

1 Q. Please provide copies of all reports, assessments and analyses, whether generated
2 by Hydro internally or commissioned by Hydro from an external source, which
3 consider or discuss the future capital expenditures (ie additional to those applied
4 for in the present Application) planned or anticipated as necessary or prudent to
5 continue operation of the Hardwoods Gas Turbine plant to its planned or
6 anticipated decommissioning as a thermal generation source, and provide updated
7 estimates for those planned or anticipated future capital expenditures.

8

9

10 A. Please see Hydro's response to IC-NLH-006, Attachment 1 - Site Recommendations,
11 IC-NLH-006 Attachment 2 – Air Intake Inspection Report, IC-NLH-006 Attachment 3 -
12 Gas Turbine Capital Plan, and NP-NLH-13, Attachment 1 - Stantec Condition
13 Assessment Study Report.



Site Recommendations



Customer: Newfoundland Labrador Hydro

Date: 21st January 2016

Project Number: Alba 4927

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Quality Certification
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ISO 14001:2004
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ISO14001 (2004 Revision)
OHSAS18001 (2007 Revision)

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Note:

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1 Hardwoods site recommendations

- CCTV cameras installed within Olympus A and Olympus B turbine enclosures to reduce the need for entering the enclosures to check on the condition of the Olympus during running.
- Emergency stop buttons located beside each Olympus enclosure door so if any major leaks are seen the package can be shut down instantly without the need of returning to the main control room.
- Pressure transmitters be installed on the fuel system before each major component to aid in fuel system fault diagnosis. These should be connected back to the DCS control system to enable trending of all fuel pressures.
- A full control system upgrade including moving all junction boxes within the various package enclosures, removing all pressure switches for pressure transmitters and all temperature switches with thermocouples.
- The shutdown sequence be modified as there is no time to let the Olympus gas turbine cool down after being in load. This should be at least 5 minutes at an N1 speed of 2000rpm. This is critical to minimize heat stresses within the Olympus.
- A spares list be made up and a list of spares kept on site.
- An Alba Power Engineer be on site during winter running to assist in any breakdowns within the system, carry out preventative maintenance and condition monitoring. This would increase reliability and reduce any down time.
- A new fuel system installed consisting of flanged solid fuel lines, more robust off engine fuel filter, new regulators and new 3 way high speed shut off valves with position indication.
- All pressure switches be checked and calibrated on an annual basis.
- DCS governor ACCEL and DECEL schedules to be fully reviewed and adjusted as required.

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2 Stephenville Site recommendations

- Windows installed on the doors of both Olympus A and Olympus B turbine enclosures so the condition of the enclosures can be viewed before entering if the need occurs.
- CCTV cameras installed within Olympus A and Olympus B turbine enclosures to reduce the need for entering the enclosures to check on the condition of the Olympus during running.
- Emergency stop buttons located beside each Olympus enclosure door so if any major leaks are seen the package can be shut down instantly without the need of returning to the main control room.
- The spill line from the Woodward LQ25 liquid fuel valve be moved to a suitable point after the fuel regulator to reduce the spill line pressure.
- Pressure transmitters be installed on the fuel system before each major component to aid in fuel system fault diagnosis. These should be connected back to the DCS control system to enable trending of all fuel pressures.
- A full control system upgrade including moving all junction boxes within the various package enclosures, removing all pressure switches for pressure transmitters and all temperature switches with thermocouples.
- The shutdown sequence be modified as there is no time to let the Olympus gas turbine cool down after being in load. This should be at least 5 minutes at an N1 speed of 2000rpm. This is critical to minimize heat stresses within the Olympus.
- A spares list be made up and a list of spares kept on site.
- The burner main fuel lines be replaced as the ones fitted from the lease engine to Olympus A are a bigger fitting size than the fuel lines on Olympus B and both Olympus at the Hardwoods site.
- An Alba Power Engineer be on site during winter running to assist in any breakdowns within the system, carry out preventative maintenance and condition monitoring. This would increase reliability and reduce any down time.
- A new fuel system installed consisting of flanged solid fuel lines, more robust off engine fuel filter, new regulators and new 3 way high speed shut off valves with position indication.
- All pressure switches be checked and calibrated on an annual basis
- DCS governor ACCEL and DECEL schedules to be fully reviewed and adjusted as required.

Report prepared by:	Paul Hayworth	Date	21 st January 2016
Approved by:	Neil McKenzie	Date	21 st January 2016



August 13, 2015
File: 133546845/18/8

Attention: Alberta Marche
Nalcor Energy
Newfoundland and Labrador Hydro
St. John's, NL A1A 4Y6

Dear Ms. Marche

Reference: Gas Turbine Air Intake Inspection Report for Stephenville & Hardwoods

Hardwoods

ON July 8th, 2015, external visual inspection was carried out for the Gas Turbine Air Intake system A and B at Hardwoods. The gas turbine plant in Hardwoods has been in service since the mid-1970s and is over 39 years old. In the early 2000s the original inlet air filter systems were redesigned. This system is different from the inlet air filter system at Stephenville, which retains the original design.

The previous inspection report, in 2007, by Hatch and Stantec, included items that were highlighted for repair. Following the report, 2 years later in 2009, the whole facility underwent a significant overhaul and the majority of the issues raised in the report were rectified. One item, which was brought forward by the report, was the condition of the coatings on the exterior portions of inlet A. During 2013 a full coating program was undertaken to rectify this issue.

An extensive visual inspection was conducted on both inlets A and B. Results from this can be found in Appendices A and B. A number of concerns were highlighted during this inspection from a corrosion, maintenance and safety aspect. All items identified were photographed and are referenced in Appendices A and B.

Stephenville

The gas turbine plant in Stephenville was placed in service in 1975, and is the sister unit to the Gas Turbine at Hardwoods. The Stephenville Gas Turbine operates as both a generator – peaking/emergency backup – and a synchronous condenser, the latter being the dominant operating mode. Similar to Hardwoods gas turbine, the inlets were visually inspected in 2007 and the deficiencies were identified in the report. The deficiencies have been rectified since the previous report. On July 23th, Stantec personnel visually inspected the inlets A and B at Stephenville extensively. At the request of the Hydro, an Magnetic Particle Inspection (MPI) were completed on the two lifting lugs located inside the lower plenum of inlet A. From the MPI, no anomalies were noted.



Results from this inspection of the inlet A and B at Stephenville can be found in Appendices C and D. A number of concerns were highlighted during this inspection from a corrosion, maintenance and safety aspect. All items identified were photographed and are referenced in Appendices C and D.

Regards,

Stantec Consulting Ltd.

Peter Lee, P.Eng
Senior Structural Engineer
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Attachment: Attachment

c. C.C.

pl document2



APPENDIX A

VISUAL INSPECTION REPORT: INLET AIR SYSTEM A (AT HARDWOODS)

	Visual inspection of Inlet Air System GGA (A)		
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Visual inspection of Inlet Air System GGA (A)

For Nalcor – NL Hydro

Prepared By	DB	 Digitally signed by David Bisset DN: cn=David Bisset, o=EM&I Stantec Ltd., ou, email=david.bisset@stantec.com, c=CA Date: 2015.07.25 17:20:26 -02'30'
Reviewed By	SI	 Digitally signed by shannon.irving@stantec.com Date: 2015.07.23 15:17:28 -03'00'
Approved By	JS	 Digitally signed by Jim Smith DN: cn=Jim Smith, o=EM&I Stantec Ltd., ou, email=jim.smith@stantec.com, c=CA Date: 2015.07.24 08:42:48 -03'00'

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1.0 Scope of Work

The scope of work includes internal and external visual inspection of Inlet Air System A (GGA), at the Hardwoods Gas Turbine Plant, followed by the preparation of an inspection report, including refurbishment drawings. Inspection of the Inlet Air System A will take place July 2015.

2.0 Inspection Findings

The gas turbine plant in Hardwoods is over 39 years old. In the early 2000s the original inlet air filter systems were redesigned. The new filtering system consists of a monoclone pre-filter and high efficiency second filter. This system is different from the inlet air filter system at Stephenville, which retains the original design.

The previous inspection, which was completed was completed in 2007 by Hatch and Stantec, included items that were highlighted in the report for repair. Following the report, 2 years later in 2009, the whole facility underwent a huge overhaul and the majority of the issues raised in the report were rectified. One item, which was brought forward by the report, was the condition of the coatings on the exterior portions of inlet A. During 2013, a full coating program was undertaken to rectify this issue.

