia	498	447	403	352	311
Temperature	°F	753	729	709	679	662
Flow	lb/hr	78700	71380	64920	57330	51110
LP Steam: Pressure	psia	74	73	72	72	71
Temperature	°F	342	343	343	344	344
Flow	lb/hr	23730	21630	19360	17100	14560
HP FW Supply Temperature	°F	79	78	79	80	80
LP FW Supply Temperature	°F	79	71	65	57	51
Stack Temperature	°F	241	241	240	242	241
<u>Steam Turbine Parameters</u>						
HP Inlet Steam Pressure	psia	478	430	388	338	299
HP Inlet Steam Temperature	°F	749	725	705	675	658
HP Inlet Steam Flow	lb/hr	157400	142800	129800	114700	102200
LP Admission Steam Pressure	psia	51	46	41	36	31
LP Admission Steam Temperature	°F	331	330	329	328	326
LP Admission Steam Flow	lb/hr	47450	43270	38730	34200	29120
Exhaust Pressure	psia	0.43	0.40	0.40	0.40	0.39
Exhaust Pressure	in. HgA	0.88	0.81	0.81	0.81	0.79
Exhaust Enthalpy	Btu/lb	957.3	955.0	954.4	953.7	954.7
<u>Miscellaneous Cycle Parameters</u>						
GT Water Injection for NOx Control (per unit)	lb/hr	13098	10807	8767	6801	4978
GT SPRINT Flow (per unit)	lb/hr	0	0	0	0	0
Cooling Water Supply Temperature	°F	47.02	47.02	47.02	47.02	47.02
Cooling Water Return Temperature	°F	59.00	57.90	56.87	55.71	54.70
Cooling Water Delta T	°F	11.98	10.88	9.85	8.69	7.68
Cooling Water Flow	USGPM	31238	31238	31238	31238	31238

Figure 2 Net Plant Heat Rate Vs. Output (2 Gas Turbines Operating)
Tufts Cove 6 Waste Heat Recovery Project



4.0 **RAMPING CONSIDERATIONS**

In their request for part-load plant performance profiles that lead to this Addendum report 1552RP02, NSPI also requested advice regarding ramping the plant from part-load to full-load, for the unfired and a potential duct-fired² design. This section 4.0 records information that was previously provided to NSPI by e-mail.

4.1 **Ramping from Part-Load to Full-Load – Unfired**

Question: NSPI would like to know how fast the plant could go from 30 MW (i.e. 2 LM600 gas turbines at minimum load) to full output under average annual temperatures and at what rate NSPI could vary load over that range to follow wind turbine generated power variations in the NSPI system.

Reply:

- a) To the best of our knowledge, any LM6000 can easily increase load at a rate of approximately 10 MW per minute. We assume that NSPI's LM6000's can also.
- b) In general, as the LM6000 increases in load/output, its exhaust temperature and exhaust flow will also rise. The increase in exhaust temperature will allow HP steam temperature (setpoint) to increase accordingly, subject primarily only to the "allowable temperature ramp rate" of the steam turbine generator (STG) itself (vendor specific). The increase in turbine exhaust flow will similarly cause increased HP steam flow, which could be readily accepted by the STG only subject to its "loading limits" (vendor specific).
- c) In essence, the STG output should climb (proportionally) almost as quickly as the GTG output, with possibly only a problem (slowdown) if the "starting" operating point had a much lower HP steam temperature than the "final" operating point.

The above assumes that the plant's heat recovery steam generators are of the OTSG type (which have less "internal" temperature rate restrictions than drum-type HRSGs), that a properly setup feedwater and condensate system is fitted, and that a properly designed steam (pressure / temperature) control system is designed. If so, the OTSG(s) HP and MP steam production will follow and adjust very quickly.

4.2 **Duct-Firing Ramping**

Question: NSPI are still exploring with the regulator, the installation and ability to use duct-firing as originally proposed. The approach we would like to use is to justify duct-firing on increased ability to regulate load in support of wind integration, i.e. capacity and heat rate are not the issue. We are assuming that that is a true statement but are not sure.

² This Addendum Report 1552RP02 and the previous Heat Balance Report 1552RP01 are both based strictly on an unfired combined-cycle power plant, i.e. no duct-firing.

Duct firing provides additional cheap capacity but does it increase ability to regulate or actually make it more difficult because of the changing steam conditions?

It would be very helpful for NSPI to understand how the plant might perform with duct firing in the scenario above. In other words, would NSPI be able to put 2 LM6000's on line at 15 MW and ramp from 30 MW to say 150 MW (i.e. full duct-firing) with more or less the same ramp rate as the unfired plant.

NSPI recognize the control would be more complicated but are trying to understand if it is a fair assumption that duct firing simply gives us a greater range, or if it actually provides a similar range at different steam conditions (assuming we have a higher bottom end if we are firing to maintain steam temperature with minimum load on the LM6000's). NSPI suspect the duct firing question may not be easily answered or within scope of this model.

Reply:

- a) Duct-firing (once at the GTG's are at base load, SPRINT on or off as applicable, and the OTSGs and STG are stable) would add further capacity flexibility (at the STG). Again, with properly designed systems, the only big impediment to STG ramping from base load to a fired load would be the HP steam temperature ramp rate issue (vendor specific), and possibly a load (ramp) limit.
- b) In essence, the "... the changing steam conditions ..." will not be a BIG problem, you just increase your duct firing rate commensurate with what the STG can take (in changing inlet temperature and/or MW ramp rate).
- c) In essence, duct-firing would provide a "greater range".
- d) The control is not "... more complicated ...", just different.

4.3 EPC Specification Considerations

Whatever approach NSPI decides upon, the EPC Specification should very clearly identify the design criteria and intent for the combined-cycle power plant.

Most EPC contractors will simply assume/design-for a base-load operated plant, and will not cater for any of the above operating criteria (i.e. part-load operation, sliding pressure and/or temperature, duct-firing, etc.) unless it's specifically spelled out in black and white what NSPI wants done.

APPENDIX A

GAS TURBINE PERFORMANCE DATA AT PART LOAD

Estimated Average Engine Performance NOT FOR GUARANTEE, REFER TO PROJECT F&ID FOR DESIGN



GE Energy

Performance By: JMCLEISH

Project Info:

Engine: LM6000 PC-SPRINT w/ FIGV at 0 Degrees
 Deck Info: G01250 - 8dx.scp
 Generator: BDAX 290ERT 60Hz, 13.8kV, 0.9PF (14839)
 Fuel: Site Gas Fuel#900-773T, 20270 Btu/lb,LHV

Date: 03/03/2008
 Time: 1:08:53 PM
 Version: 3.6.0

Case #	100	101	102	102	101	103	104	105	106	107	108	109
Ambient Conditions												
Dry Bulb, °F	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Wet Bulb, °F	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8	41.8
RH, %	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0
Altitude, ft	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Ambient Pressure, psia	14.691	14.691	14.691	14.691	14.691	14.691	14.691	14.691	14.691	14.691	14.691	14.691
Engine Inlet												
Comp Inlet Temp, °F	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
RH, %	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0
Conditioning	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
Tons or kBtu/hr	0	0	0	0	0	0	0	0	0	0	0	0
Pressure Losses												
Inlet Loss, inH2O	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Volute Loss, inH2O	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Exhaust Loss, inH2O	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Partload %	100	90	80			70	60	50	40	30	20	10
kW, Gen Terms	50212	45196	40176	38487	38413	35156	30136	25117	20098	15081	10068	5073
Est. Btu/kW-hr, LHV	8509	8561	8834	8964	8846	9123	9531	10158	11034	12605	16055	25878
Degraded Output with 2% Degradation	49208	44292	39372	37717	37645	34453	29533	24615	19696	14779	9867	4972
Degraded Heat Rate with 2% Margin	8679	8732	9011	9143	9023	9305	9722	10361	11255	12857	16376	26396
Fuel Flow												
MMBtu/hr, LHV	427.2	386.9	354.9	345.0	339.8	320.7	287.2	255.1	221.8	190.1	161.6	131.3
lb/hr	21077	19088	17510	17020	16764	15823	14170	12587	10941	9379	7974	6476
NOx Control												
Water Injection												
lb/hr	17506	14298	12124	11479	14489	13098	10807	8767	6801	4978	3437	1978
Temperature, °F	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
SPRINT												
LPC	LPC	LPC	LPC	LPC	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
lb/hr	8308	8308	8308	8308	0	0	0	0	0	0	0	0
Control Parameters												
HP Speed, RPM	10404	10178	10056	10020	10088	10011	9860	9699	9559	9388	9216	9024
LP Speed, RPM	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600
PS3 - CDP, psia	457.8	438.6	412.3	402.1	404.2	385.2	360.4	333.2	306.9	275.8	241.2	204.6
T3CRF - CDT, °F	962	919	893	886	946	928	899	870	839	804	769	729
T48IN, °R	2038	1953	1914	1907	1920	1901	1844	1789	1718	1657	1615	1560
T48IN, °F	1578	1494	1454	1447	1460	1442	1384	1329	1258	1197	1155	1101
Exhaust Parameters												
Temperature, °F	841.9	791.8	779.5	781.0	787.1	786.2	761.4	742.5	712.1	695.0	704.9	712.0
lb/sec	297.8	292.1	277.7	271.3	272.9	261.4	248.6	233.4	219.4	200.8	178.1	153.9
lb/hr	1071980	1051615	999711	976682	982382	940972	894901	840086	789983	722967	641113	554150
Energy, Btu/s- Ref 0 °R	100109	93752	87995	86036	86590	82786	76832	70751	64542	57993	51779	44920
Energy, Btu/s- Ref T2 °F	62398	56903	53035	51895	52397	50067	45798	41687	37291	33116	29760	25933
Cp, Btu/lb-R	0.2762	0.2728	0.2717	0.2716	0.2705	0.2701	0.2682	0.2667	0.2646	0.2631	0.2628	0.2622
Emissions (NOT FOR USE IN ENVIRONMENTAL PERMITS)												
NOx ppmvd Ref 15% O2	32	32	32	32	32	32	32	32	32	32	32	32
NOx as NO2, lb/hr	55	50	46	44	44	41	37	33	28	24	21	17
CO ppmvd Ref 15% O2	10	10	10	10	14	14	14	14	14	13	12	16
CO, lb/hr	10.03	9.78	9.05	8.70	11.78	11.31	9.95	8.77	7.41	6.04	4.74	5.02
CO2, lb/hr	57069.95	51721.10	47461.11	46136.96	45466.63	42920.75	38463.05	34185.95	29745.36	25520.63	21712.56	17648.64
HC ppmvd Ref 15% O2	2	2	2	2	2	2	2	2	2	2	2	2
HC, lb/hr	1.26	1.15	1.05	1.02	1.01	0.95	0.85	0.76	0.66	0.56	0.48	0.39
SOX as SO2, lb/hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exh Wght % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)												
AR	1.2253	1.2306	1.2333	1.2339	1.2410	1.2424	1.2460	1.2492	1.2530	1.2563	1.2590	1.2622
N2	71.8553	72.1642	72.3241	72.3612	72.7768	72.8577	73.0695	73.2563	73.4782	73.6731	73.8276	74.0183
O2	14.6536	15.3142	15.6016	15.6460	15.9066	16.0248	16.4573	16.8339	17.3263	17.7147	17.9622	18.3022
CO2	5.3238	4.9183	4.7475	4.7238	4.6282	4.5613	4.2980	4.0693	3.7653	3.5300	3.3867	3.1848
H2O	6.9374	6.3685	6.0894	6.0309	5.4430	5.3095	4.9251	4.5874	4.1736	3.8226	3.5615	3.2294
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0009	0.0009	0.0009	0.0009	0.0012	0.0012	0.0011	0.0010	0.0009	0.0008	0.0007	0.0009
HC	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
NOX	0.0035	0.0032	0.0031	0.0031	0.0031	0.0030	0.0028	0.0027	0.0025	0.0023	0.0022	0.0021
Exh Mole % Dry (NOT FOR USE IN ENVIRONMENTAL PERMITS)												
AR	0.9661	0.9634	0.9623	0.9621	0.9614	0.9609	0.9592	0.9578	0.9559	0.9544	0.9535	0.9522
N2	80.7937	80.5680	80.4728	80.4592	80.3956	80.3583	80.2157	80.0929	79.9318	79.8077	79.7318	79.6263
O2	14.4249	14.9688	15.1981	15.2309	15.3840	15.4739	15.8174	16.1133	16.5014	16.8005	16.9834	17.2374
CO2	3.8104	3.4953	3.3625	3.3435	3.2545	3.2024	3.0035	2.8321	2.6073	2.4341	2.3282	2.1809

Estimated Average Engine Performance NOT FOR GUARANTEE, REFER TO PROJECT F&ID FOR DESIGN



GE Energy

Performance By: JMCLEISH
Project Info:

Engine: LM6000 PC-SPRINT w/ FIGV at 0 Degrees
Deck Info: G01250 - 8dx.scp
Generator: BDAX 290ERT 60Hz, 13.8kV, 0.9PF (14839)
Fuel: Site Gas Fuel#900-773T, 20270 Btu/lb,LHV

Date: 03/03/2008
Time: 1:08:53 PM
Version: 3.6.0

Case #	100	101	102	102	101	103	104	105	106	107	108	109
H2O	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0011	0.0010	0.0010	0.0010	0.0013	0.0013	0.0012	0.0011	0.0010	0.0009	0.0008	0.0010
HC	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001
NOX	0.0035	0.0032	0.0031	0.0031	0.0030	0.0029	0.0028	0.0026	0.0024	0.0022	0.0021	0.0020

Exh Mole % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)

AR	0.8616	0.8675	0.8706	0.8713	0.8792	0.8807	0.8849	0.8885	0.8928	0.8967	0.8997	0.9034
N2	72.0537	72.5468	72.8023	72.8614	73.5213	73.6513	73.9945	74.2981	74.6607	74.9796	75.2321	75.5452
O2	12.8645	13.4786	13.7494	13.7926	14.0686	14.1824	14.5907	14.9475	15.4132	15.7841	16.0249	16.3539
CO2	3.3982	3.1473	3.0420	3.0278	2.9762	2.9351	2.7705	2.6272	2.4354	2.2869	2.1968	2.0691
H2O	10.8177	9.9557	9.5319	9.4431	8.5506	8.3463	7.7556	7.2351	6.5946	6.0497	5.6436	5.1254
SO2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO	0.0009	0.0009	0.0009	0.0009	0.0012	0.0012	0.0011	0.0011	0.0010	0.0009	0.0008	0.0009
HC	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
NOX	0.0031	0.0029	0.0028	0.0028	0.0027	0.0027	0.0025	0.0024	0.0022	0.0021	0.0020	0.0019

Aero Energy Fuel Number**Gas Analysis**

	Volume %	Weight %	Weight %
Hydrogen	0.0000	0.0000	0.0000
Methane	89.0000	78.5651	78.5651
Ethane	6.6000	10.9202	10.9202
Ethylene	0.0000	0.0000	0.0000
Propane	2.0000	4.8528	4.8528
Propylene	0.0000	0.0000	0.0000
Butane	0.2200	0.7036	0.7036
Butylene	0.0000	0.0000	0.0000
Butadiene	0.0000	0.0000	0.0000
Pentane	0.0200	0.0794	0.0794
Cyclopentane	0.0000	0.0000	0.0000
Hexane	0.0000	0.0000	0.0000
Heptane	0.0000	0.0000	0.0000
Carbon Monoxide	0.0000	0.0000	0.0000
Carbon Dioxide	1.7600	4.2623	4.2623
Nitrogen	0.4000	0.6166	0.6166
Water Vapor	0.0000	0.0000	0.0000
Oxygen	0.0000	0.0000	0.0000
Hydrogen Sulfide	0.0000	0.0000	0.0000
Ammonia	0.0000	0.0000	0.0000
Btu/lb, LHV	20270		
Btu/scf, LHV	973		
Btu/scf, HHV	1077		
Btu/lb, HHV	22425		
Fuel Temp, °F	60.0		
NOx Scalar	1.021		
Specific Gravity	0.63		

Engine Exhaust

Exhaust Avg. Mol. Wt., Wet Basis	28.1	28.2	28.2	28.2	28.3	28.3	28.4	28.4	28.5	28.5	28.5	28.6
Inlet Flow Wet, pps	288.5	285.6	287.3	288.6	279.0	282.9	281.6	282.8	281.6	284.5	288.8	290.7
Inlet Flow Dry, pps	287.1	284.2	285.9	287.2	277.7	281.5	280.3	281.5	280.2	283.2	287.4	289.3
Shaft HP	68508	61696	54888	52600	52500	48089	41297	34513	27736	20966	14205	7472

Generator Information

Capacity kW	67686	67686	67686	67686	67686	67686	67686	67686	67686	67686	67686	67686
Efficiency	0.983	0.982	0.982	0.981	0.981	0.980	0.979	0.976	0.972	0.965	0.950	0.910
Inlet Temp, °F	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Gear Box Loss	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRQ48, Torque Limit Cold End	122004	112896	102532	98793	100100	93037	83373	73255	63610	53150	41913	30881