3.0 Introduction

EMIS technician performed a visual inspection of the inlet air filter systems A and B at the Hardwoods gas Turbine Facility starting July 8, 2015. The gas turbine at the site has been in service since the mid 1970s. The objective of this inspection is to provide HYDRO with recommendations on the best course of actions for any issues which may be identified in the inspection.

4.0 Findings

An extensive visual inspection was conducted on both inlets A and B. Results from this can be found below. A number of concerns were highlighted during this inspection from a corrosion, maintenance and safety aspect. All items identified were photographed and are referenced in the below report. For the report, finding have been summarized into main categories.

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4.1. Exterior

A visual inspection was completed on the exterior portions of Inlet Air System A (GGA), structural and non-structural.

4.1.1. Exterior – Structural

Inlet Air system A was found to be in overall fair condition throughout the inspection (photo 3). The inlet air structure is constructed of structural steel plate and supported by concrete foundations. Foundations are in good condition with no visible signs of cracking or deterioration noted. All exterior structural steel was found to be in good condition. As mentioned earlier, coatings on both Inlet air systems were done in 2013. Because of this, coatings on the exterior of the inlet system were noted to be in fair condition. Isolated areas of coating breakdown were also noted. From inspection, it could be told that coatings were installed in poor weather allowing previous corrosion to leak through to the new top layer of coatings (photo 35). Steel cladding surrounding inlet air system are in fair condition throughout with coating failures noted in isolated areas. One hole noted on the West side underside of vent (photo 36).

4.1.2. External Non-Structural

During the external visual inspection of Inlet Air System A, numerous items were identified as health, safety and potential to harm items. These are items are listed below:

- I. Power outlet located below access platform on the East side of Inlet A with no weather cover, open to elements and potential to cause harm (photo 31).
- II. Broken electrical box located on the West side of Inlet A is open to elements and potential to cause harm (photo 34).
- III. Light on the South side of inlet are in poor condition (photo 33). In the condition it is at the current time, there is potential to harm due to water ingress potential.
- IV. Broken electrical box located on the West side of inlet and a gap allowing for water ingress with the potential to harm (photo 37).
- V. Mesh on bottom section of inlet overhangs on East side and is in poor condition. Gap noted at top section of mesh. Further investigation required to fully report the extent of this issue (photo 32).
- VI. Seal on West access door on top level platform with deteriorating door seal (photo 26).

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4.2. Internal Inlet Air filter room – West Side

A visual inspection was completed on the internal Inlet Air filter room, West side of the Inlet Air System A (GGA), structural and non-structural.

4.2.1. Internal Inlet Air filter room – West Side – Structural

Internals of the West side inlet air filter room are in poor condition in regards to structural support and members. Equipment is in fair condition. Overall, deck plating was found with up to 25% coating breakdown and scale up to 10mm located in isolated areas. Rated using ASTM rust grade D610-08 as 2-G.

Steel deck plating is in poor condition with holes noted. Worst of these are triangle shaped measuring 250mmx100mm and is located below the cyclomatic filtration unit, at the connection between the deck and outside wall (photo 23). Furthermore to this finding, holes were found throughout the deck plating (photos 19 and 21). This area would need to be further investigated to confirm wall thickness remaining in these areas.

Hole, as shown in photo 36, located from exterior visual inspection, could not be confirmed on top side due to condition of top side deck plate (found to be worst condition than indicated from exterior visual). As seen in photo 23, there is an additional deck plate located below this top plate giving support, however, further investigation would be recommended for this.

Air gap noted, exposing internal elements of inlet air filter room to water ingress, is present on the South side (photo 17). This was found to be different to Inlet B, with the difference been that B was found to have a machined piece attached to eliminate water ingress (photo 45).

Base plate of cyclomatic filtration unit is in poor condition with greater than 50% coating breakdown and scale up to 10mm in isolated areas. Rated using ASTM rust grade D610-08 as 0-G (photo 24).

All welded connections were visually assessed during the time of inspection and no anomalies or areas of concern for further investigation were noted.

Equipment inside of Inlet air filter room West, is in overall good condition. One note which was made during the inspection was that the filters located inside of A were found with more residue on them than those of B. This was talked through with the Nalcor representative aiding EMIS technicians in their inspections. One conclusion which we could draw from this was that A is

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located within closer proximity to the road than B, possibly drawing in more unwanted contaminants to the filters than B located further from the road (photo 25).

4.2.2. Internal Inlet Air filter room – West Side – Non-Structural

During visual inspection of Internal Inlet Air Filter room West side, one item was identified as health and safety with potential to harm. This item is listed below:

- I. Fixed lighting inside of building have blown/not working causing poor lighting conditions and causing the potential to trip and fall.

4.3. Internal Inlet Air filter room – East Side

A visual inspection was completed on the internal Inlet Air filter room East side of the Inlet Air System A (GGA), structural and non-structural.

4.3.1. Internal Inlet Air filter room – East Side – Structural

Internals of the East side inlet air filter room are in fair to poor condition in regards to structural support and members. Equipment was found to be in fair condition. Overall, deck plating was found with up to 20% coating breakdown and scale up to 10mm located in isolated areas. Rated using ASTM rust grade D610-08 as 2-G.

Steel deck plating is in poor condition with heavy pitting noted, mainly focused to the deck directly located below the cyclomatic filtration unit (photo 5). Coating breakdown and scale up to 10mm mainly focused below the cyclomatic filtration unit and at connection between deck plate and vertical (photos 4, 6 and 8).

Base plate of cyclomatic filtration unit is in poor condition with greater than 50% coating breakdown and 5-7mm scale in isolated areas. Rated using ASTM rust grade D610-08 as 0-G (photo 7).

Air gap noted, exposing internal elements of inlet air filter room to water ingress was present on the South side (photo 17). This was found to be different to Inlet B, with the difference been that B was found to have a machined piece attached to eliminate water ingress (photo 45).

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Equipment inside of Inlet air filter room East is in overall good condition. One note which was made during the inspection was that the filters located inside of A were found with more residue on them than those of B. This was talked through with the Nalcor representative aiding EMIS technicians in their inspections. One conclusion that we could draw from this was that A is located within closer proximity to the road than B, possibly drawing in more unwanted contaminants to the filters than B located further from the road (photo 25).

4.3.2. Internal Inlet Air filter room – East Side – Non-Structural

During visual inspection of Internal Inlet Air Filter room East side, no non-structural items were identified as anomalies.

4.4. Internal Emergency Air filter

A visual inspection was completed on the internal emergency Inlet Air filter of the Inlet Air System A (GGA), structural and non-structural.

4.4.1. Internal Emergency Air Filter – Upper Plenum – Structural

Visual inspections of the internals of the emergency air filter upper plenum were conducted from the East and West side inlet air filter rooms. This was due to the fact that access to this area is prohibited, and the only way in which an inspection was achievable was with one filter been removed.

Inspections revealed extensive coating breakdown on horizontal structural beams at floor level, surface corrosion was also noted in these areas (photo 12). Coating breakdown also noted in isolated areas of connections between steel floor plating and vertical sections of I-beams at floor level (photo 14). Isolated coating breakdown with scale up to 5mm scale noted on corner section of I-beams located on the East side of this portion of the inlet, directly below the filter which was removed to allow for inspections (photo 13).

40% coating breakdown and surface corrosion noted on top side of emergency inlet filtration vertical sections, rated using ASTM rust grade D610-08 as 1-G (photo 12).

100% coating breakdown and surface corrosion noted on internal portion of hatchway door on North side of inlet (photo 15). This condition was not repeated on the outside of this hatch.

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Studs and nuts were noted to be missing from the vertical sections of the I-beams inside of the upper plenum (photo 11). This shows studs missing from the vertical sections however the horizontal sections are bolted tightly together. This was found to be the case for the whole vertical section of I-beam.

4.4.2. Internal Emergency Air Filter – Upper Plenum – Non-Structural

During visual inspection of Internal Inlet Air Filter room west side, one item was identified as, health and safety and potential to harm. This item is listed below.

- I. Debris located at the South end with the potential to cause damage (photo 16).

4.5. Internal of turbine room

A visual inspection was completed on the internal of the turbine room on the Inlet Air System A (GGA), structural and non-structural.

4.5.1. Internal of turbine room - Structural

Concluding from extensive visual inspection inside of the turbine room, all structural steel was found to be in good condition with no coating breakdown or corrosion noted.

The lower Plenum was accessed using a confined space entry permit and removal of a small hatchway on Thursday July 9, 2015. It was noted that very small levels of corrosion were found to be evident in the south west corner (photo 39). Concrete floor was found to be wet in isolated areas, this was expected due to the top of the Plenum being open to the elements, allowing water ingress.

In the turbine room itself, one stud was found to be missing from the South side mesh shielding (photo 41).