Correct Control Parameters

PS3JQA, psia	462.348	442.958	416.396	406.095	408.216	389.027	363.981	336.510	309.949	278.540	243.596	206.633
XN25R3, rpm	6300	6249	6228	6222	6132	6121	6085	6046	6025	5997	5972	5948

8th Stage Bleed

Flow, pps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pressure, psia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Temperature, °R	0	0	0	0	0	0	0	0	0	0	0	0

CDP Bleed

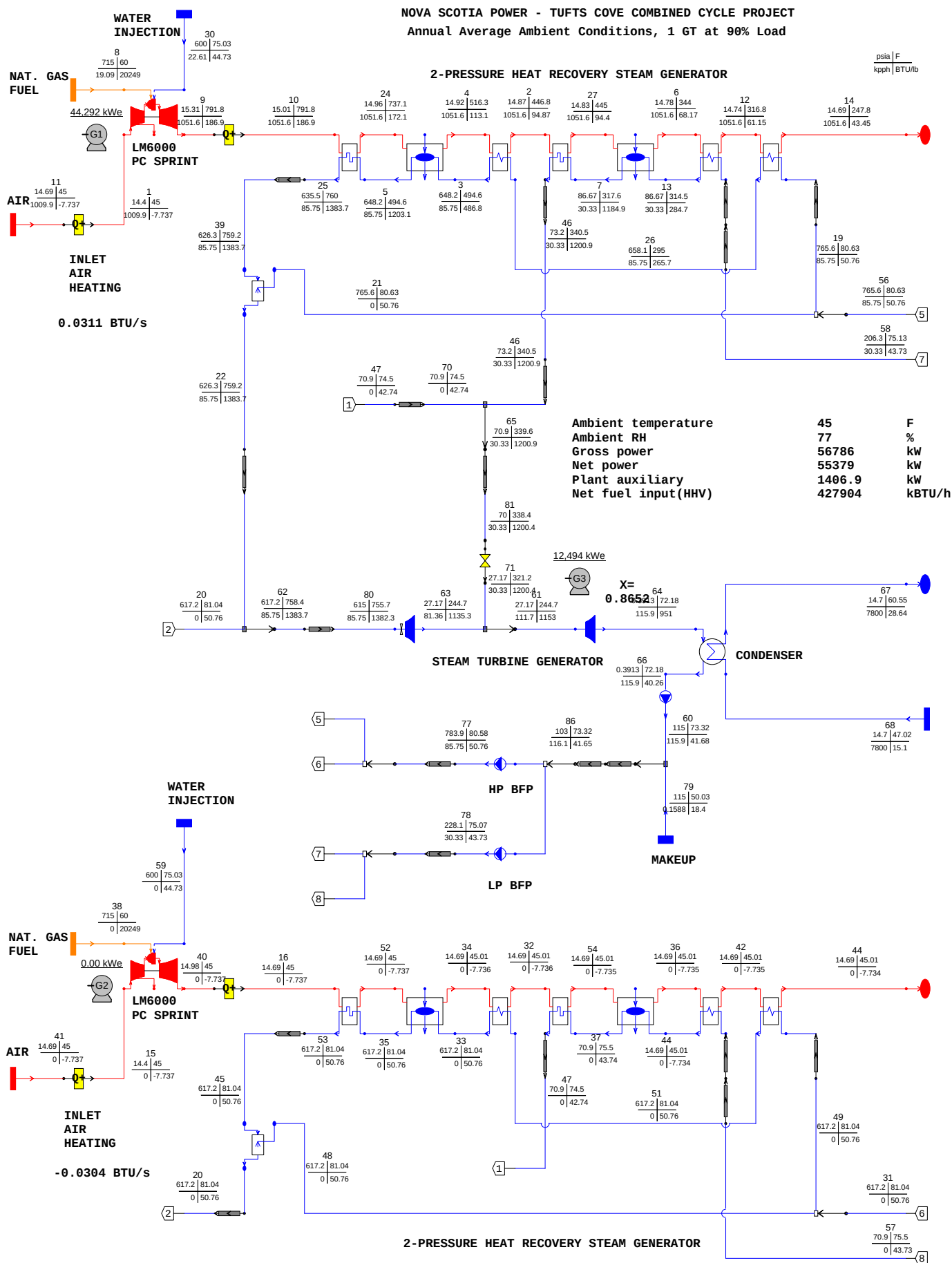
Flow, pps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pressure, psia	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

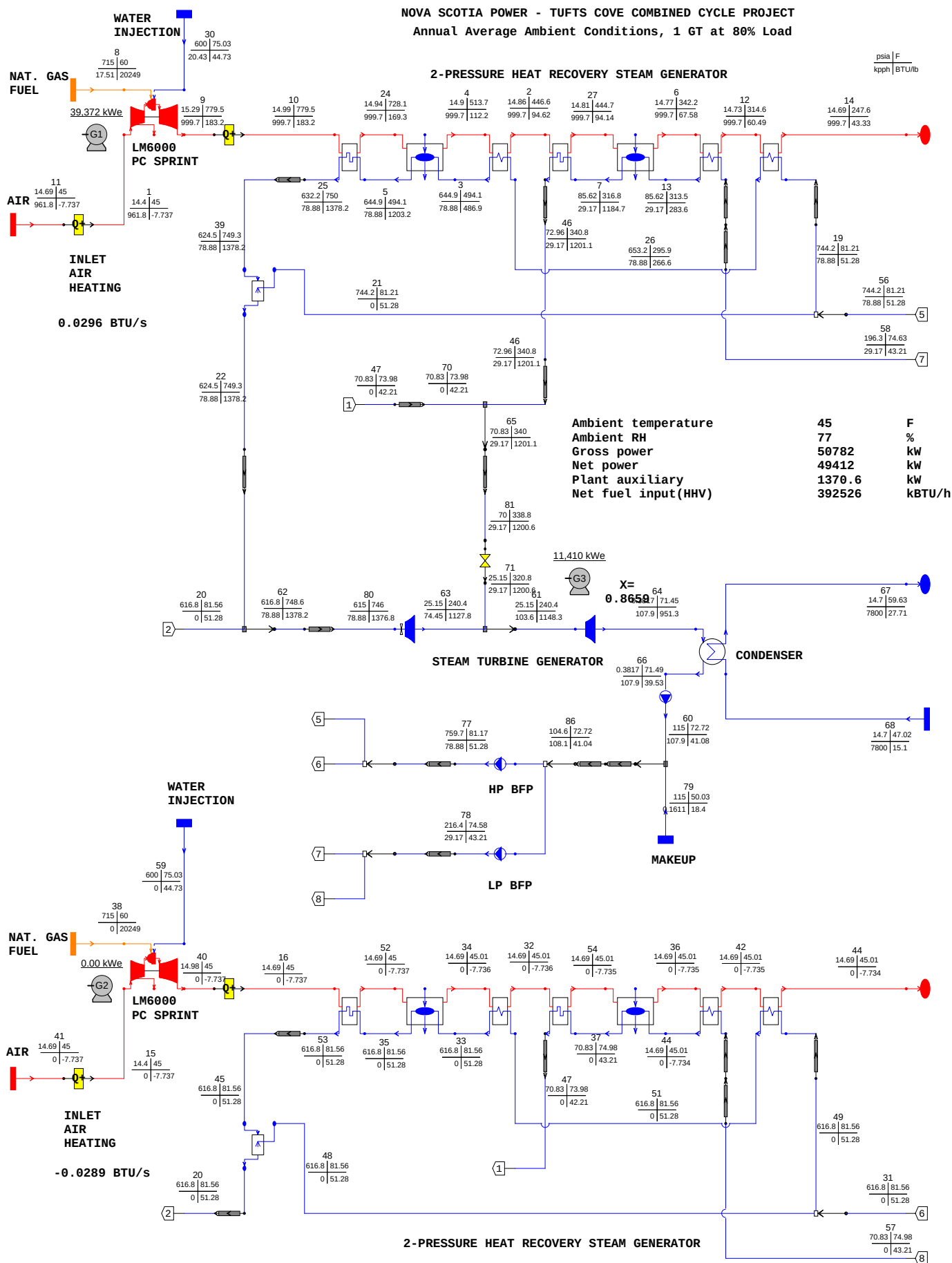
Est. Gas Pressure at Baseplate, psig	552.6	523.0	488.5	475.8	476.7	452.9	419.7	384.7	350.4	311.5	269.8	225.6
--------------------------------------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