4.5.2. Internal of turbine room – Non-Structural

During the external visual inspection of Inlet Air System A, numerous items were identified as health and safety with potential to harm items. These are items are listed below:

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- I. Electrical connection box located at floor level is in close proximity to the East side access door with no cover exposing live cables causing a potential to harm (photo 40).
- II. Electrical connection box located at head level in close proximity to the East side access door with no cover exposing live cables causing a potential to harm (photo 42).
- III. Air leak present on ¾" piping on the South side of East access door (photo 43). Nalcor representative advised of this at the time of discovery.
- IV. Electrical outlet box in poor condition with cover broken (photo 44).

4.6. Platforms and access ladders

A visual inspection was completed on the platforms and access ladders of the Inlet Air System A (GGA), structural and non-structural.

4.6.1. Platforms and access ladders- Structural

Platforms and ladders were found to be in overall good condition in relation to their structural content, one small section of deck grating located on the top level on the East side was found to be loose.

Small isolated areas of coating breakdown with very low level of corrosion noted on all decks, rated using ASTM rust grade D610-08 as 4-S for all platforms located on Inlet A.

4.6.2. Platforms and access ladders – Non-structural

During the external visual inspection of Inlet Air System A, numerous items were identified as, health and safety with potential to harm items. These are items are listed below:

- I. Hatch located on middle platform at deck level have lifting handles which are not identified which can cause tripping hazards (photo 30).
- II. All ladders located on Inlet A were found with no safety chain or barriers at the top of the ladders to prevent workers falling when working on the platform itself (photo 28).

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 1 – General overview of site looking West.



Photo 2 – General overview of site looking East.



Photo 3 – General overview of Inlet Air System A looking West.



Photo 4 – Coating breakdown and scale noted on steel deck plating below cyclomatic filtration system.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 5 – Heavy pitting, coating breakdown and scale on steel deck plating below cyclomatic filtration system.



Photo 6 – Coating breakdown and light scaling in Southeast corner, located below cyclomatic filtration system.



Photo 7 – Coating breakdown and scale noted on base plate of cyclomatic filtration system.



Photo 8 – General view of steel deck plating looking South. Coating breakdown and surface corrosion throughout.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 9 – General overview of cyclomatic filtration system in good condition.



Photo 10 – General overview of bank of filters in good condition.



Photo 11 – Coating breakdown on horizontal structural beams. Studs missing from vertical sections of I-beams.



Photo 12 – Coating breakdown on horizontal structural beams.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 13 – Isolated area of coating breakdown and scaling.



Photo 14 – Isolated sections coating breakdown between connection of horizontal I-beams and deck plating.



Photo 15 – 100% coating breakdown on hatch door.



Photo 16 – Debris located inside emergency air filter on the South side.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 17 – Air gap located around section of cyclomatic filtration system allowing internal of air filter room open to the elements.



Photo 18 – Coating breakdown, scaling and debris located below cyclomatic filtration unit in West side air filter room.



Photo 19 – Coating breakdown and holes on steel deck plating below cyclomatic filtration unit.



Photo 20 – Coating breakdown, heavy scaling and holes below cyclomatic filtration unit.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 21 – Numerous holes located on deck plating in West side Air Filter room.



Photo 22 – Coating breakdown and light scaling on steel deck plating.



Photo 23 – Hole located below cyclomatic filtration unit with coating breakdown and scaling noted.



Photo 24 – Coating breakdown and scaling on base plate of cyclomatic filtration unit.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 25 – Overview of filter in fair condition. This was typical of all filters in Inlet Air Filter System A.



Photo 26 – Door seal on West side door with onset of deterioration.



Photo 27 – General overview of top platform in good condition.



Photo 28 – No safety chain located at the top of ladders. This was typical of all access ladders on Inlet Air System A.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 29 – Small levels of coating breakdown and surface corrosion on top level platform.



Photo 30 – Hatch handle at deck level with no warning, causing tripping hazard with potential to harm.

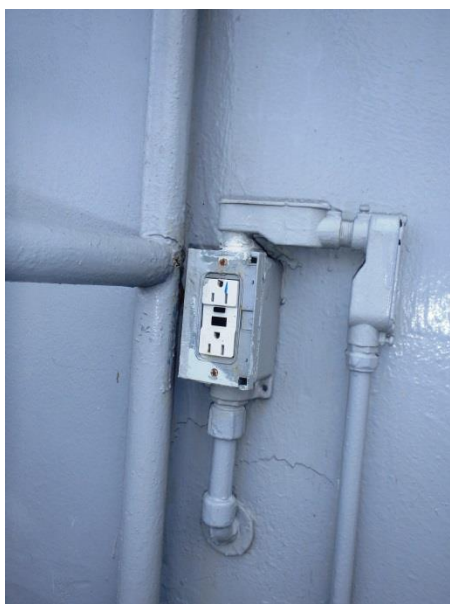


Photo 31 – Power outlet with no weather cover, allowing water ingress into power source.



Photo 32 – Mesh parting from steel structure on East side.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 33 – Light on South side in poor condition, allowing water ingress.



Photo 34 – Broken electrical box allowing water ingress.



Photo 35 – Coating breakdown noted on underside of inlets, West side.



Photo 36 – Hole noted on underside of inlets west side.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 37 – Damaged electrical source, allowing water ingress and potential to harm.



Photo 38 – Low levels of coating breakdown inside lower Plunem (confined space).



Photo 39 – Water collected on concrete floor of confined space.

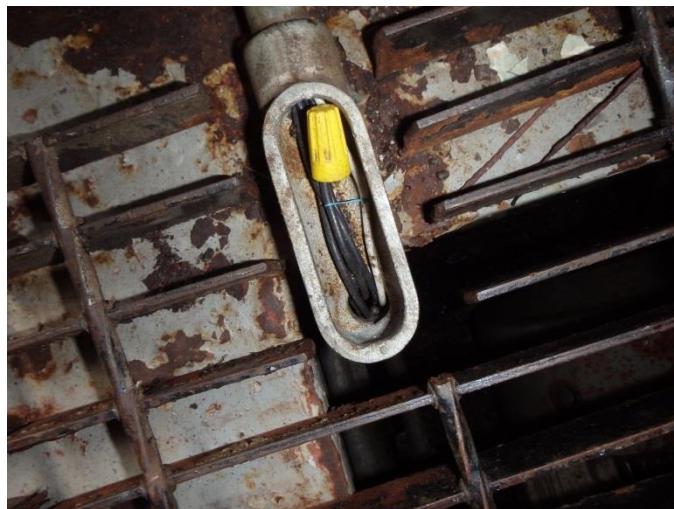


Photo 40 – Electrical connection box found with no cover.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 41 – Missing stud located.



Photo 42 – Electrical connection box with no cover.



Photo 43 – Section of piping identified with air leak.



Photo 44 – Damaged electrical box.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings

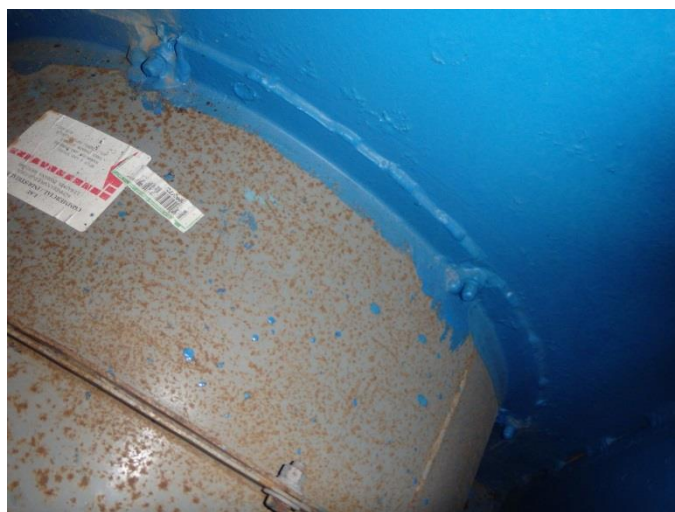
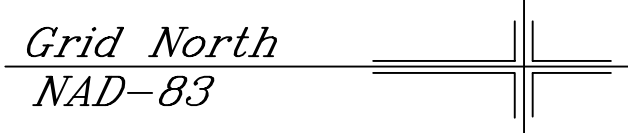


Photo 45 – Comparison of Inlet Air System B, no exposure to atmosphere.