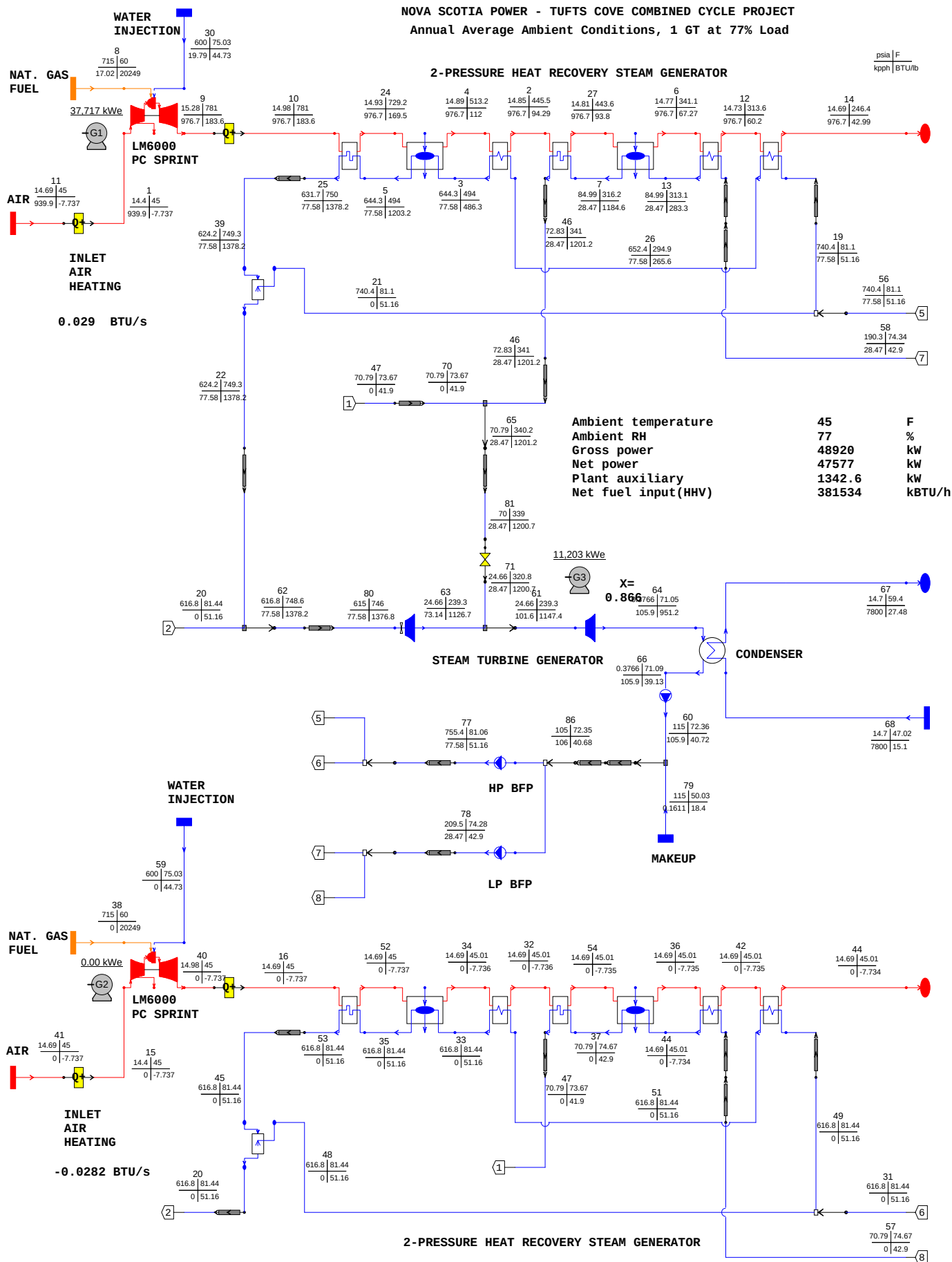
APPENDIX B

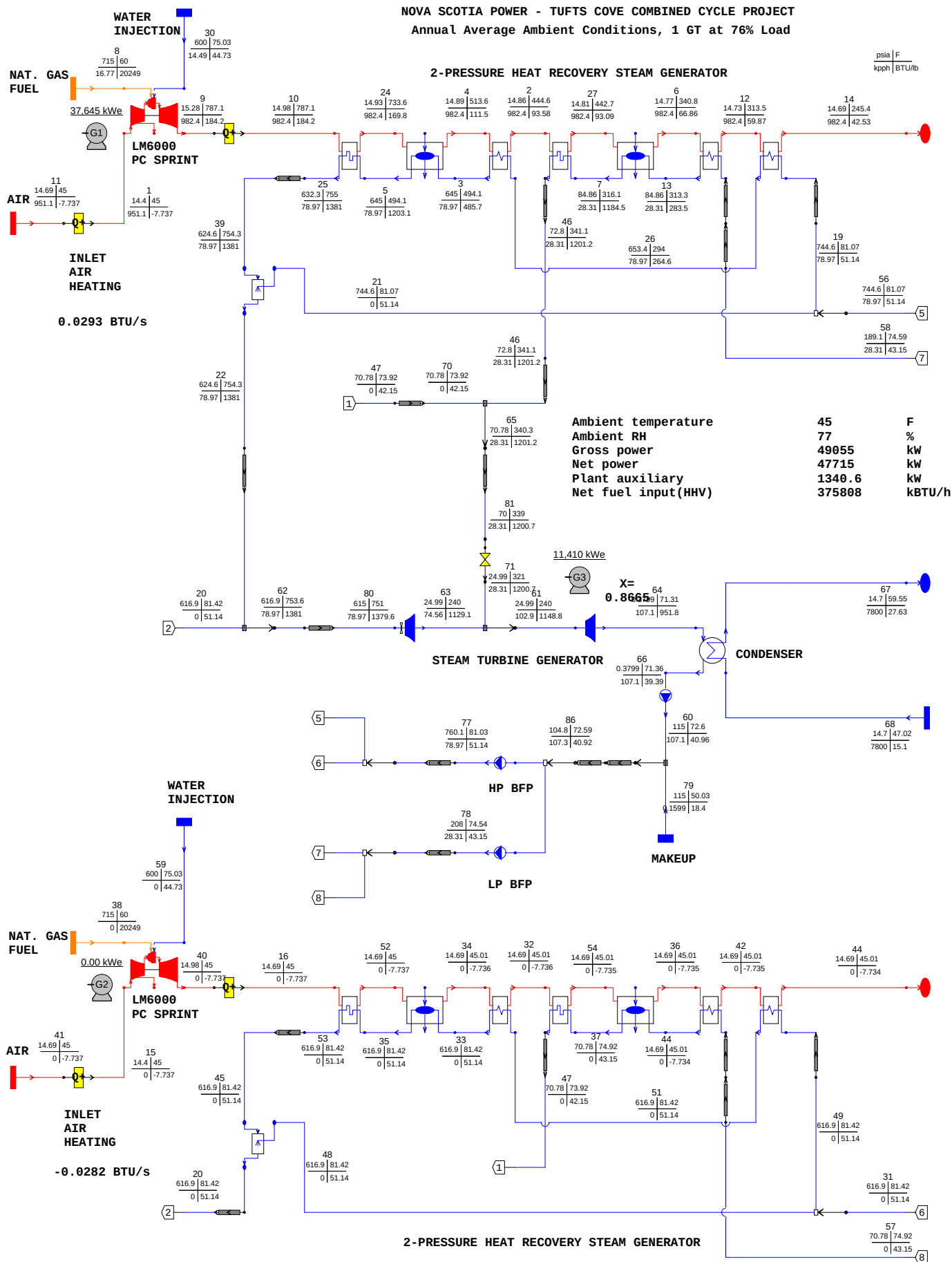
HEAT BALANCES ONE GAS TURBINE OPERATING AT PART LOAD

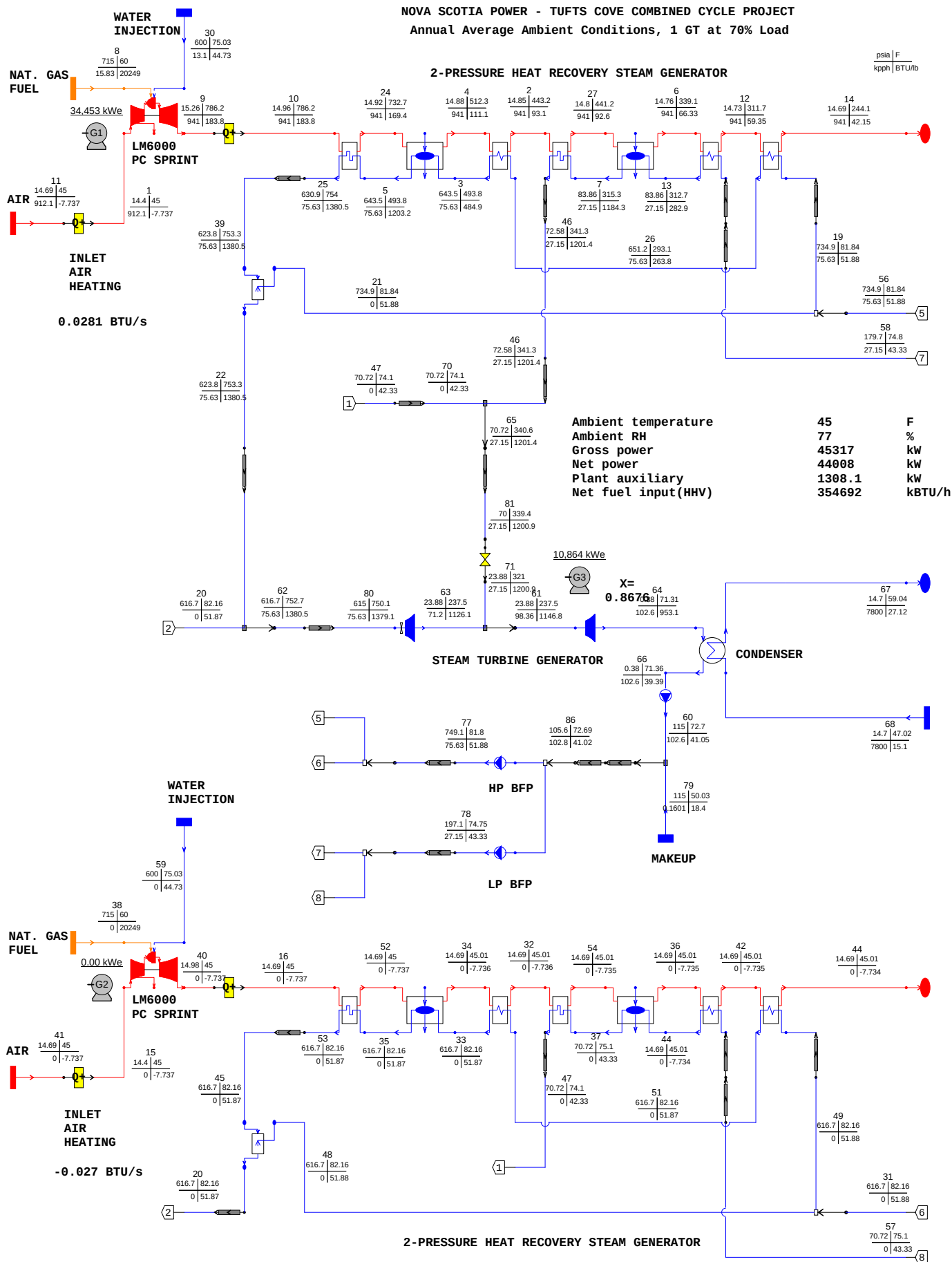


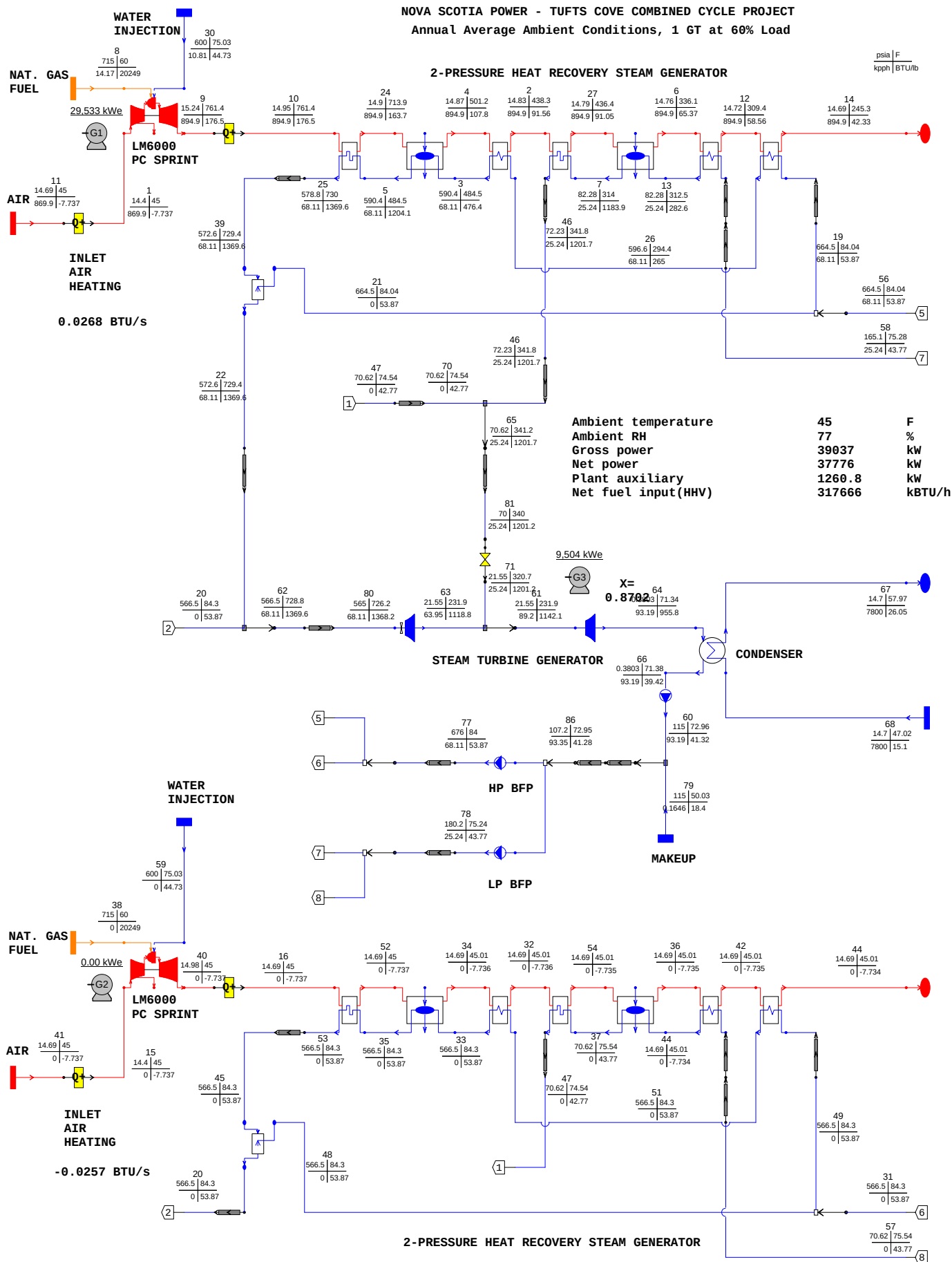




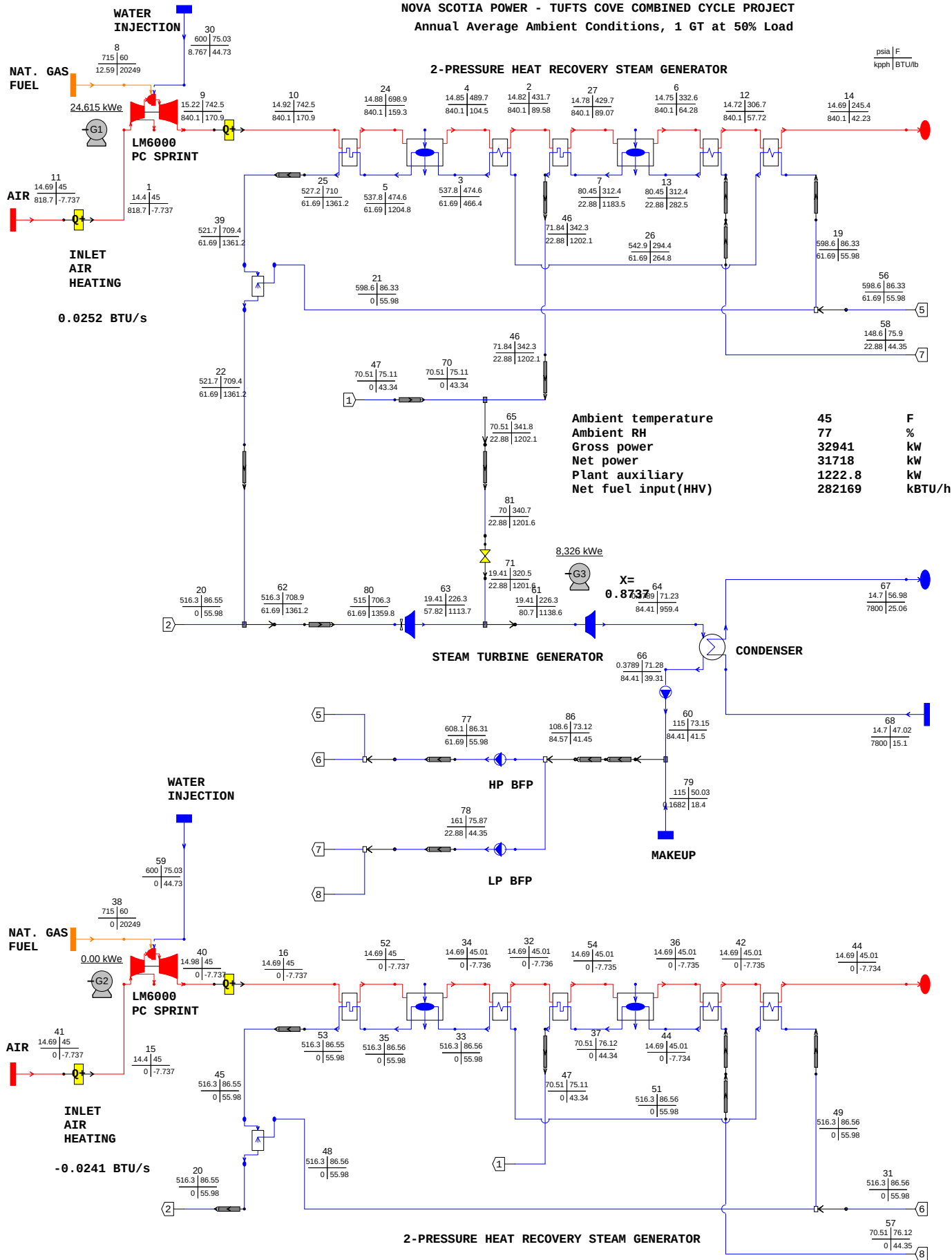




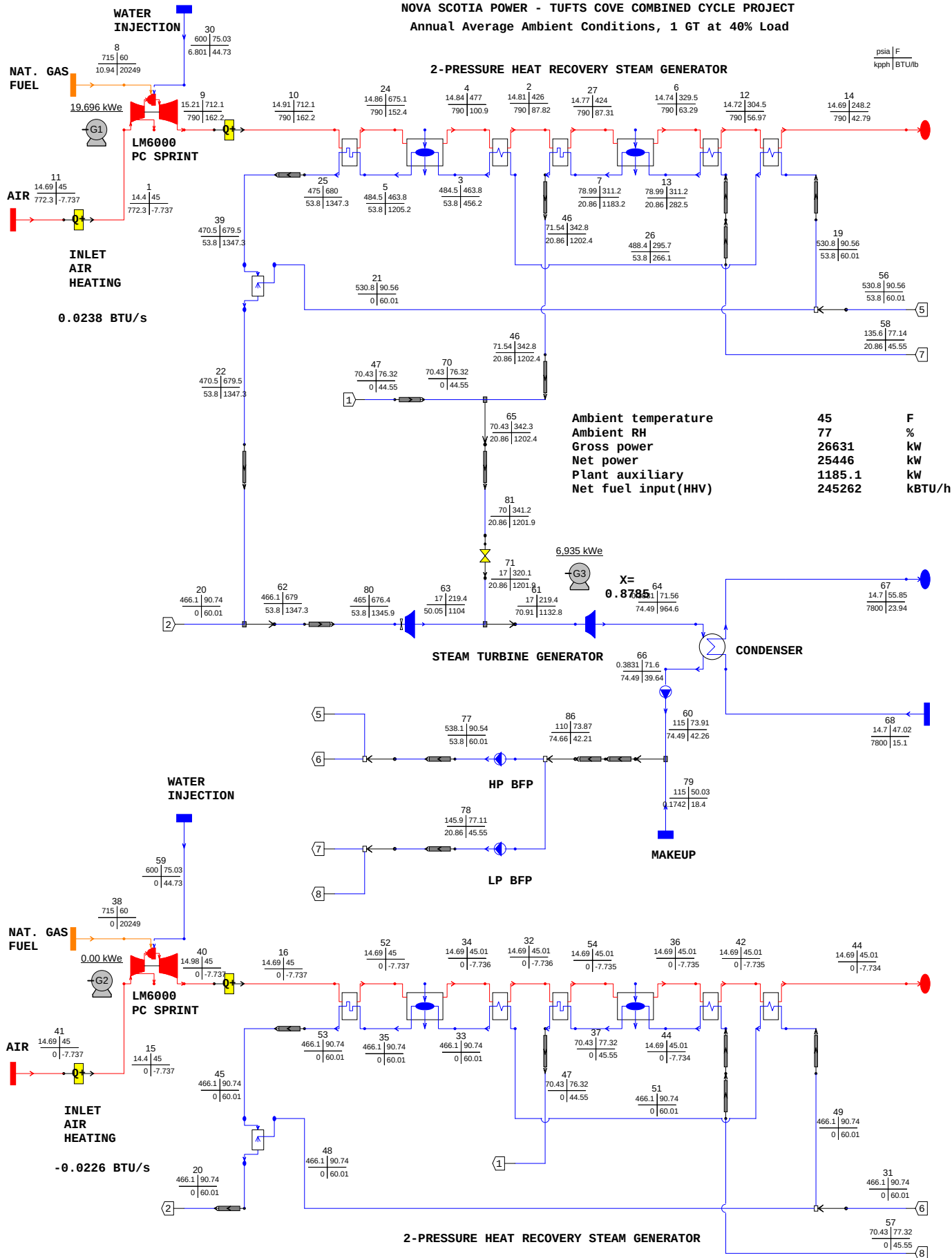


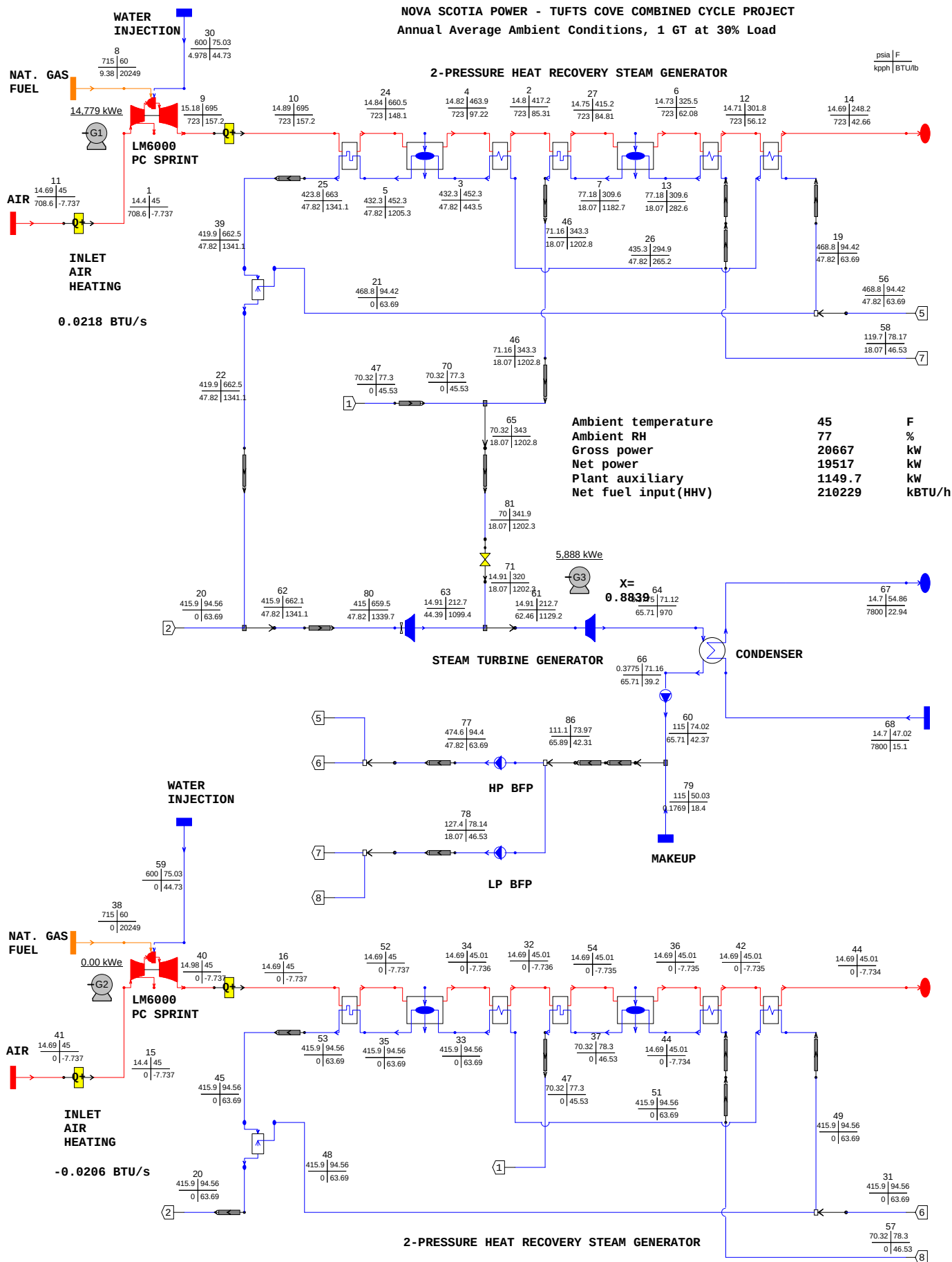


NOVA SCOTIA POWER - TUFTS COVE COMBINED CYCLE PROJECT
Annual Average Ambient Conditions, 1 GT at 50% Load



NOVA SCOTIA POWER - TUFTS COVE COMBINED CYCLE PROJECT
Annual Average Ambient Conditions, 1 GT at 40% Load



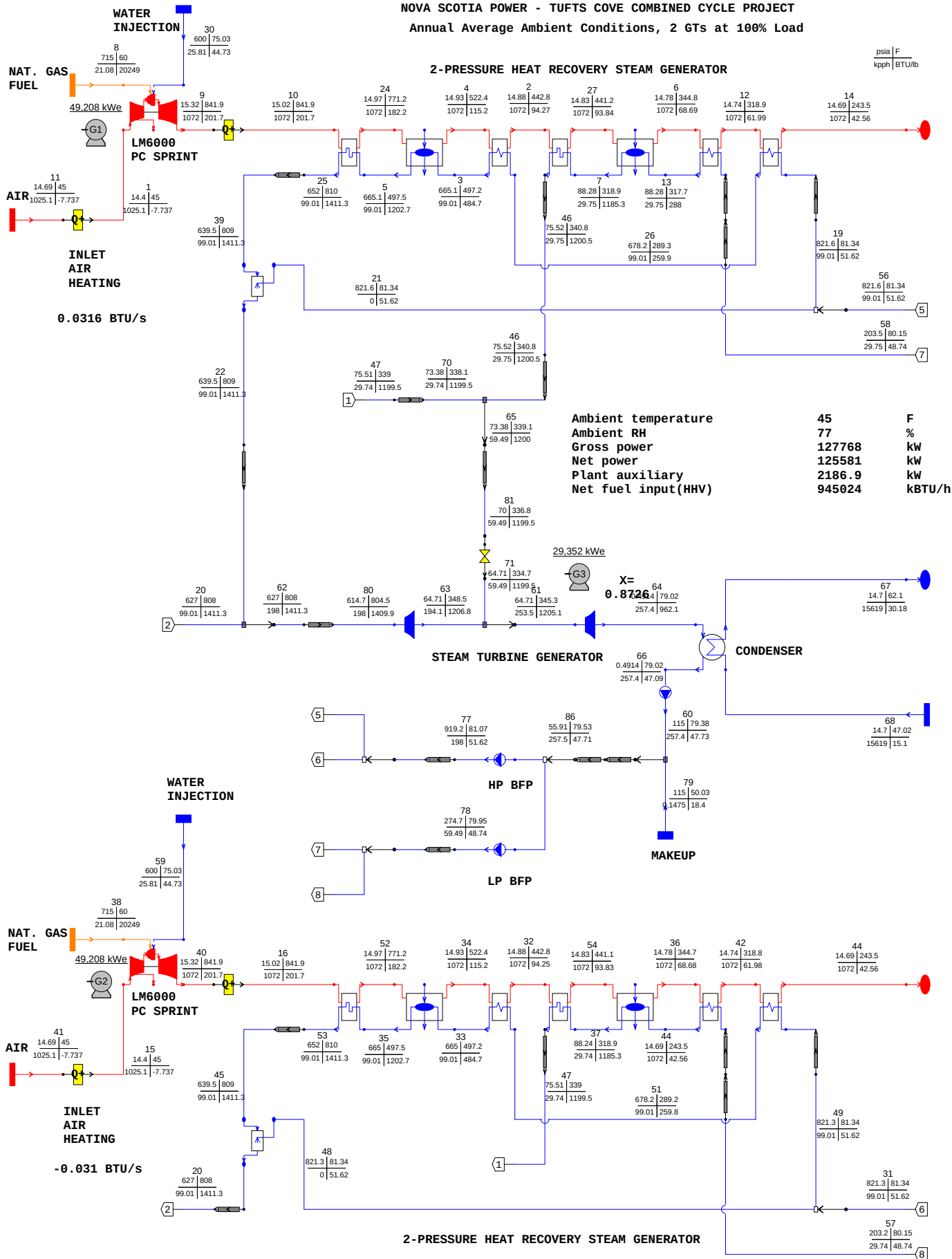


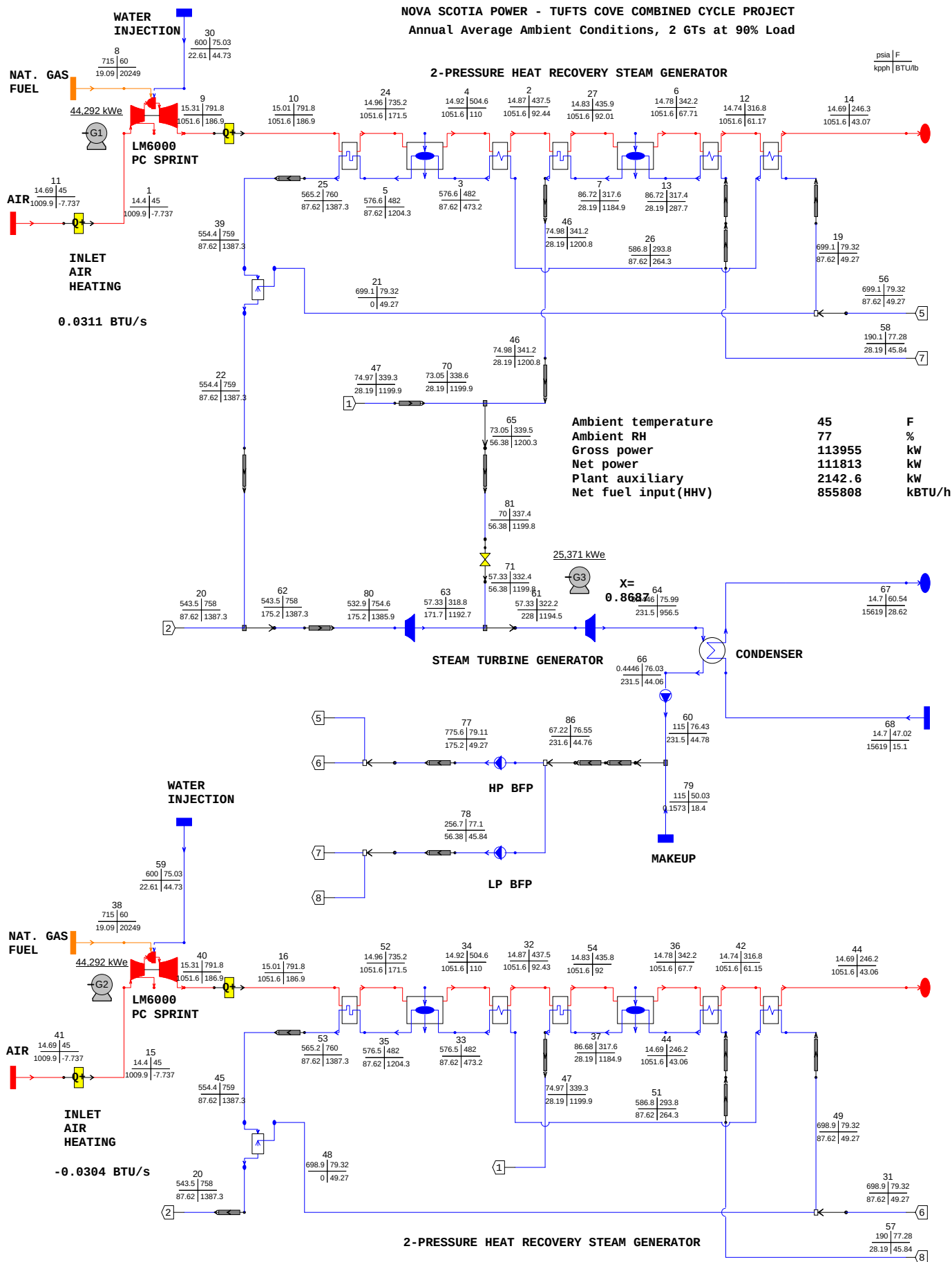
APPENDIX C

HEAT BALANCES

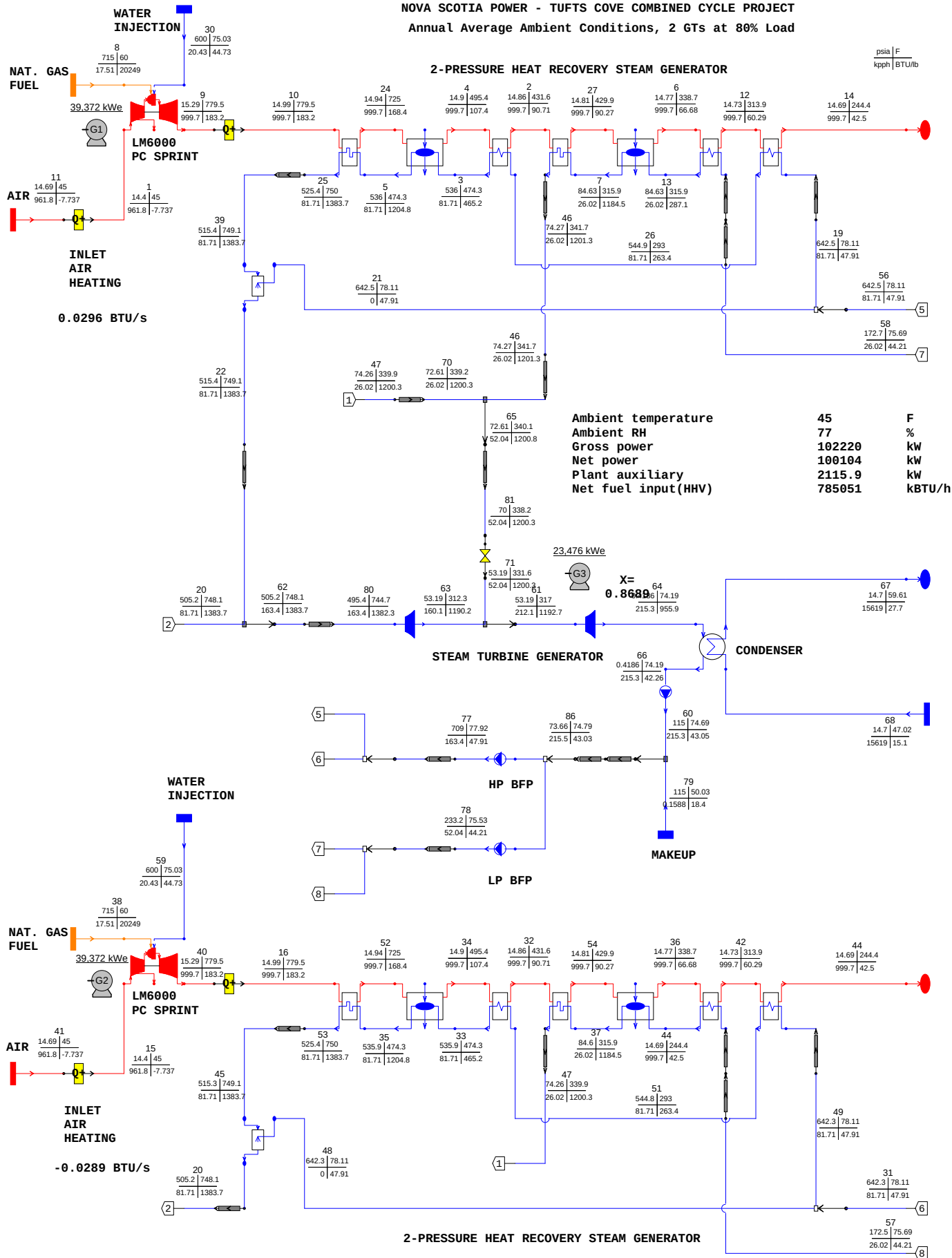
TWO GAS TURBINES OPERATING AT PART LOAD

NOVA SCOTIA POWER - TUFTS COVE COMBINED CYCLE PROJECT
Annual Average Ambient Conditions, 2 GTs at 100% Load