List of Attachments

Attachment 1: B1-333-C-73
Attachment 2: B1-333-M-140
Attachment 3: A1-333-M-142



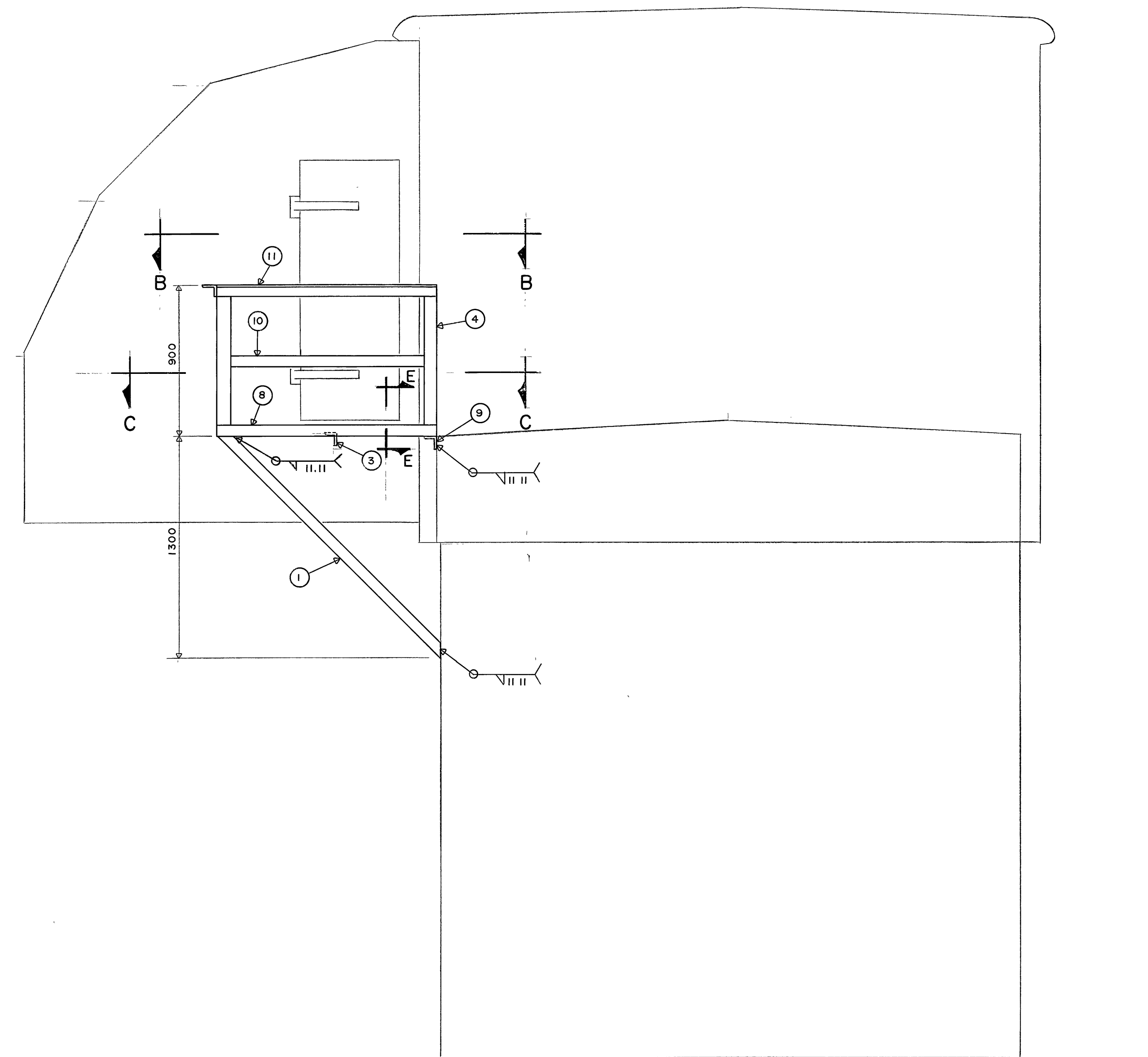
Photo



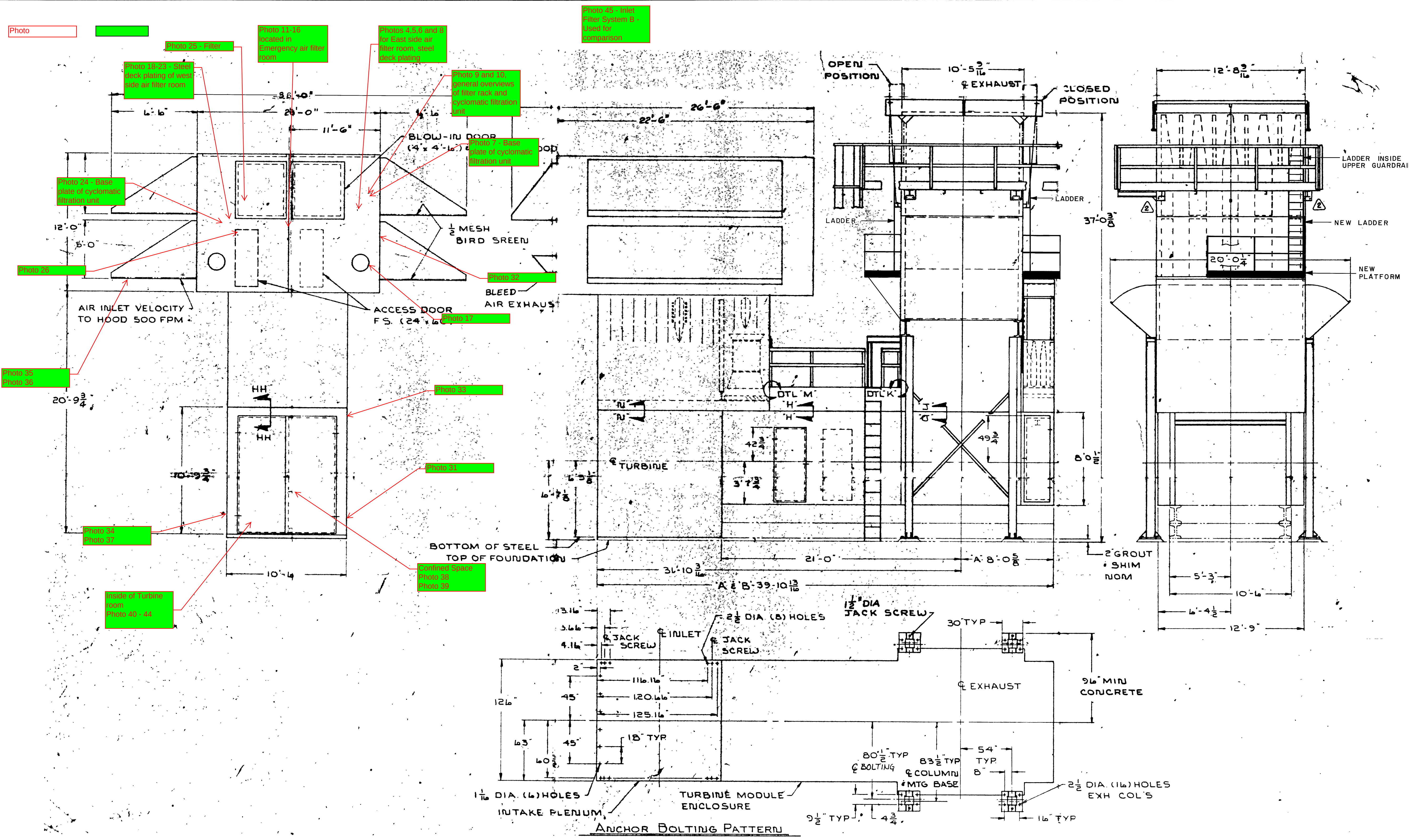
NOTICE: This Drawing contains intellectual property of Newfoundland and Labrador Hydro (HYDRO) and shall not be copied or distributed in whole or part without prior written consent from HYDRO. Use of the drawing shall be restricted to purposes of prosecution of a contract with HYDRO.	
ELECT.	SCALE: 1 : 500
CIVIL	DESIGNED:
TRANS.	DRAWN: W. Boland
MECH.	DATE: 2000-12-12
P&C	CHECKED:
TELC.	APPROVED:

NEWFOUNDLAND AND LABRADOR HYDRO

W.O. NO.	DWG. NO.	B1-	333 - C - 73	RI
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- | | | |
|---|---|------------------------------------|
|  | NEWFOUNDLAND AND LABRADOR HYDRO | |
| | <h1 style="text-align: center;">HARDWOODS TERMINAL STATION</h1> <h2 style="text-align: center;">GAS TURBINE</h2> <h2 style="text-align: center;">AIR FILTER HOUSE CATWALK &
LADDER DETAILS</h2> | |
| SCALE AS SHOWN
CHECKED <i>for Jansen</i>
W.O. No | DESIGNED
APPROVED <i>[Signature]</i>
DWG No | DRAWN RTCG
DATE 86-11-20
REV |