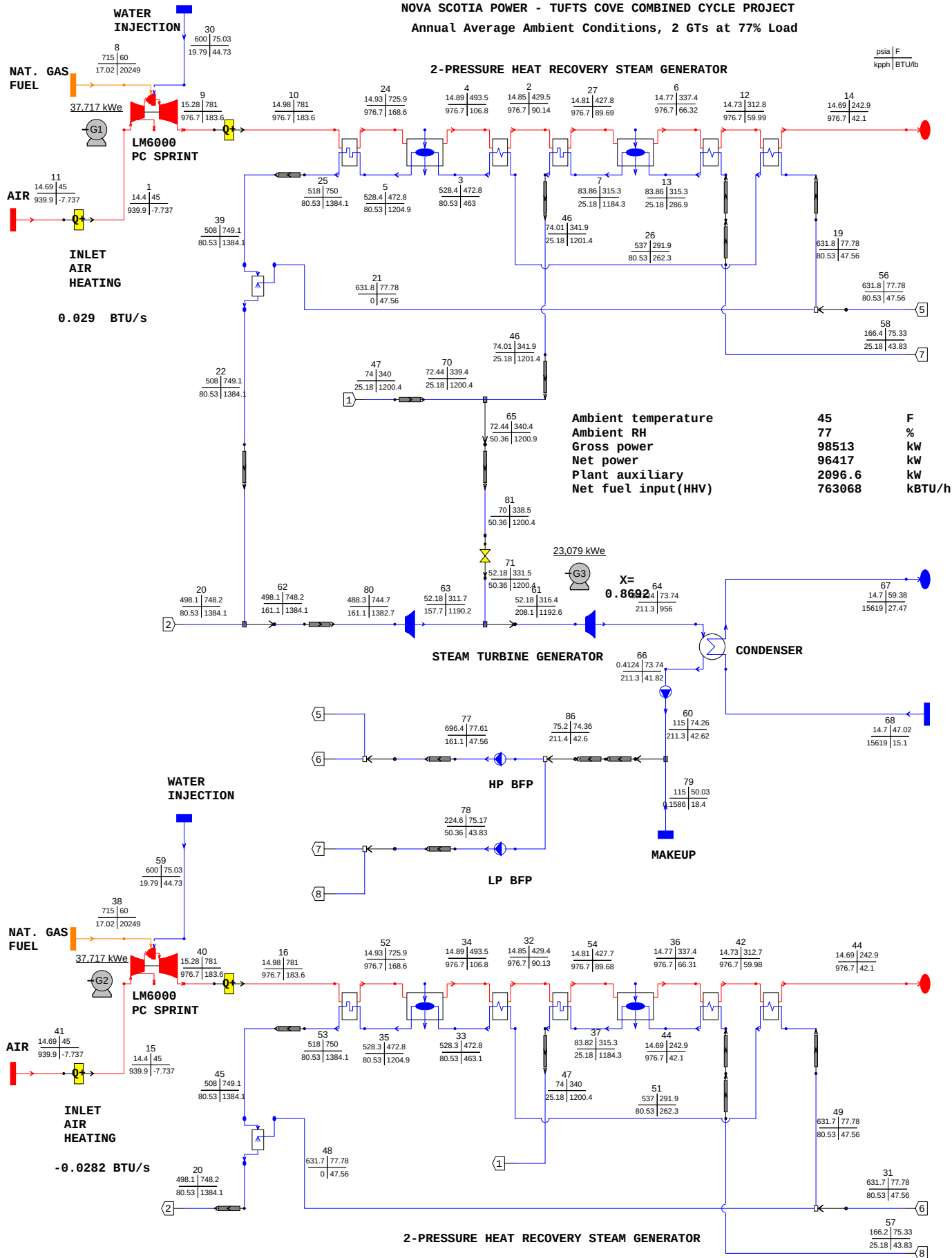




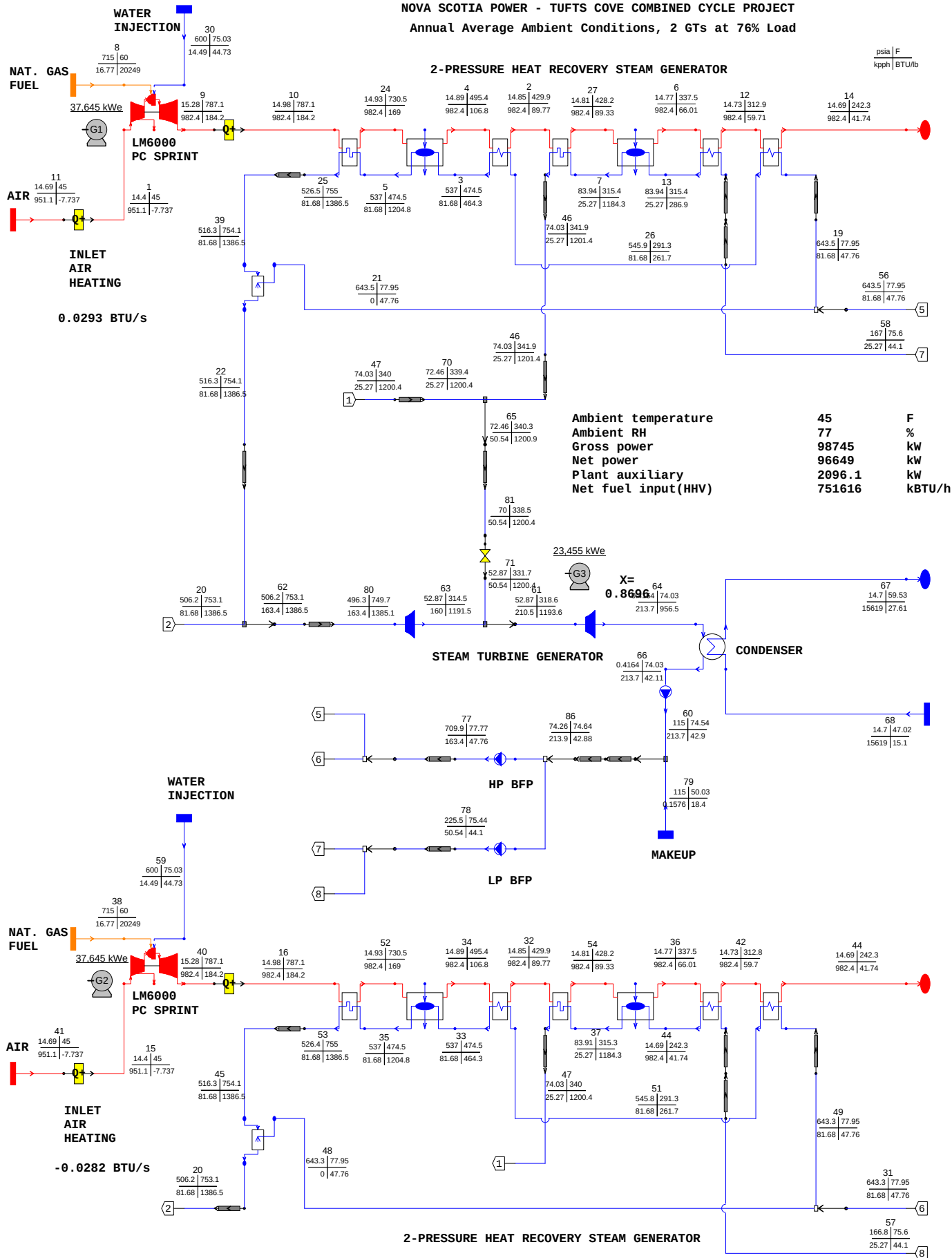
NOVA SCOTIA POWER - TUFTS COVE COMBINED CYCLE PROJECT
Annual Average Ambient Conditions, 2 GTs at 80% Load

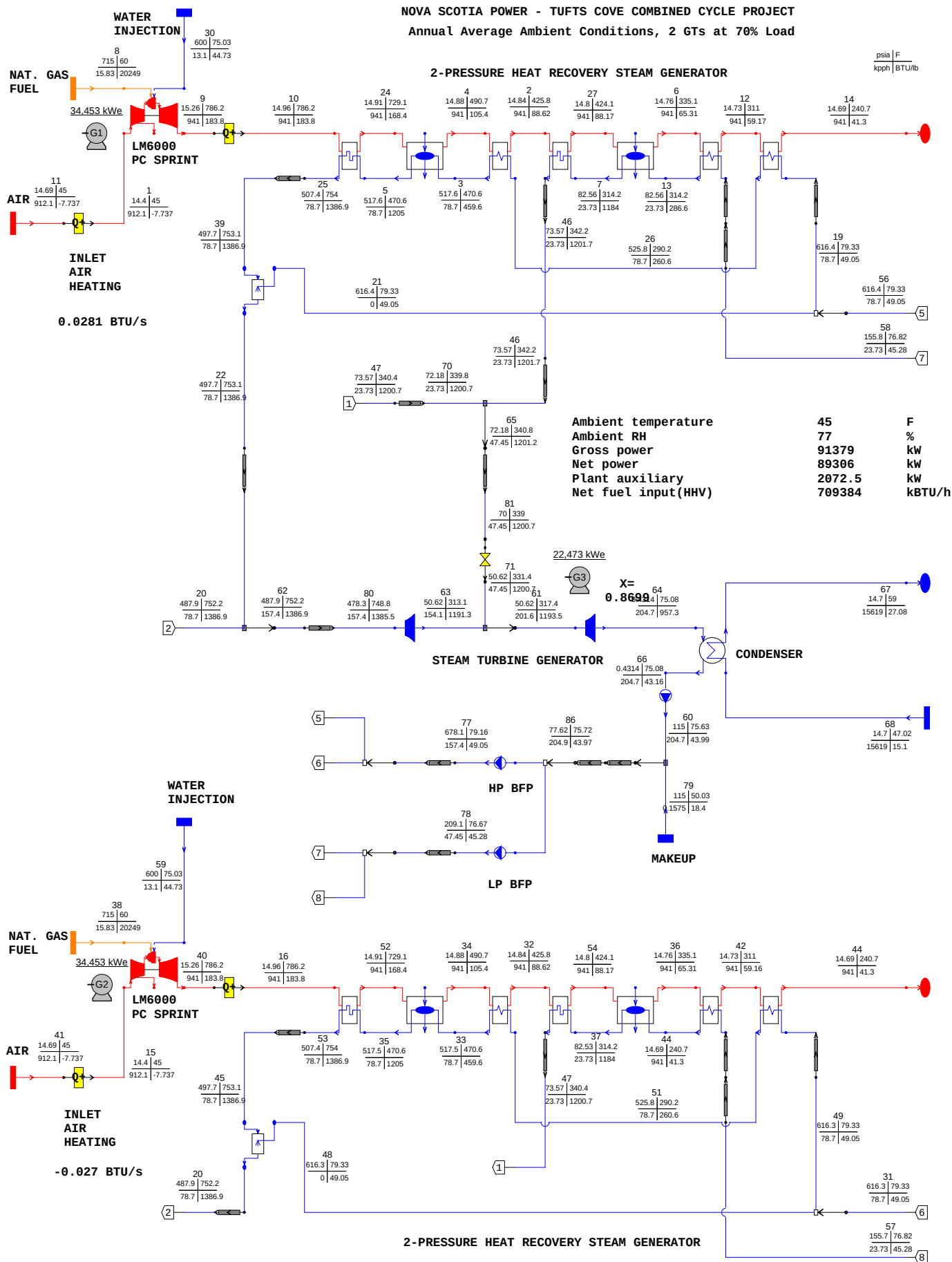


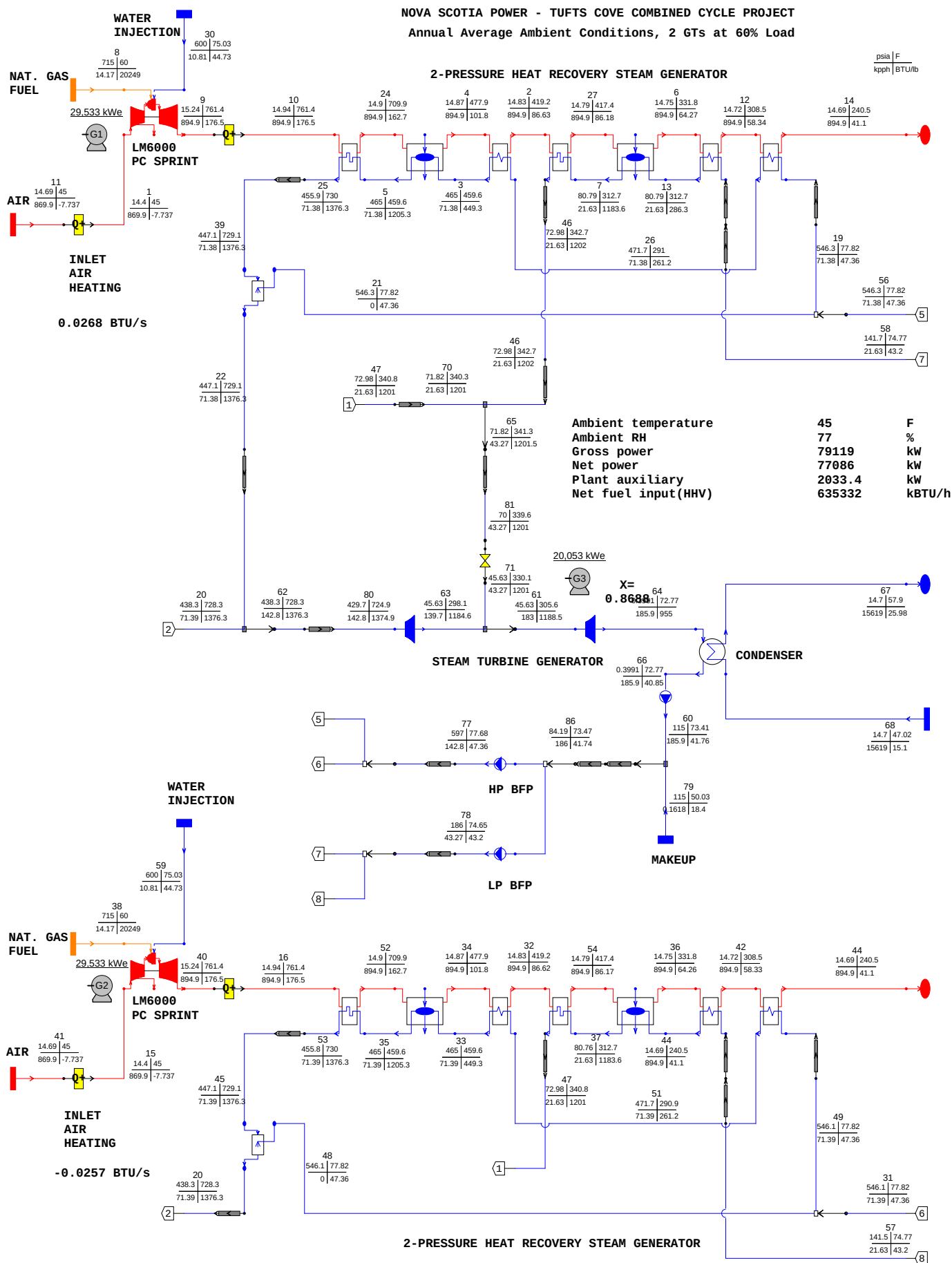
NOVA SCOTIA POWER - TUFTS COVE COMBINED CYCLE PROJECT
Annual Average Ambient Conditions, 2 GTs at 77% Load



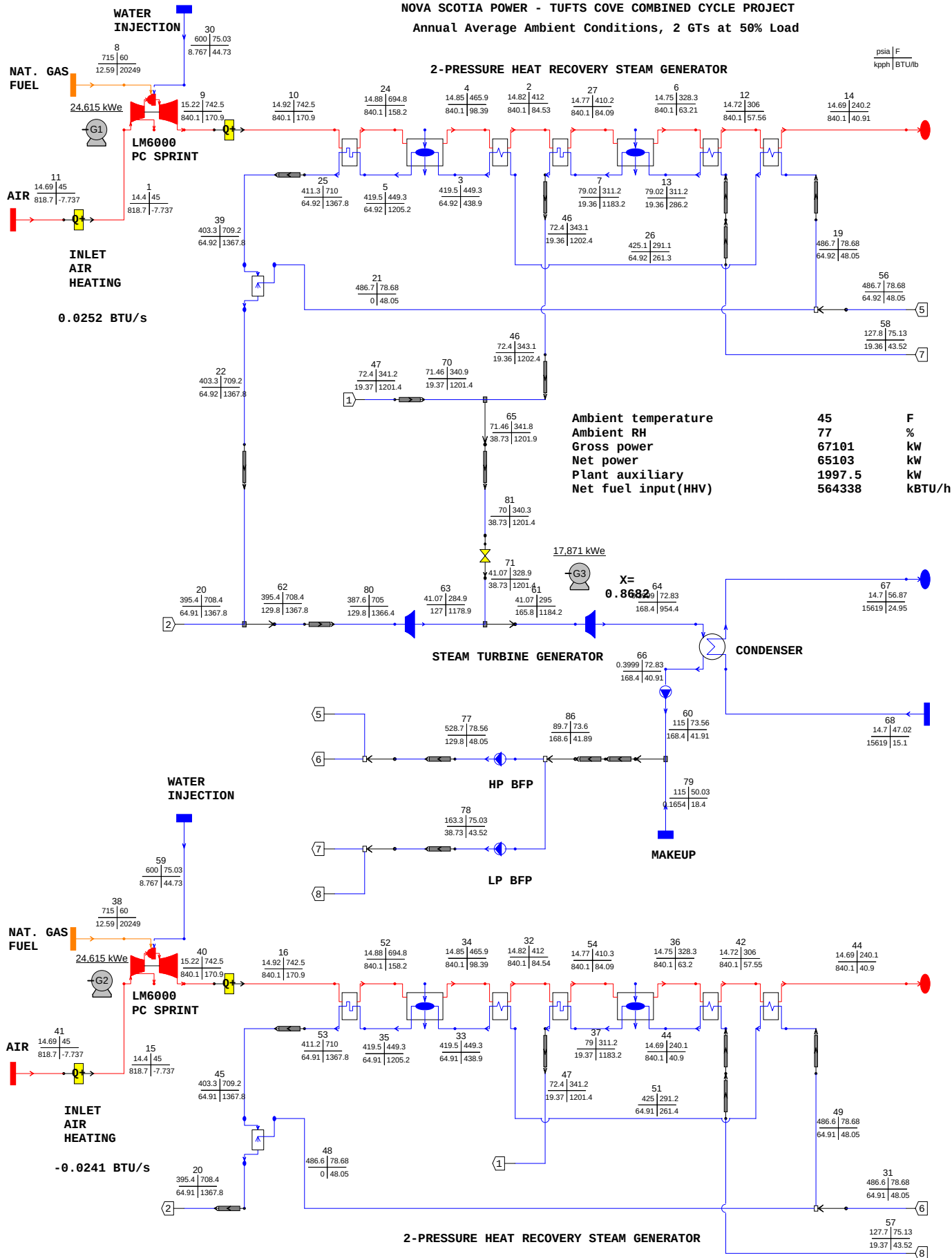
NOVA SCOTIA POWER - TUFTS COVE COMBINED CYCLE PROJECT
Annual Average Ambient Conditions, 2 GTs at 76% Load

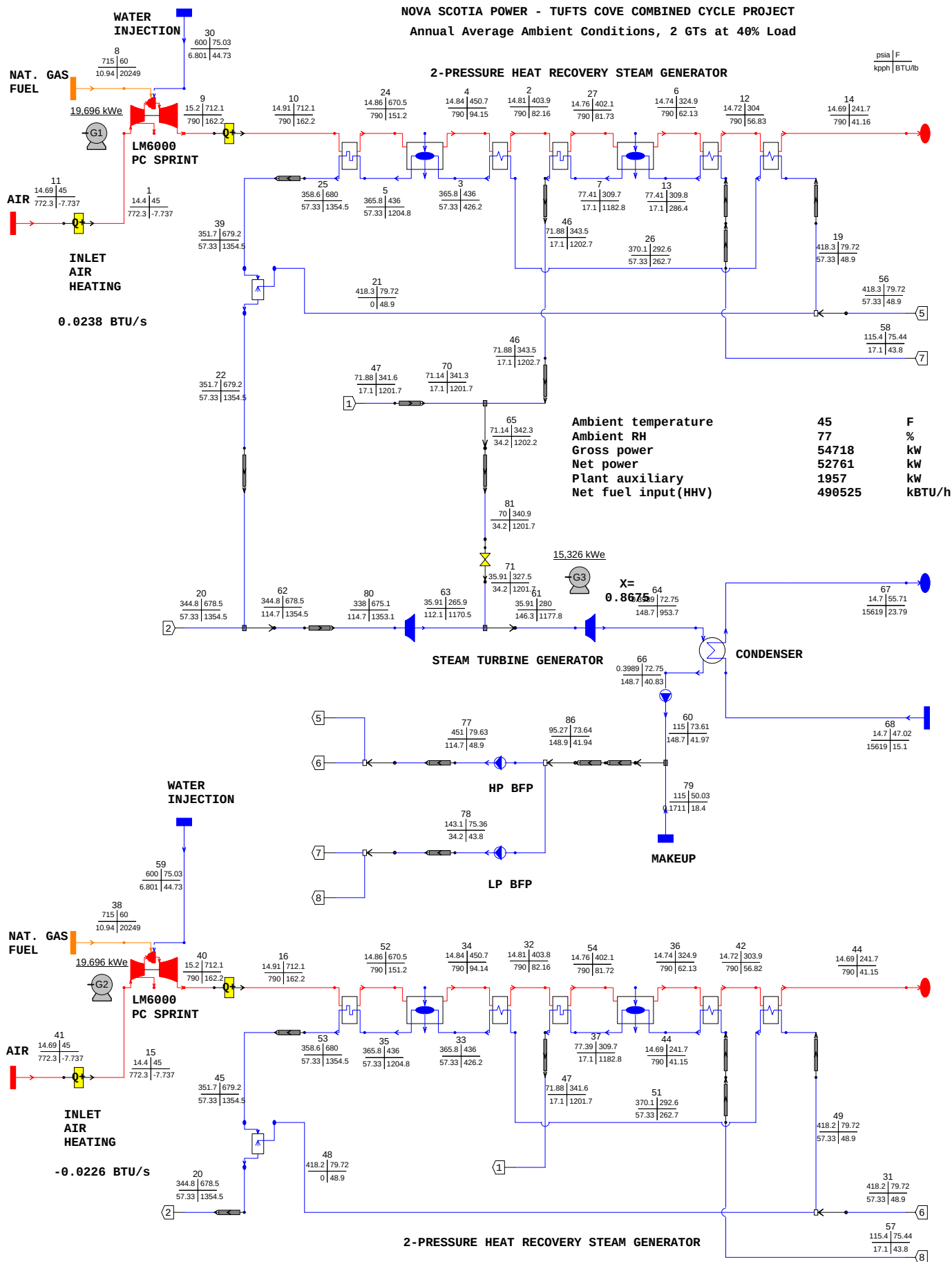




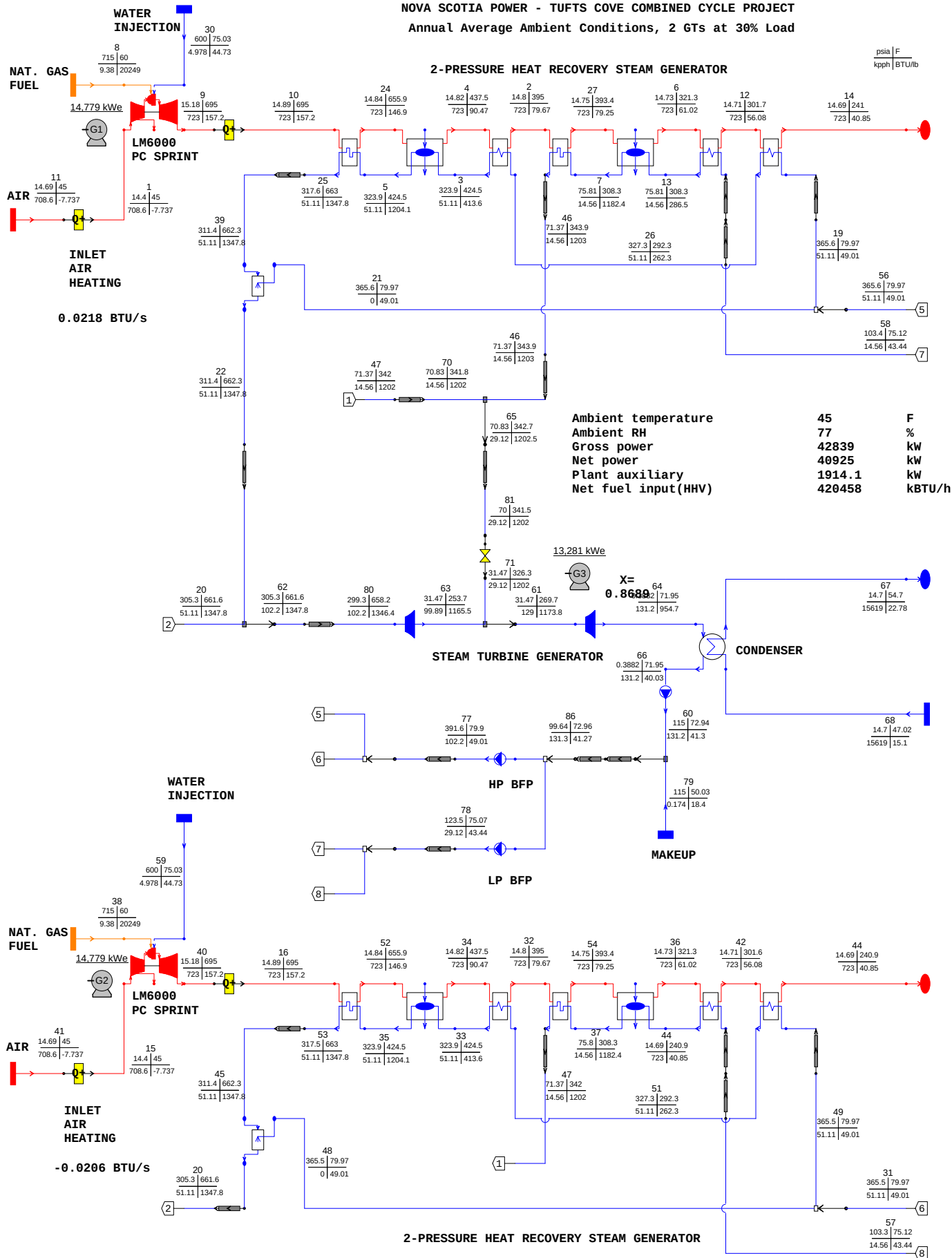


NOVA SCOTIA POWER - TUFTS COVE COMBINED CYCLE PROJECT
Annual Average Ambient Conditions, 2 GTs at 50% Load





NOVA SCOTIA POWER - TUFTS COVE COMBINED CYCLE PROJECT
Annual Average Ambient Conditions, 2 GTs at 30% Load





Technical Correspondence Sheet

To: **MPSA Ref.:** TC-NSP-MPSA-011R
NSPI Ref.: NSP-MPSA-011
From: **Date:** March 17, 2009

Project: NSPI - TUFTS COVE 6 WASTE HEAT RECOVERY
Subject: STG Minimum Load
Teleconference March 11, 2009, TC-NSP-MPSA-008R, MHI
Ref.: Engineering Sheet Ref. No. TX70C-090043

☐ COMMENT
☐ QUESTIONNAIRE
☒ REPLY
☐ INFORMATION

NSPI Question:

Hi

As discussed at yesterdays teleconference with AMEC/MPSA/NSP, here are revised calculations for minimum ST load using lower condenser vacuum to control wetness. The plot on MHI's Steam Turbine Performance Curve appears to respect the conditions set by MHI.

Please ask MHI if this is acceptable.



Technical Correspondence Sheet

Tufts Cove 6 Project

Determine Minimum STG Load at Minimum Condenser Vacuum

HP Steam Temperature 690 °F

		Winter	Summer
		Case 5	Case 6
Amb Temp	F	24	66
Compressor Inlet Temp	F	40	66
CW Temp	F	34	63
STG Output	kW	13,250	12,840
Condenser Vacuum	psia	0.335	0.462
Exhaust Steam Wetness	%	14.2	13.4
CW Load	%	39	100
OTSG Outlet Conditions			
HP Steam Inlet Pressure	psia	646	646
HP Steam Inlet Temperature	F	690	690
HP Steam Inlet Flow	lb/h	97,620	97,620
LP Steam Inlet Pressure	psia	80	80
LP Steam Inlet Temperature	F	366	366
LP Steam Inlet Flow	lb/h	35,794	33,651
STG Inlet Conditions			
HP Steam Inlet Pressure	psia	631	631
HP Steam Inlet Temperature	F	688.4	688.4
HP Steam Inlet Flow	lb/h	97,620	97,620
LP Steam Inlet Pressure	psia	76	76
LP Steam Inlet Temperature	F	364.7	364.7
LP Steam Inlet Flow	lb/h	35,794	33,651

HP Steam Temperature 725 °F

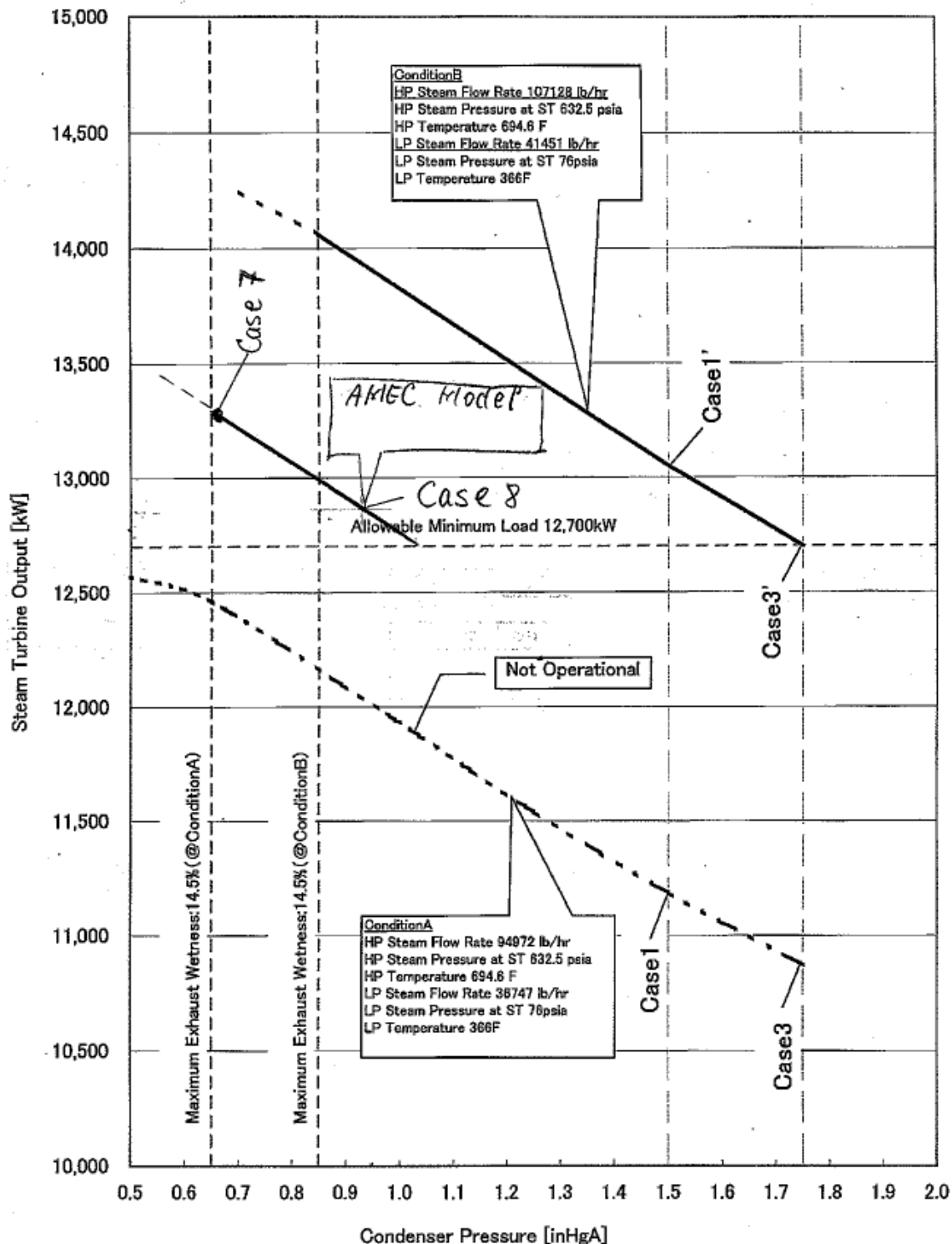
		Winter	Summer
		Case 7	Case 8
Amb Temp	F	24	66
Compressor Inlet Temp	F	40	66
CW Temp	F	34	63
STG Output	kW	13,240	12,820
Condenser Vacuum	psia	0.32	0.46
Exhaust Steam Wetness	%	14	13
CW Load	%	41	100
OTSG Outlet Conditions			
HP Steam Inlet Pressure	psia	646	646
HP Steam Inlet Temperature	F	725	727
HP Steam Inlet Flow	lb/h	95,001	95,001
LP Steam Inlet Pressure	psia	80	80
LP Steam Inlet Temperature	F	366	366
LP Steam Inlet Flow	lb/h	35,794	33,651
STG Inlet Conditions			
HP Steam Inlet Pressure	psia	631	631
HP Steam Inlet Temperature	F	725	727
HP Steam Inlet Flow	lb/h	95,001	95,001
LP Steam Inlet Pressure	psia	76	76
LP Steam Inlet Temperature	F	364.7	364.7
LP Steam Inlet Flow	lb/h	35,794	33,651

Technical Correspondence Sheet



*Steam Turbine Performance Curve
for Minimum Steam Conditions*

2/4



C25-203

Technical Correspondence Sheet



MPSA Response:

1. MHI calculation results are as follows:

Item	Unit	Case5 Winter 690°F	Case6 Summer 690°F	Case7 Winter 725°F	Case8 Summer 725°F
Turbine Inlet Steam Pressure	psia	631.0	631.0	631.0	631.0
Turbine Inlet Steam Temperature	°F	688.4	688.4	725.0	727.0
Turbine Inlet Steam Flow	lb/h	97,620	97,620	95,001	95,001
Induction Steam Pressure	psia	76.0	76.0	76.0	76.0
Induction Steam Temperature	°F	364.7	364.7	364.7	364.7
Induction Steam Flow	lb/h	35,794	33,651	35,794	33,651
Condenser Vacuum	psia	0.33500	0.46200	0.32000	0.46000
	inHgA	0.68	0.94	0.65	0.94
Steam Turbine Output	kW	12,630	12,100	12,710	12,150
Exhaust Wetness	%	14.5	13.4	14.0	12.7

2. The steam turbine output in the above cases are now close to MHI recommended minimum load. This is comfortable for MHI at this stage.
3. During commissioning, our commissioning TFA will confirm actual operating conditions and stability of plant operation in cooperation with the Customer. Final confirmation and recommendation regarding steam turbine plant operation will be provided in our commissioning report.

Please do not hesitate to contact me if you have any questions or concerns. Thank You.

Sincerely,

Jerry Taflampas
 Project Manager
 Mitsubishi Power Systems Americas, Inc.
 100 Colonial Center Parkway, Suite 500
 Lake Mary, FL 32746
 Phone: 407-688-6386
 Fax: 407-688-6487
 E-mail: jtaflampas@mpshq.com

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Request IR-16:

Reference Capital Cost Breakdown Table

Steam Turbine Generator and Major Components

Electrical Switchgear, etc

- a) NSPI states that this increase of \$1,557,284 is due to "increased automation". Please explain why there is a requirement for increase automation over that in the original plant design.
- b) Is the quoted \$1,557,284 the full capital cost increase due to this design change or is there an impact on other plant components, e.g engineering design? If so, please provide details on the impact and the full capital cost increase of this design change.
- c) Please provide a full npv economic analysis of the justification for the total incremental increase in capital spending, i.e. as provided in the response to part b.
- d) Please explain why this requirement for increased automation could not have been foreseen by NSPI.

Response IR-16:

- a) This is the first unstaffed plant of its type to be constructed by Nova Scotia Power Inc. and the extent of automation required for operation was underestimated. The plant is designed to run unstaffed so as not to increase the overall labour cost of the Tufts Cove Generating Station. To run unstaffed, all valves required for start-up and shutdown required automation.

CI# 28098 TUC 6 Waste Heat Recovery Project
Authority to Overspend (ATO) (NSUARB P-128.07)
NSPI Responses to UARB Information Requests

NON-CONFIDENTIAL

1 Response IR-16:

2
3 b) The quoted capital cost increase includes motorized valves, cabling, cable tray, breakers
4 and instrumentation. This design change also impacted the building modifications
5 required to provide the required space. Please refer to UARB IR-12 for these details.
6

7 c) The electrical system increased cost is justified as it is the result of process changes and
8 the addition of mechanical equipment. It is necessary to provide power and control to the
9 equipment.
10

11 d) This is the first unmanned plant of its type to be constructed by Nova Scotia Power Inc.
12 This is a valid design and operating concept and has been implemented in various
13 projects but NSPI was not able to obtain design details while developing the project
14 budget.

REDACTED

Request IR-17:

Reference Capital Cost Breakdown Table

Generator Transformer, Cables, Protection and BOP Cables

a) NSPI states that cable costs have increased by \$658,257. Is this increase due to the cost from manufacturer's, e.g. cost/meter increase, or is the increase due to additional cable length? Please provide details on the derivation of the cost increase.

Response IR-17:

a) The increase is primarily due to increased automation of the plant. This involved more cabling to motorized valves and instrumentation and a corresponding increase in cable tray and motor control centers. The original budget had an allowance for a smaller scope of electrical work.