DWG. WAS BURGESS ENVIR. SYS. 120D10562 SH. 1 OF 13

		NEWFOUNDLAND AND LABRADOR HYDRO	
HARDWOODS TERMINAL STATION GAS TURBINE PLATFORM LOCATION GENERATOR SIDE			
SCALE	N.T.S.	DESIGNED	DRAWN W.H.
CHECKED		APPROVED	DATE 1987-10-09
DWG No	A1- 333-M-142		REV 0

REFERENCE DRAWINGS		REVISIONS		PASSED	
No	DATE	DESCRIPTION	BY	CKD	
333-M-144		GAS TURBINE PLATFORM			
333-M-143		GAS TURBINE PLATFORM LOCATION GAS TURBINE SIDE			
333-M-141		GAS TURBINE ACTUATOR ACCESS PLATFORM			



APPENDIX B

VISUAL INSPECTION REPORT: INLET AIR SYSTEM B (AT HARDWOODS)

	Visual inspection of Inlet Air System GGB (B)		
Doc Ref: N/A	Rev: 0	Date: July 16, 2015	Page 1 of 19

Visual inspection of Inlet Air System GGB (B)

For Nalcor – NL Hydro

Prepared By	DB	 Digitally signed by David Bisset DN: cn=David Bisset, o=EM&I Stantec Ltd., ou, email=david.bisset@stantec.com, c=CA Date: 2015.07.25 17:20:59 -02'30'
Reviewed By	SI	 Digitally signed by shannon.irving@stantec.com Date: 2015.07.23 15:18:00 -03'00'
Approved By	JS	 Digitally signed by Jim Smith DN: cn=Jim Smith, o=EM&I Stantec Ltd., ou, email=jim.smith@stantec.com, c=CA Date: 2015.07.23 15:01:01 -03'00'

 newfoundland labrador hydro a nalcor energy company	Visual inspection of Inlet Air System GGB (B)		
Doc Ref: N/A	Rev: 0	Date: July 16, 2015	Page 2 of 19

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	Visual inspection of Inlet Air System GGB (B)		
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1.0 Scope of Work

The scope of work includes internal and external visual inspection of Inlet Air System B (GGB), at the Hardwoods Gas Turbine Plant, followed by the preparation of an inspection report, including refurbishment drawings. Inspection of the Inlet Air System A will take place July 2015.

2.0 Background

The gas turbine plant in Hardwoods is over 39 years old. In the early 2000's the original inlet air filter systems were redesigned. The new filtering system consists of a monoclone pre-filter and high efficiency second filter. This system is different from the inlet air filter system at Stephenville, which retains the original design.

The previous inspection, which was completed was completed in 2007 by Hatch and Stantec, included items that were highlighted in the report for repair. Following the report, 2 years later in 2009, the whole facility underwent a huge overhaul and the majority of the issues raised in the report were rectified. One item, which was brought forward by the report, was the condition of the coatings on the exterior portions of inlet B. During 2013 a full coating program was undertaken to rectify this issue.

3.0 Introduction

EMIS Technician performed a visual inspection of the inlet air filter systems A and B at the Hardwoods gas Turbine Facility starting July 8, 2015. The gas Turbine at the site has been in service since the mid 1970s. The objective of this inspection is to provide HYDRO with recommendations on the best course of actions for any issues which may be identified in the inspection.

4.0 Findings

An extensive visual inspection was conducted on both inlets A & B. Results from this can be found below. A number of concerns were highlighted during this inspection, from a corrosion, maintenance, and safety aspect. All items identified were photographed and are referenced in the below report. For the report, findings have been summarized into main categories.

 a nalcor energy company	Visual inspection of Inlet Air System GGB (B)		
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4.1. Exterior

A visual inspection was completed on the exterior portions of Inlet Air System B (GGB), structural and non-structural.

4.1.1. Exterior - Structural

Inlet Air system B was found to be in overall fair condition throughout the inspection (photo 3). The inlet air structure is of structural steel plate and supported by concrete foundations. Foundations are in fair condition with visible signs of cracking and deterioration noted on the Northwest corner (photo 28). All exterior structural steel was in good condition. As mentioned earlier, coatings on both Inlet air systems were done in 2013. Because of this, coatings on the exterior of the inlet system were noted to be in fair condition. Very small isolated areas of coating breakdown were also noted. From inspection, it could be told that coatings were installed in poor weather allowing previous corrosion to leak through to the new top layer of coatings. Steel cladding surrounding inlet air system found to be in good condition throughout (photo 3).

Roof of Inlet B is in fair condition with coating breakdown and light surface corrosion noted, rated using ASTM rust grade D610-08 as 2-S (photo 36).

4.1.2. External Non-Structural

During the external visual inspection of Inlet Air System B, numerous items were identified as health and safety with potential to harm items. These items are listed below:

- I. Electrical box located on the West side adjacent to access platform of Inlet B in poor condition with exposing electrical wires to water ingress, potential to harm, (photo 26).
- II. Electrical boxes are in poor condition and are heavily corroded at the underside edge of inlet duct, East side (photo 21).
- III. Studs are in poor condition on access door hatch with 100% coating breakdown and surface corrosion noted, middle platform on the South side (photo 22).
- IV. Associated piping are in fair condition with coating breakdown and surface corrosion, rated using ASTM rust grade D610-08 as 2-S (photo 25).
- V. Associated piping rubber hose in poor condition with cracks noted allowing for water ingress (photo 27).

 newfoundland labrador a nalcor energy company	Visual inspection of Inlet Air System GGB (B)		
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- VI. Mesh located on bottom section of inlet duct is in fair condition with gaps noted from visual inspection. A closer inspection would be recommended to fully assess if this could cause a dropping hazard (photo 29).

4.2. Internal Inlet Air filter room – West Side

A visual inspection was completed on the internal Inlet Air filter room, West side of the Inlet Air System B (GGB), structural and non-structural.

4.2.1. Internal Inlet Air filter room – West Side - Structural

Internals of the west side inlet air filter room are in fair condition in regards to structural support and members. Equipment was in fair condition. Overall, deck plating was found with up to 10% coating breakdown with scale up to 3mm located in isolated areas, rated using ASTM rust grade 610-08 as 3-G.

Base plate of cyclomatic filtration unit is in poor condition with greater than 50% coating breakdown and scale up to 8mm in isolated areas, rated using ASTM rust grade D610-08 as 0-G (photos 5 and 6).

All welded connections were visually assessed during the time of inspection and no anomalies or areas of concern for further investigation were noted.

Equipment inside of Inlet air filter room West, is in overall good condition.

4.2.2. Internal Inlet Air filter room – West Side – Non-Structural

During visual inspection of Internal Inlet Air Filter room West side, one item was identified as health and safety with potential to harm. This item is listed below:

- I. Fixed lighting inside of building have blown/not working causing poor lighting conditions, causing the potential to trip and fall.

 newfoundland labrador a nalcor energy company	Visual inspection of Inlet Air System GGB (B)		
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4.3. Internal Inlet Air filter room – East Side

A visual inspection was completed on the internal Inlet Air filter room East side of the Inlet Air System B (GGB), structural and non-structural.

4.3.1. Internal Inlet Air filter room – East Side - Structural

Internals of the East side inlet air filter room are in fair condition in regards to structural support and members. Equipment was in fair condition. Overall, deck plating was found with up to 15% coating breakdown with scale up to 4mm in isolated areas, rated using ASTM rust grade D610-08 as 3-S (photo 4).

Steel deck plating in fair condition with light pitting noted, mainly focused to the deck directly located below the cyclomatic filtration unit (photos 14 and 15). Coating breakdown and scale up to 4mm mainly focused below the cyclomatic filtration unit and at connection between deck plate and vertical (photos 14 and 15).

Base plate of cyclomatic filtration unit is in poor condition with greater than 50% coating breakdown and 5-7mm scale in isolated areas, rated using ASTM rust grade D610-08 as 0-G.

Equipment inside of Inlet air filter room East are in overall good condition.

4.3.2. Internal Inlet Air filter room – East Side – Non-Structural

During visual inspection of Internal Inlet Air Filter room on the East side, no non-structural items were identified as anomalies.

4.4. Internal Emergency Air filter

A visual inspection was completed on the internal emergency Inlet Air filter of the Inlet Air System B (GGB), structural and non-structural.