The cost increase included in the ATO is based on contractor bid prices to supply, install and terminate cables. Electrical packages were bid on a lump sum basis with adjustment prices for additions and deletions as work progressed on the contract. Confidential Attachment 1 provides bid prices received at time of tender and shows the wide variation in unit rates.

CONDUCTOR ADJUSTMENT PRICE IN CABLE TRAY																						
Note: 10-Nov-09																						
Price is per metre for plus or minus change in length																						
Refer to Section 1020 clause 1.8.2																						
							Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price	
Item	Conductor Size & Type						m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
1																						
	3	C	600	MCM	Cu	TECK	\$239.86	\$96.14	\$336.00	240.42	54.12	\$294.54	\$ 200.00	\$ 37.00	\$237.00	\$ 205.33	\$ 48.04	\$253.37	179.33	59.37	\$238.70	\$0.00
2	3	C	500	MCM	Cu	TECK	\$207.94	\$88.93	\$296.87	146.76	54.12	\$200.88	\$ 196.00	\$ 37.00	\$233.00	\$ 170.55	\$ 32.35	\$202.90	179.33	59.37	\$238.70	\$0.00
3	1	C	500	MCM	Cu	TECK	\$91.14	\$64.90	\$156.04	62.69	54.12	\$116.81	\$ 75.00	\$ 27.00	\$102.00	\$ 26.43	\$ 23.85	\$50.28	66.19	62.2	\$128.39	\$0.00
4	3	C	350	MCM	Cu	TECK	\$119.09	\$79.32	\$198.41	117.21	50.51	\$167.72	\$ 127.00	\$ 31.00	\$158.00	\$ 48.84	\$ 37.84	\$86.68	112.35	36.4	\$148.75	\$0.00
5	2	C	350	MCM	Cu	TECK	\$119.09	\$79.32	\$198.41	117.21	50.51	\$167.72	\$ 127.00	\$ 31.00	\$158.00	\$ 48.50	\$ 37.58	\$86.08	112.35	35.57	\$147.92	\$0.00
6	1	C	350	MCM	Cu	TECK	\$52.89	\$48.07	\$100.96	55.16	39.69	\$94.85	\$ 43.00	\$ 22.00	\$65.00	\$ 22.04	\$ 23.85	\$45.89	66.19	62.2	\$128.39	\$0.00
7	3	C	4---0	AWG	Cu	TECK	\$65.57	\$62.49	\$128.06	59.09	30.67	\$89.76	\$ 65.00	\$ 26.00	\$91.00	\$ 30.51	\$ 31.04	\$61.55	58.89	47.44	\$106.33	\$0.00
8	2	C	4---0	AWG	Cu	TECK	\$65.57	\$62.49	\$128.06	59.09	54.12	\$113.21	\$ 65.00	\$ 26.00	\$91.00	\$ 30.00	\$ 30.78	\$60.78	58.89	47.44	\$106.33	\$0.00
9	1	C	4---0	AWG	Cu	TECK	\$39.71	\$43.26	\$82.97	36.21	54.12	\$90.33	\$ 28.00	\$ 18.00	\$46.00	\$ 14.79	\$ 21.30	\$36.09	58.89	47.44	\$106.33	\$0.00
10	3	C	1---0	AWG	Cu	TECK	\$69.00	\$57.69	\$126.69	35.00	25.26	\$60.26	\$ 41.00	\$ 21.00	\$62.00	\$ 19.46	\$ 25.81	\$45.26	36.52	30.7	\$67.22	\$0.00
11	1	C	1---0	AWG	Cu	TECK	\$39.71	\$33.65	\$73.36	32.20	54.12	\$86.32	\$ 18.00	\$ 16.00	\$34.00	\$ 9.91	\$ 17.57	\$27.48	36.52	3.7	\$40.22	\$0.00
12	3	C	2	AWG	Cu	TECK	\$27.92	\$45.67	\$73.59	21.83	21.65	\$43.48	\$ 24.00	\$ 18.00	\$42.00	\$ 15.27	\$ 21.25	\$36.52	17.65	20.8	\$38.45	\$0.00
13	3	C	3	AWG	Cu	TECK	\$21.37	\$43.26	\$64.63	18.53	20.93	\$39.46	\$ 20.00	\$ 18.00	\$38.00	\$ 12.10	\$ 19.86	\$31.96	17.65	20.8	\$38.45	\$0.00
14	4	C	4	AWG	Cu	TECK	\$24.76	\$45.67	\$70.43	21.72	54.12	\$75.84	\$ 20.00	\$ 18.00	\$38.00	\$ 12.73	\$ 20.48	\$33.20	14.1	19.3	\$33.40	\$0.00
15	3	C	4	AWG	Cu	TECK	\$19.30	\$40.86	\$60.16	15.93	18.04	\$33.97	\$ 16.00	\$ 17.00	\$33.00	\$ 9.78	\$ 17.64	\$27.43	14.1	19.3	\$33.40	\$0.00
16	4	C	6	AWG	Cu	TECK	\$19.60	\$40.86	\$60.46	15.61	18.04	\$33.65	\$ 14.00	\$ 17.00	\$31.00	\$ 8.72	\$ 17.64	\$26.36	10.97	18.71	\$29.68	\$0.00
17	3	C	6	AWG	Cu	TECK	\$14.58	\$38.46	\$53.04	11.74	18.04	\$29.78	\$ 11.00	\$ 16.00	\$27.00	\$ 7.36	\$ 15.09	\$22.46	10.97	18.71	\$29.68	\$0.00
18	2	C	6	AWG	Cu	TECK	\$14.58	\$38.46	\$53.04	10.06	14.43	\$24.49	\$ 10.00	\$ 15.00	\$25.00	\$ 6.96	\$ 15.45	\$22.41	10.79	17.17	\$27.96	\$0.00
19	8	C	8	AWG	Cu	TECK	\$0.00	\$0.00	\$0.00	8.67	18.04	\$26.71	\$ 15.00	\$ 30.00	\$45.00	\$ 8.99	\$ 17.00	\$25.99	40.5	93.44	\$133.94	\$0.00
20	6	C	8	AWG	Cu	TECK	\$0.00	\$0.00	\$0.00	8.67	18.04	\$26.71	\$ 12.00	\$ 30.00	\$42.00	\$ 8.65	\$ 16.74	\$25.40	39.64	95.06	\$134.70	\$0.00
21	3	C	8	AWG	Cu	TECK	\$10.67	\$36.05	\$46.72	6.66	12.63	\$19.28	\$ 6.00	\$ 15.00	\$21.00	\$ 5.21	\$ 11.57	\$16.78	5.48	16.16	\$21.64	\$0.00
22	2	C	8	AWG	Cu	TECK	\$9.87	\$36.05	\$45.92	6.10	10.82	\$16.93	\$ 5.00	\$ 14.00	\$19.00	\$ 4.55	\$ 9.02	\$13.56	4.85	15.45	\$20.30	\$0.00
23	1	C	8	AWG	Cu	TECK	\$9.87	\$36.05	\$45.92	6.10	10.82	\$16.93	\$ 7.00	\$ 11.00	\$18.00	\$ 4.24	\$ 8.11	\$12.36	4.85	15.45	\$20.30	\$0.00
24	3	C	10	AWG	Cu	TECK	\$8.83	\$31.25	\$40.08	5.10	10.82	\$15.93	\$ 5.00	\$ 13.00	\$18.00	\$ 3.79	\$ 8.17	\$11.96	4.38	13.34	\$17.72	\$0.00
25	2	C	10	AWG	Cu	TECK	\$8.20	\$31.25	\$39.45	4.41	10.82	\$15.24	\$ 4.00	\$ 12.00	\$16.00	\$ 3.37	\$ 7.32	\$10.68	4.03	13.69	\$17.72	\$0.00
26	20	C	12	AWG	Cu	TECK	\$19.99	\$45.67	\$65.66	15.93	21.65	\$37.58	\$ 14.00	\$ 18.00	\$32.00	\$ 11.20	\$ 17.05	\$28.25	12.27	18.7	\$30.97	\$0.00
27	12	C	12	AWG	Cu	TECK	\$13.49	\$40.86	\$54.35	11.57	18.04	\$29.61	\$ 9.00	\$ 16.00	\$25.00	\$ 7.76	\$ 12.67	\$20.43	8.27	16.25	\$24.52	incomplete
28	7	C	12	AWG	Cu	TECK	\$11.48	\$33.65	\$45.13	7.18	17.32	\$24.50	\$ 6.00	\$ 13.00	\$19.00	\$ 5.30	\$ 9.87	\$15.17	6.55	14.56	\$21.11	incomplete
29	4	C	12	AWG	Cu	TECK	\$8.49	\$28.84	\$37.33	4.67	10.82	\$15.49	\$ 4.00	\$ 12.00	\$16.00	\$ 3.86	\$ 7.32	\$11.17	3.53	11.15	\$14.68	incomplete
30	3	C	12	AWG	Cu	TECK	\$7.80	\$26.44	\$34.24	4.10	10.82	\$14.93	\$ 4.00	\$ 10.00	\$14.00	\$ 3.18	\$ 7.32	\$10.50	3.37	10.52	\$13.89	incomplete
31	2	C	12	AWG	Cu	TECK	\$7.39	\$26.44	\$33.83	3.66	10.82	\$14.48	\$ 4.00	\$ 10.00	\$14.00	\$ 2.92	\$ 6.47	\$9.39	3.37	10.52	\$13.89	incomplete
32	7	C	16	AWG	Cu	TECK	\$10.67	\$31.25	\$41.92	4.87	12.63	\$17.50	\$ 4.00	\$ 12.00	\$16.00	\$ 10.86	\$ 9.02	\$19.88	4.25	12.05	\$16.30	incomplete
33	4	C	16	AWG	Cu	TSP	\$8.66	\$26.44	\$35.10	5.10	10.82	\$15.93	\$ 3.00	\$ 10.00	\$13.00	\$ 9.16	\$ 8.24	\$17.41	3.78	10.96	\$14.74	incomplete
34	3	C	16	AWG	Cu	TSP	\$7.51	\$26.44	\$33.95	3.68	10.82	\$14.50	\$ 3.00	\$ 10.00	\$13.00	\$ 8.32	\$ 7.86	\$16.17	3.68	10.55	\$14.23	incomplete
35	2	C	16	AWG	Cu	TSP	\$7.51	\$26.44	\$33.95	3.38	10.82	\$14.20	\$ 3.00	\$ 10.00	\$13.00	\$ 6.62	\$ 9.02	\$15.63	3.66	10.25	\$13.91	incomplete
36	1	C	16	AWG	Cu	TSP	\$7.51	\$26.44	\$33.95	3.38	10.82	\$14.20	\$ 3.00	\$ 10.00	\$13.00			\$0.00	3.25	10	\$13.25	incomplete
37	1	C	4---0	AWG	Cu	GND	\$14.79	\$45.67	\$60.46	13.07	18.04	\$31.11	\$ 19.00	\$ 17.00	\$36.00	\$ 13.79	\$ 8.55	\$22.34	13.97	13.6	\$27.57	incomplete
38	1	C	2---0	AWG	Cu	GND	\$12.41	\$40.86	\$53.27	8.70	16.24	\$24.94	\$ 15.00	\$ 16.00	\$31.00	\$ 8.93	\$ 6.72	\$15.65	12.83	11.22	\$24.05	incomplete

Note: Deletion price @ 80% of above prices

Price is per metre for plus change in length
To Delete - Deduct 20% of these unit prices

CONDUCTOR ADJUSTMENT PRICE IN CONDUIT

Note: 10-Nov-09
Price is per metre for plus or minus change in length
Refer to Section 1020 clause 1.8.2

Item	Conductor Size & Type						Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price	Supply Price		Install Price	Total Price	Supply Price	Install Price	Total Price
							m	m	m	m	m	m	m	m	m	Type Adj	m	m	m	m	m	m
1	3	C	600	MCM	Cu	TECK	\$227.47	\$91.33	\$318.80	237.23	0.66	\$237.89	237.23	0.66	\$237.89	RW90	\$ 169.70	\$ 35.42	\$205.11			incomplete
2	3	C	500	MCM	Cu	TECK	\$195.56	\$81.72	\$277.28	143.58	0.66	\$144.23	143.58	0.66	\$144.23	RW90	\$ 128.27	\$ 34.00	\$162.27			incomplete
3	1	C	500	MCM	Cu	TECK	\$84.86	\$57.69	\$142.55	61.93	0.66	\$62.58	61.93	0.66	\$62.58	RW90	\$ 35.10	\$ 11.05	\$46.15			incomplete
4	3	C	350	MCM	Cu	TECK	\$106.70	\$74.51	\$181.21	114.02	0.66	\$114.68	114.02	0.66	\$114.68	RW90	\$ 76.55	\$ 25.50	\$102.05			incomplete
5	2	C	350	MCM	Cu	TECK	\$106.70	\$74.51	\$181.21	114.02	0.66	\$114.68	114.02	0.66	\$114.68	RW90	\$ 51.03	\$ 17.85	\$68.88			incomplete
6	1	C	350	MCM	Cu	TECK	\$46.30	\$40.86	\$87.16	54.40	0.66	\$55.05	54.40	0.66	\$55.05	RW90	\$ 25.53	\$ 8.50	\$34.03			incomplete
7	3	C	4---0	AWG	Cu	TECK	\$56.67	\$57.69	\$114.36	56.93	0.66	\$57.58	56.93	0.66	\$57.58	RW90	\$ 46.30	\$ 17.00	\$63.30			incomplete
8	2	C	4---0	AWG	Cu	TECK	\$56.67	\$57.69	\$114.36	56.93	0.66	\$57.58	56.93	0.66	\$57.58	RW90	\$ 30.88	\$ 11.90	\$42.78			incomplete
9	1	C	4---0	AWG	Cu	TECK	\$34.79	\$36.05	\$70.84	35.44	0.66	\$36.10	35.44	0.66	\$36.10	RW90	\$ 15.44	\$ 5.95	\$21.39			incomplete
10	3	C	1---0	AWG	Cu	TECK	\$62.41	\$50.47	\$112.88	34.24	0.66	\$34.89	34.24	0.66	\$34.89	RW90	\$ 23.84	\$ 11.05	\$34.89			incomplete
11	1	C	1---0	AWG	Cu	TECK	\$34.79	\$28.84	\$63.63	32.00	0.66	\$32.66	32.00	0.66	\$32.66	RW90	\$ 7.95	\$ 4.25	\$12.20			incomplete
12	3	C	2	AWG	Cu	TECK	\$21.32	\$38.46	\$59.78	21.07	0.66	\$21.72	21.07	0.66	\$21.72	RW90	\$ 13.12	\$ 4.25	\$17.37			incomplete
13	3	C	3	AWG	Cu	TECK	\$16.45	\$36.05	\$52.50	17.77	0.66	\$18.42	17.77	0.66	\$18.42	RW90	\$ 11.93	\$ 9.35	\$21.28			incomplete
14	4	C	4	AWG	Cu	TECK	\$19.85	\$38.46	\$58.31	20.95	0.66	\$21.61	20.95	0.66	\$21.61	RW90	\$ 13.28	\$ 9.35	\$22.63			incomplete
15	3	C	4	AWG	Cu	TECK	\$14.38	\$33.65	\$48.03	15.17	0.66	\$15.82	15.17	0.66	\$15.82	RW90	\$ 9.99	\$ 8.50	\$18.49			incomplete
16	4	C	6	AWG	Cu	TECK	\$14.67	\$33.65	\$48.32	14.85	0.66	\$15.50	14.85	0.66	\$15.50	RW90	\$ 13.32	\$ 11.05	\$24.37			incomplete
17	3	C	6	AWG	Cu	TECK	\$9.66	\$33.65	\$43.31	11.55	0.66	\$12.20	11.55	0.66	\$12.20	RW90	\$ 6.04	\$ 6.80	\$12.84			incomplete
18	2	C	6	AWG	Cu	TECK	\$9.66	\$31.25	\$40.91	9.87	0.66	\$10.52	9.87	0.66	\$10.52	RW90	\$ 4.03	\$ 6.57	\$10.59			incomplete
19	8	C	8	AWG	Cu	TECK	\$0.00	\$0.00	\$0.00	7.90	0.66	\$8.56	7.90	0.66	\$8.56	RW90	\$ 25.45	\$ 14.81	\$40.27			incomplete
20	6	C	8	AWG	Cu	TECK	\$0.00	\$0.00	\$0.00	7.90	0.66	\$8.56	7.90	0.66	\$8.56	RW90	\$ 22.06	\$ 14.17	\$36.23			incomplete
21	3	C	8	AWG	Cu	TECK	\$5.75	\$28.84	\$34.59	6.46	0.66	\$7.12	6.46	0.66	\$7.12	RW90	\$ 4.00	\$ 5.95	\$9.95			incomplete
22	2	C	8	AWG	Cu	TECK	\$4.95	\$28.84	\$33.79	5.91	0.66	\$6.57	5.91	0.66	\$6.57	RW90	\$ 2.67	\$ 4.25	\$6.92			incomplete
23	1	C	8	AWG	Cu	TECK	\$4.95	\$28.84	\$33.79	5.91	0.66	\$6.57	5.91	0.66	\$6.57	RW90	\$ 1.33	\$ 3.86	\$5.20			incomplete
24	3	C	10	AWG	Cu	TECK	\$3.91	\$26.44	\$30.35	4.91	0.66	\$5.57	4.91	0.66	\$5.57	RW90	\$ 2.30	\$ 4.25	\$6.55			incomplete
25	2	C	10	AWG	Cu	TECK	\$3.28	\$24.04	\$27.32	4.22	0.66	\$4.88	4.22	0.66	\$4.88	RW90	\$ 1.53	\$ 3.40	\$4.93			incomplete
26	20	C	12	AWG	Cu	TECK	\$15.07	\$38.46	\$53.53	13.77	0.66	\$14.42	13.77	0.66	\$14.42	RW90	\$ 9.71	\$ 21.89	\$31.60			incomplete
27	12	C	12	AWG	Cu	TECK	\$8.57	\$33.65	\$42.22	9.41	0.66	\$10.06	9.41	0.66	\$10.06	RW90	\$ 5.83	\$ 17.00	\$22.83			incomplete
28	7	C	12	AWG	Cu	TECK	\$6.56	\$26.44	\$33.00	6.42	0.66	\$7.07	6.42	0.66	\$7.07	RW90	\$ 4.24	\$ 10.20	\$14.44			incomplete
29	4	C	12	AWG	Cu	TECK	\$3.57	\$21.63	\$25.20	4.47	0.66	\$5.13	4.47	0.66	\$5.13	RW90	\$ 1.95	\$ 5.95	\$7.90			incomplete
30	3	C	12	AWG	Cu	TECK	\$2.88	\$19.23	\$22.11	3.91	0.66	\$4.57	3.91	0.66	\$4.57	RW90	\$ 1.46	\$ 4.25	\$5.71			incomplete
31	2	C	12	AWG	Cu	TECK	\$2.47	\$19.23	\$21.70	3.46	0.66	\$4.12	3.46	0.66	\$4.12	RW90	\$ 0.97	\$ 2.55	\$3.52			incomplete
32	7	C	16	AWG	Cu	TECK	\$5.75	\$24.04	\$29.79	4.68	0.66	\$5.34	4.68	0.66	\$5.34		\$ 10.18	\$ 8.50	\$18.68			incomplete
33	4	C	16	AWG	Cu	TSP	\$3.74	\$19.23	\$22.97	4.91	0.66	\$5.57	4.91	0.66	\$5.57		\$ 5.94	\$ 2.55	\$8.49			incomplete
34	3	C	16	AWG	Cu	TSP	\$2.59	\$19.23	\$21.82	3.48	0.66	\$4.14	3.48	0.66	\$4.14		\$ 5.26	\$ 2.45	\$7.71			incomplete
35	2	C	16	AWG	Cu	TSP	\$2.59	\$19.23	\$21.82	3.19	0.66	\$3.84	3.19	0.66	\$3.84		\$ 3.39	\$ 2.55	\$5.94			incomplete
36	1	C	16	AWG	Cu	TSP	\$2.59	\$19.23	\$21.82	3.19	0.66	\$3.84	3.19	0.66	\$3.84				\$0.00			incomplete
37	1	C	4---0	AWG	Cu	GND	\$10.07	\$21.63	\$31.70	12.88	0.66	\$13.54	12.88	0.66	\$13.54		\$ 13.79	\$ 8.55	\$22.34			incomplete
38	1	C	2---0	AWG	Cu	GND	\$7.69	\$16.82	\$24.51	8.51	0.66	\$9.17	8.51	0.66	\$9.17		\$ 8.93	\$ 6.72	\$15.65			incomplete