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4.4.1. Internal Emergency Air Filter – Upper Plenum - Structural

Visual inspections of the internals of the emergency air filter upper plenum, were conducted from the East and West side inlet air filter rooms. This was due to the fact that access to this area is prohibited and the only way in which an inspection was achievable was with one filter been removed.

Inspections revealed light coating breakdown on structural beams. Surface corrosion was also noted in these areas (photo 11). Coating breakdown also noted in isolated areas of connections between steel floor plating and vertical sections of I-beams at floor level (photos 11 and 12). Isolated coating breakdown noted on connection between vertical sections and ceiling section of I-beams located on the North side (photo 13).

Coating breakdown and surface corrosion noted on top side of emergency inlet filtration vertical sections with 40% coating breakdown. Rated using ASTM rust grade D610-08 as 1-G (photos 10 and 16).

Isolated section of coating breakdown noted at connection section between 2 I-beams located in centre location. Coating breakdown and scale up to 5mm noted (photo 16).

100% coating breakdown and surface corrosion noted on internal portion of hatchway door on North side of inlet (photo 12). This condition was not repeated on the outside of this hatch.

4.4.2. Internal Emergency Air Filter – Upper Plenum – Non-Structural

During visual inspection of Internal Inlet Emergency Air Filter room, no non-structural items were identified as anomalies.

4.5. Internal of turbine room

A visual inspection was completed on the internal of the turbine room on the Inlet Air System B (GGB), structural and non-structural.

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4.5.1. Internal of turbine room - Structural

Concluding from extensive visual inspection inside of the turbine room, all structural steel was found to be in good condition with no coating breakdown or corrosion noted.

Small areas of corrosion noted at connection between vertical sections and concrete base (photo 33).

Coating breakdown and surface corrosion noted on bottom side of emergency inlet filtration vertical sections, 40% coating breakdown noted. Rated using ASTM rust grade D610-08 as 1-G (photo 34).

4.5.2. Internal of turbine room – Non-Structural

During the external visual inspection of Inlet Air System B, numerous items were identified as health and safety with potential to harm items. These are items are listed below:

- I. Electrical connection box, located on floor level, is in close proximity to the East side access door, and is with no cover exposing live cables causing a potential to harm (photo 30).
- II. Electrical connection box, located on floor level, is in close proximity to the East side access door. Found with no cover exposing live cables causing a potential to harm (photo 35).
- III. Mesh on ceiling is in poor condition, hanging from current position, causing a potential to fall and injure (photo 32).
- IV. Damaged mesh located on the South end wall (photo 31).

4.6. Platforms and access ladders

A visual inspection was completed on the platforms and access ladders of the Inlet Air System B (GGB), structural and non-structural.

	Visual inspection of Inlet Air System GGB (B)		
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4.6.1. Platforms and access ladders - Structural

Platforms and ladders are in overall good condition in relation to their structural content. One small section of deck grating located on the top level East side, was found to be loose.

Small isolated areas of coating breakdown with very low levels of corrosion noted on all decks, rated using ASTM rust grade D610-08 as 4-S for all platforms located on Inlet B (photo 18).

4.6.2. Platforms and access ladders – Non-structural

During the external visual inspection of Inlet Air System B, numerous items were identified as health and safety with potential to harm items. These are items are listed below:

- I. Hatch located on middle platform at deck level found to have lifting handles which are not identified which can cause tripping hazards (photo 23).
- II. All ladders located on Inlet B were found with no safety chain or barriers at the top of the ladders to prevent workers falling when working on the platform itself (photo 20).

	Visual inspection of Inlet Air System GGB (B)		
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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 1 – General overview of site looking West.



Photo 2 – General overview of site looking East.



Photo 3 – General overview of Inlet Air System B looking Southwest.



Photo 4 – Coating breakdown and scale noted on deck plating in West side air filter room.

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Doc Ref: N/A	Rev: 0	Date: July 16, 2015	Page 11 of 19

Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 5 – Coating breakdown/corrosion on base plate of cyclomatic filtration unit, West side air filter room.

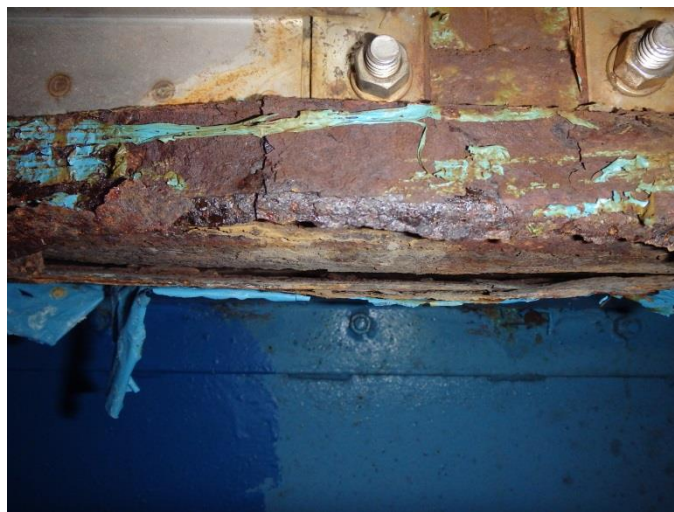


Photo 6 – Coating breakdown/corrosion on base plate of cyclomatic filtration unit, West side air filter room.



Photo 7 – General overview of cyclomatic filtration unit and filters at West side air filter room.



Photo 8 – General overview of cyclomatic filtration unit and filters at East side air filter room.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 9 – General overview of emergency air filter system. Small levels of coating breakdown noted.



Photo 10 – Emergency air filter system with coating breakdown noted on vertical sections.



Photo 11 – Coating breakdown at connection between horizontal floor level I-beams and deck plating.



Photo 12 – 100% coating breakdown on hatchway door.

	Visual inspection of Inlet Air System GGB (B)		
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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 13 – Isolated coating breakdown and surface corrosion at connection between vertical wall panels and ceiling.



Photo 14 – Coating breakdown/corrosion on deck plating in East side air filter room.



Photo 15 – Coating breakdown/corrosion on deck plating in East side air filter room.



Photo 16 – Isolated coating breakdown at connection between 2 I-beams located inside of emergency air filter system.

	Visual inspection of Inlet Air System GGB (B)		
Doc Ref: N/A	Rev: 0	Date: July 16, 2015	Page 14 of 19

Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 17 – Deterioration on East side hatch door seal.



Photo 18 – Coating breakdown on horizontal sections of top platform structural beams.



Photo 19 – General overview of top level platform looking East.

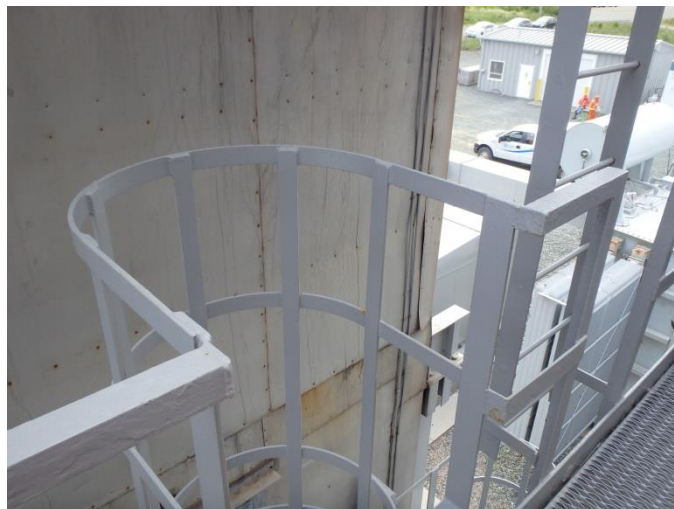


Photo 20 – Top level access ladder with no safety chain across top section. This was typical of all access ladders located on Inlet Air System B.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 21 – Electrical boxes in poor condition on East side of Inlet Air System B.



Photo 22 – 100% coating breakdown on stud for hatchway door located on middle platform South side.



Photo 23 – Middle platform ground level. Hatchway handles causing tripping hazard.



Photo 24 – Isolated sections of coating breakdown on platform supporting structural members.

 newfoundland labrador a nalcor energy company	Visual inspection of Inlet Air System GGB (B)		
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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 25 – Associated piping in fair condition with coating breakdown and surface corrosion.



Photo 26 – Damaged electrical box allowing water ingress.



Photo 27 – Damaged rubber hose on associated piping allowing for water ingress.