Note: Deletion price @ 80% of above prices
Price is per metre for plus change in length
To Delete - Deduct 20% of these unit prices

CABLE TRAY ADJUSTMENT PRICE

Note: 5-Oct-09
Price is per metre for plus or minus change in length
Refer to Section 1020 clause 1.8.2

Item	Cable Tray	Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price
	Width (inch)	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
1	6	\$35.66	\$137.00	\$172.66	62.38	188.83	\$251.22	\$ 76.00	\$ 108.00	\$184.00	\$ 45.31	\$ 88.94	\$134.25	37.42	148	\$185.42			incomplete
2	12	\$36.37	\$146.62	\$182.99	63.93	203.50	\$267.43	\$ 79.00	\$ 111.00	\$190.00	\$ 51.08	\$ 108.26	\$159.34	39.21	147.98	\$187.19			incomplete
3	24	\$39.30	\$168.25	\$207.55	83.40	203.50	\$286.90	\$ 96.00	\$ 127.00	\$223.00	\$ 56.51	\$ 132.73	\$189.24	77.77	248.23	\$326.00			incomplete
4	30	\$40.61	\$185.07	\$225.68	98.52	220.00	\$318.52	\$ 103.00	\$ 130.00	\$233.00	\$ 72.46	\$ 153.33	\$225.80	n/a	n/a	n/a			incomplete
5	36	\$41.75	\$194.69	\$236.44	118.16	252.08	\$370.25	\$ 113.00	\$ 158.00	\$271.00	\$ 88.75	\$ 172.65	\$261.40	43.72	173.56	\$217.28			incomplete

Note: Deletion price @ 80% of above prices

Price is per metre for plus change in length
To Delete - Deduct 20% of these unit prices

CONDUIT TRAY ADJUSTMENT PRICE

Note: 10-Nov-09
Price is per metre for plus or minus change in length
Refer to Section 1020 clause 1.8.2

Item	Conduit	Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price	Supply Price	Install Price	Total Price
	Size (inch)	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
1	0.75	\$8.58	\$100.95	\$109.53	7.28	57.20	\$64.48	\$ 22.00	\$ 132.00	\$154.00	\$ 10.11	\$ 25.76	\$35.87	11.18	77.04	\$88.22			incomplete
2	1	\$11.39	\$117.77	\$129.16	10.31	69.30	\$79.61	\$ 22.00	\$ 117.00	\$139.00	\$ 11.13	\$ 30.91	\$42.04	13.8	81.86	\$95.66			incomplete
3	1.25	\$14.80	\$127.39	\$142.19	11.74	76.63	\$88.37	\$ 25.00	\$ 126.00	\$151.00	\$ 13.30	\$ 42.50	\$55.80	16.71	85.41	\$102.12			incomplete
4	1.5	\$16.95	\$144.21	\$161.16	18.21	83.97	\$102.18	\$ 26.00	\$ 119.00	\$145.00	\$ 17.34	\$ 61.82	\$79.16	20.04	106.43	\$126.47			incomplete
5	2	\$22.57	\$158.63	\$181.20	26.99	96.07	\$123.05	\$ 35.00	\$ 137.00	\$172.00	\$ 21.72	\$ 74.70	\$96.42	27.36	125.78	\$153.14			incomplete
6	2.5	\$37.28	\$192.28	\$229.56	47.00	121.73	\$168.73	\$ 53.00	\$ 151.00	\$204.00	\$ 30.55	\$ 112.05	\$142.59	47.75	153.93	\$201.68			incomplete
7	3	\$44.30	\$221.13	\$265.43	63.00	163.17	\$226.17	\$ 74.00	\$ 170.00	\$244.00	\$ 39.71	\$ 133.94	\$173.65	61.6	183.29	\$244.89			incomplete
8	4	\$70.70	\$283.62	\$354.32	101.01	243.83	\$344.84	\$ 107.00	\$ 219.00	\$326.00	\$ 59.39	\$ 177.73	\$237.12	100.51	219.85	\$320.36			incomplete
9	6	\$160.72	\$377.36	\$538.08	195.50	390.50	\$586.00	\$ 326.00	\$ 312.00	\$638.00	\$ 84.85	\$ 208.64	\$293.48	167.32	312.51	\$479.83			incomplete

Note: Deletion price @ 80% of above prices

Price is per metre for plus change in length
To Delete - Deduct 20% of these unit prices

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Request IR-18:

Reference Capital Cost Breakdown Table

Engineering Design, Procurement and Commissioning

- a) Please provide details on the design changes that prompted the additional spending of \$716,061. Include in your response the amount of the increase caused by each design change.
- b) What portion of the \$200,000 increase for the controls consultant is due to design changes and what due to "underestimating the complexity of the combined cycle process"?
- c) Please explain why NSPI used a controls consultant that was not aware of the "complexity of the combined cycle process" and why the increase due to this factor should be included as part of the unforeseen increase of this ATO.
- d) Please provide further details on the increase of \$529,310 in commissioning costs. Include in your explanation details on the development of the original estimate (hours estimated, hourly rate, personnel assigned) and similar data on the additions that produced the capital cost increase.
- e) Please provide the total commissioning costs included in the original work order, the total commissioning costs in the ATO, and the percentage increase.
- f) Please explain why this increase for additional commissioning costs could not have been foreseen by NSPI.

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Request IR-18: (cont'd)

g) The total increase in Engineering Design, Procurement and Commissioning is approximately \$2.5 million for an increase of approximately 38% from the May 2008 filing. Please comment on the proposition that NSPI seriously underestimated this component of the project's costs in the original estimate.

Response IR-18:

a) Please refer to Attachment 1.

b) Design complexities identified by the EPCM consultant led to a \$200,000 increase for additional DCS hardware to support the changes in the process design. This cost increase is the result of an increase in the input/ output (I/O) count from 679 to 1273 which represents an increase of almost 88 percent from the I/O count provided at the time of tender.

The original bid from the controls consultant / supplier of the Distributed Control System (DCS) was based on the specification provided by the Engineer, Procure & Construction Management (EPCM) consultant.

c) The controls consultant has proven to be very capable. Their design review to program DCS logic identified potential problems with the process control proposed by the EPCM and led to a number of revisions to the Process and Instrumentation design.

CI# 28098 TUC 6 Waste Heat Recovery Project
Authority to Overspend (ATO) (NSUARB P-128.07)
NSPI Responses to UARB Information Requests

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1 Response IR-18: (cont'd)

2
3 d) The original budget included \$750,000 for commissioning. This figure was based on the
4 EPCM leading the work with some support from NSPI. As the project developed the
5 complexity became more apparent and it has been identified that additional support staff
6 will be required. This support is now being sourced through specialist startup service
7 providers. NSPI has increased the number of NSPI staff scheduled to be on site for
8 commissioning. The availability of experienced startup personnel has severely
9 diminished over the past two decades as a result of reduced power plant construction
10 activities.

11
12 e) The commissioning cost in the work order budget was \$750,000. The ATO includes a
13 forecast of \$1,279,310 for a 70 percent increase.

14
15 f-g) This is the first plant of this type NSPI has built and there were no similar designs or
16 plants in North America available for comparison when preparing the budget.

Design Change	Increase in Capital Expenditure (\$)
Harbour infill & CW intake	70,180
Document Control	26,095
Project Web	45,528
Layout Development	4,113
Process & PID Development	56,468
Process Engineering re-work	9,116
Air conditioned area for MELCO cabinets	17,035
Process development CW system	24,663
DCS Specification	37,300
Dynamic Soil Testing	11,000
Electrical Mezzanine	24,060
PID rework	7,128
Lateral Capacity of Piles	11,655
Relocation of Lift Station	8,541
Close coupled condenser verification	29,814
Additional review due to changes in MHI/IST and vendors' design	76,912
Expediting	31,875
FPS steam velocity	1,520
Revise cable schedule	820
Thermofin drawing markup rework	3,773
Re-tagging of instruments on P&IDs	33,785
Bid evaluations	5,300
Pre-bid (time only, T&L not included)	4,680
Research for replacement for Hydrazin	613
Doc Control to issue documents to Contractors	45,600
Steam and water sampling	3,885
Relocate gas skid	1,535
Remove holds from IFC	49,730
Changing UPS from Three Phase to Single Phase	3,623
Survey	8,715
Geotechnical work for CW intake	61,000
Total	716,061

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Request IR-19:

Reference Capital Cost Breakdown Table

Insurance, AFUDC, Duty and A/O

a) Please provide the cost estimate of each of the above items. Provide the amount included in the original estimate, the ATO, and the amount of the increase.

b) Please explain and provide a calculation of why delayed spending and a later in-service date reduces AFUDC.

Response IR-19:

a) Please refer to the table below.

	Original Estimate (\$)	ATO Estimate (\$)	Increase/Decrease (\$)
Insurance	656,992	527,546	(129,446)
AFUDC	6,925,590	6,413,217	(512,373)
Duty	1,199,381	1,154,992	(44,389)
A/O	1,037,610	1,303,446	265,836
Total	9,819,573	9,399,201	(420,372)

b) Please refer to Attachment 1 for the calculation of the Allowance for Funds Used During Construction (AFUDC) associated with this project. AFUDC is calculated on the cumulative spend of the project. As spending is delayed the cumulative spend will remain lower until a later period, reducing the amount of AFUDC calculated for this project.

Month	Original Submission			ATO Submission		
	AFUDC Base (\$ 000s)	Rate per month (%)	AFUDC (\$ 000s)	AFUDC Base (\$ 000s)	Rate per month (%)	AFUDC (\$ 000s)
July-08	153	0.66	1	-	-	-
August-08	306	0.66	2	-	-	-
September-08	1,356	0.66	9	-	-	-
October-08	5,782	0.66	38	2,915	0.66	19
November-08	11,873	0.66	78	5,784	0.66	38
December-08	15,599	0.66	103	8,645	0.66	57
January-09	17,443	0.66	115	9,411	0.69	65
February-09	18,716	0.66	123	13,099	0.69	90
March-09	20,922	0.66	138	13,237	0.69	91
April-09	22,665	0.66	149	17,121	0.69	117
May-09	26,268	0.66	173	17,202	0.69	118
June-09	29,043	0.66	191	18,008	0.69	124
July-09	33,698	0.66	222	25,223	0.69	173
August-09	36,817	0.66	243	27,505	0.69	189
September-09	40,457	0.66	267	30,317	0.69	208
October-09	43,039	0.66	284	33,451	0.69	229
November-09	46,945	0.66	309	35,090	0.69	241
December-09	49,039	0.66	323	37,307	0.69	256
January-10	55,246	0.66	364	43,635	0.66	287
February-10	58,590	0.66	386	45,508	0.66	299
March-10	63,566	0.66	419	53,792	0.66	354
April-10	67,815	0.66	447	57,480	0.66	378
May-10	71,828	0.66	473	63,969	0.66	421
June-10	74,309	0.66	490	69,561	0.66	458
July-10	78,406	0.66	517	77,112	0.66	507
August-10	79,535	0.66	524	82,248	0.66	541
September-10	81,212	0.66	535	85,959	0.66	566
October-10	83,749	In-service	-	89,093	0.66	586
November-10	84,273	In-service	-	92,272	In-service	-
December-10	84,297	In-service	-	92,997	In-service	-
Total AFUDC			6,925			6,412

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Request IR-20:

Reference Capital Cost Breakdown Table

Contingency

- a) Please confirm, or explain why NSPI cannot confirm, that the May 2008 estimate had a contingency of \$7,213,207 and that in the present ATO estimate NSPI has used up the full contingency amount so that the contingency in the ATO estimate is zero.
- b) Please confirm, or explain why NSPI cannot confirm, that, if NSPI had not used the contingency funds, the total project costs would have increased by \$15,913,072, i.e. the total of \$8,699,865 + \$7,213,207.
- c) Please provide the estimated accuracy of the May 2008 estimate, e.g. +/- X%
- d) Please provide the estimated accuracy of the ATO estimate, e.g. +/- X%.
- e) Now that there is no contingency in the estimate, please explain what process NSPI will follow to obtain additional funds if there is any increase in the capital cost of this project beyond the ATO estimate.

Response IR-20:

- a) Confirmed. NSPI had a contingency of \$7,213,207 in the May 2008 estimate and this has been used. The current ATO estimate does not show a specific general contingency.

CI# 28098 TUC 6 Waste Heat Recovery Project
Authority to Overspend (ATO) (NSUARB P-128.07)
NSPI Responses to UARB Information Requests

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1 Response IR-20: (cont'd)

2
3 b) Contingency amounts constitute project costs like other project expenses. It is accurate
4 that had the project been completed without needing either the ATO amount or the
5 contingency, the cost would be \$15,913,072 lower than anticipated.

6
7 c) The May 2008 estimate was believed to be +/- 10 percent overall when submitted. The
8 risk was not uniform across all activities.

9
10 d) The ATO estimate is believed to be +/- 2 percent.

11
12 e) Contingencies are factored into construction projects during the budget development
13 phase to account for project details not yet confirmed. At this stage of the Tufts Cove 6
14 Waste Heat Recovery project, all the equipment has been purchased and NSPI has a
15 better understanding of the work required to ensure viable commissioning of the project.
16 The need for a general contingency is now mitigated and the remaining risk has been
17 incorporated into the individual cost component budgets. Given these factors NSPI does
18 not anticipate a requirement for additional project funding.