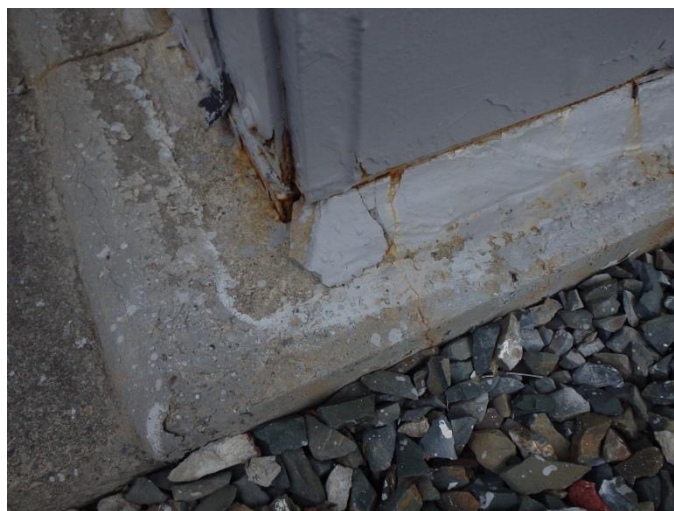


Photo 28 – Isolated area of deterioration at Northwest corner of concrete base.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 29 – Damaged section of mesh.



Photo 30 – Electrical connection in poor condition.



Photo 31 – Damaged section of mesh.



Photo 32 – Damaged and hanging mesh.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 33 – Isolated areas of corrosion.



Photo 34 – Coating breakdown and surface corrosion on vertical members.



Photo 35 – Electrical connection in poor condition.

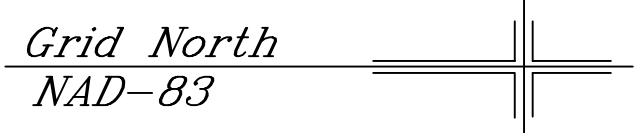


Photo 36 – Roof structural steel in fair condition.

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List of Attachments

Attachment 1: B1-333-C-73
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Attachment 3: A1-333-M-142



Photo



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NEWFOUNDLAND AND LABRADOR HYDRO

HARDWOODS TERMINAL STATION AND GAS TURBINE SITE LAYOUT

W.O. NO.	DWG. NO.	B1-	333 - C - 73	REV. 4
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NOTES

1. ALL WELDS TO BE 4-76mm FILLET WELDS UNLESS OTHERWISE SPECIFIED.
2. USE A 66011 WELDING ELECTRODE FOR ALL WELDS
3. WELD BOTH SIDES. GRIND FLUSH ON GRATING SIDE.
4. ALL FLOOR ANGLES SHOULD BE WELDED TO G.T. MODULE WHERE POSSIBLE.

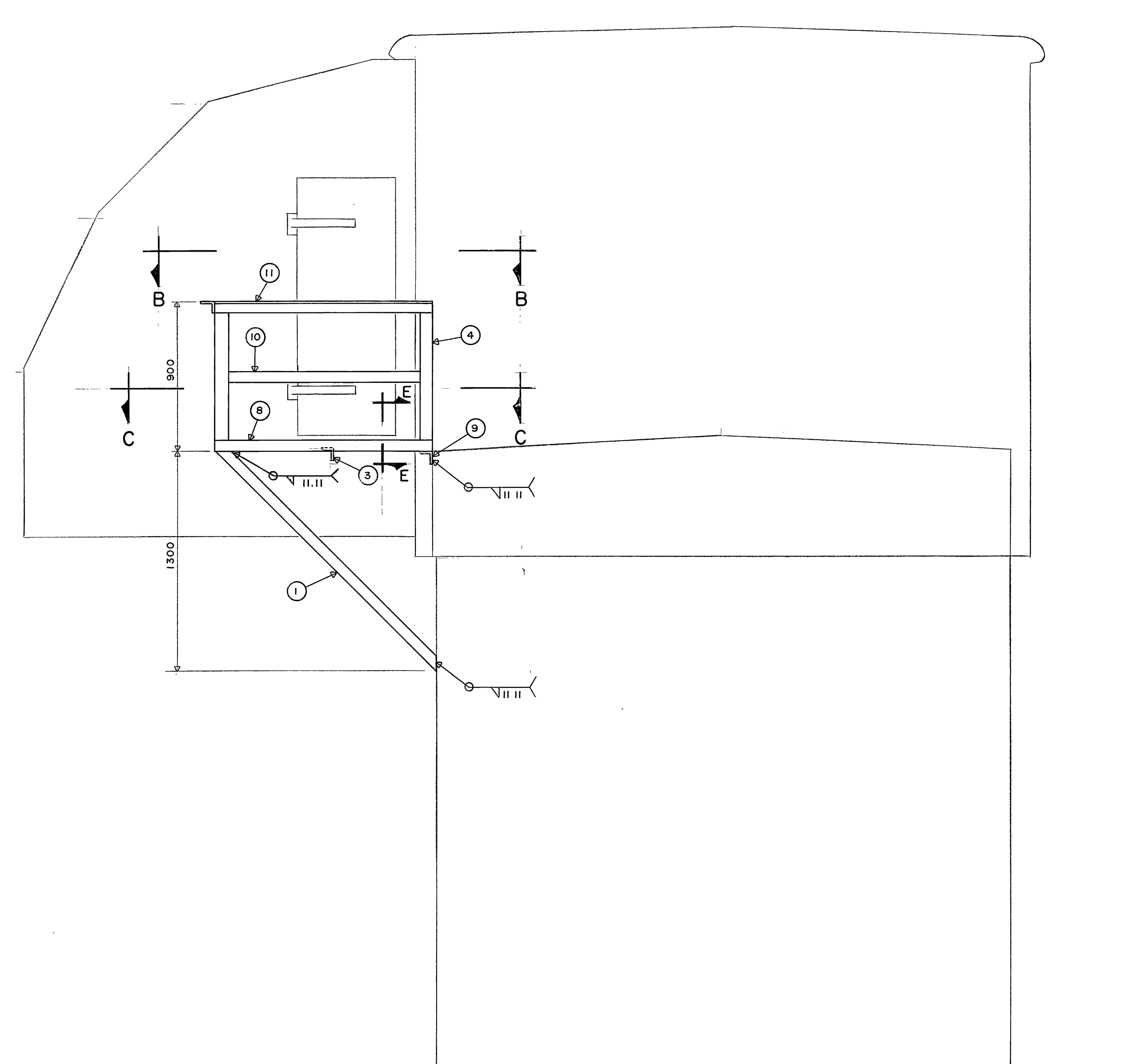


Diagram illustrating the cross-section (SECTION E-E) of the floor support assembly. The assembly consists of a central core (6) sandwiched between two layers (7 and 8). The core is supported by a base (9) and a top layer (10). The entire assembly is mounted on a support structure (11). The diagram shows the assembly is welded onto the module along the whole length.

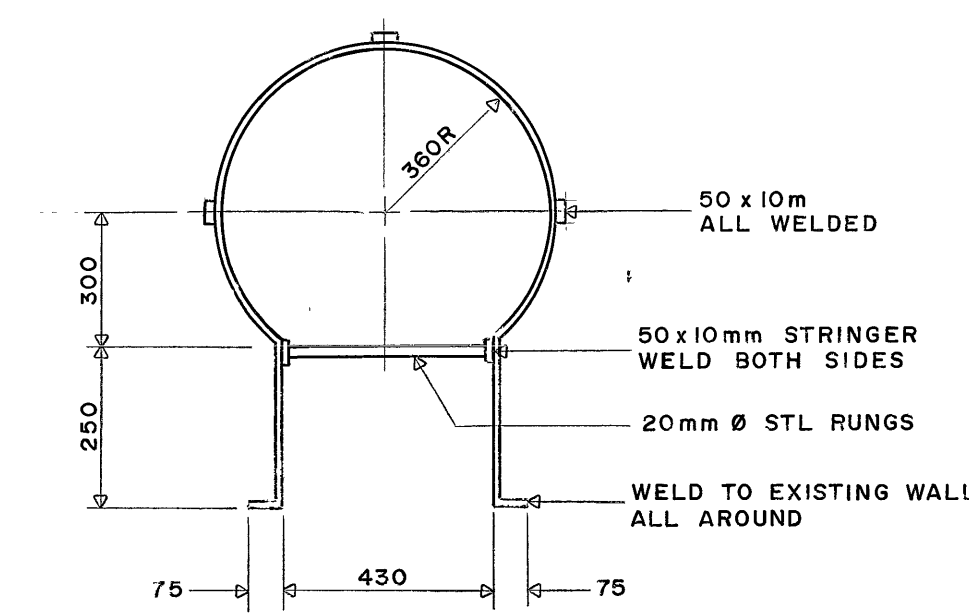
SECTION E-E
 "FLOOR SUPPORT"

WELD ONTO MODULE
 ALONG WHOLE LENGTH

Technical drawing of a rectangular module. The overall dimensions are 1800 (height) and 900 (width). The drawing includes several callouts and annotations:

- 7**: Callout to the top edge.
- 6**: Callout to the top edge.
- 4**: Callout to the top edge.
- WELD ON MODULE FULL LENGTH**: Text label pointing to the top edge.
- 3**: Callout to the left edge.
- SEE NOTE 3**: Text label inside the module.
- 9**: Callout to the right edge.
- NOTE**: Text label pointing to a detail view of the corner.
- ANGLE CUT AT 45° TO PREVENT OVERLAPPING**: Text label pointing to the corner detail.
- SEE NOTE 3**: Text label pointing to the corner detail.

Diagram illustrating the bottom of the refrigerator compartment. The bottom cover (5) is shown being removed from the bottom panel (12).

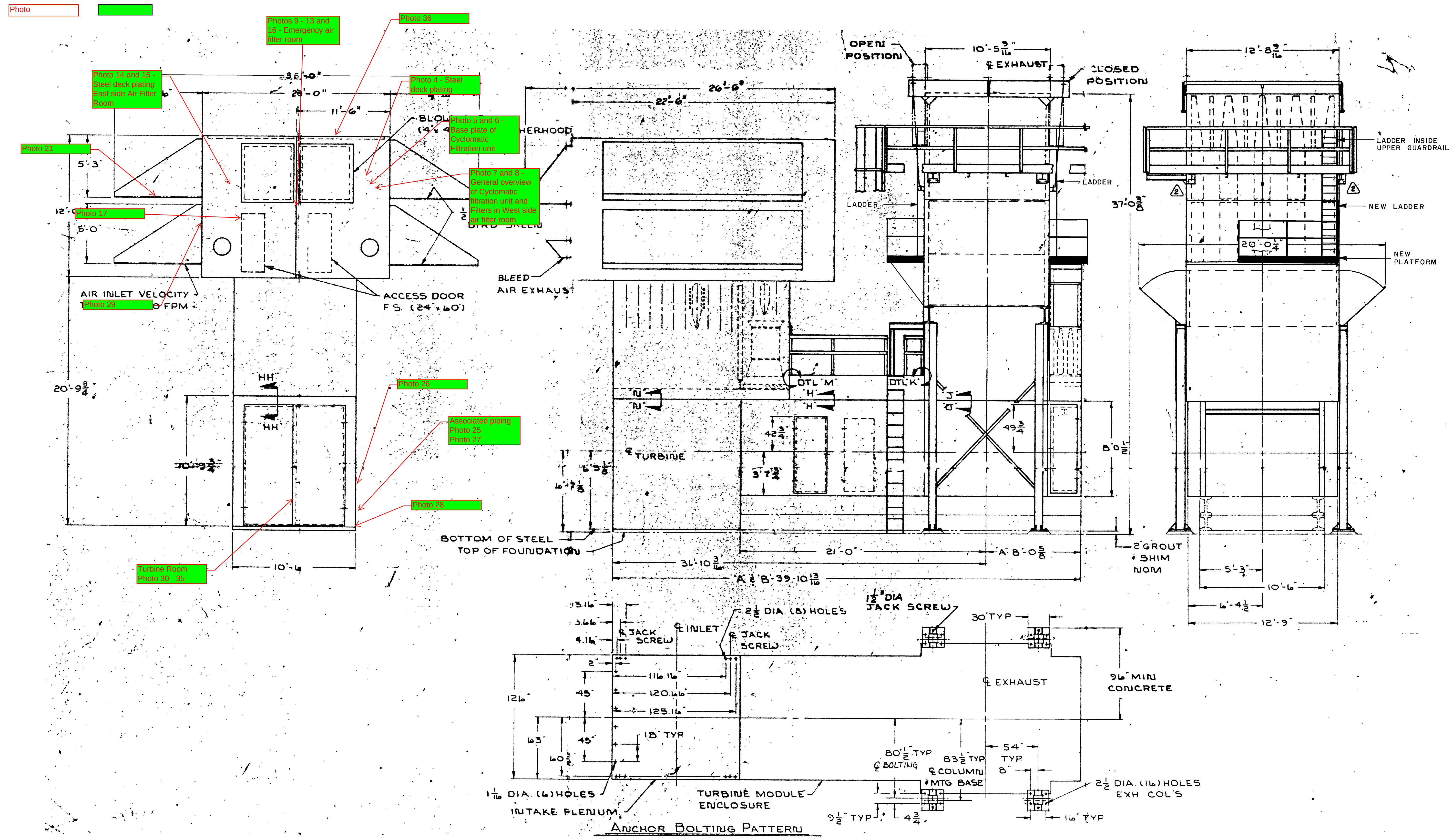


SECTION C-C
"FLOOR DETAIL" NTS

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NEWFOUNDLAND AND LABRADOR HYDRO

SCALE AS SHOWN	DESIGNED	DRAWN RTCG
CHECKED <i>for Jones</i>	APPROVED <i>[Signature]</i>	DATE 86-11-20
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DWG. WAS BURGESS ENVIR. SYS. 120D10562 SH. 1 OF 13

	NEWFOUNDLAND AND LABRADOR HYDRO			
	HARDWOODS TERMINAL STATION GAS TURBINE PLATFORM LOCATION GENERATOR SIDE			
SCALE	N.T.S.	DESIGNED	DRAWN	W.H.
CHECKED		APPROVED	DATE	1987-10-09
DWG No	A1- 333-M-142		REV	0

REFERENCE DRAWINGS		REVISIONS		PASSED	
DWG No	TITLE	No	DATE	DESCRIPTION	BY
333-M-144	GAS TURBINE PLATFORM				
333-M-143	GAS TURBINE PLATFORM LOCATION GAS TURBINE SIDE				
333-M-141	GAS TURBINE ACTUATOR ACCESS PLATFORM				



APPENDIX C

VISUAL INSPECTION REPORT: INLET AIR SYSTEM A (AT STEPHENVILLE)

	Visual inspection of Inlet Air System GGA (A)		
Doc Ref: N/A	Rev: 0	Date: July 23, 2015	Page 1 of 20

Visual inspection of Inlet Air System GGA (A)

For Nalcor – NL Hydro

Prepared By	DB	 Digitally signed by David Bisset DN: cn=David Bisset, o=EM&I Stantec Ltd, ou, email=David.Bisset@stantec.com, c=CA Date: 2015.08.07 12:31:25 -02'30'	Aug-7-15
Reviewed By	SI	 Digitally signed by shannon.irving@stantec.com Date: 2015.08.07 13:18:03 -03'00'	
Approved By	JS	 Digitally signed by Jim Smith DN: cn=Jim Smith, o=EM&I Stantec Ltd, ou, email=jim.smith@stantec.com, c=CA Date: 2015.08.07 11:08:25 -03'00'	Aug-7-15

	Visual inspection of Inlet Air System GGA (A)		
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1.0 Scope of Work

The scope of work includes internal and external visual inspection of Inlet Air System A (GGA), at the Stephenville Gas Turbine Plant, followed by the preparation of an inspection report, including refurbishment drawings. Inspection of the Inlet Air System A will take place July 2015.

2.0 Inspection Findings

The gas turbine plant in Stephenville was placed in service in 1975, and is the sister unit to the Gas Turbine at Hardwoods. Like Hardwoods, the Stephenville Gas Turbine operates as both a generator – peaking/emergency backup – and a synchronous condenser, the latter being the dominant operating mode.

The Facility consists of two Rolls Royce Olympus C, 25 MW Gas Generator Engines (A and B) fired on #2 Diesel Oil, each driving a Curtiss Wright Power Turbine equipped with a SSS size 208T clutch. Each Gas Generator has an air intake structure and each power turbine has an Exhaust stack. Gas Generator Engine B was overhauled in 2000. Gas Generator A has never been overhauled since going into service in 1975. It is our understanding that both exhaust stacks were replaced in 1992.

The previous inspection, which was completed was completed in 2007 by Hatch and Stantec, included items that were highlighted in the report for repair. Following the report, 2 years later in 2009, the whole facility underwent a huge overhaul and the majority of the issues raised in the report were rectified.

3.0 Introduction

EMIS technician performed a visual inspection of the inlet air filter systems A and B at the Stephenville Gas Turbine Facility starting July 20, 2015. The objective of this inspection is to provide HYDRO with recommendations on the best course of actions for any issues which may be identified in the inspection.

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4.0 Findings

An extensive visual inspection was conducted on both inlets A and B. Results from this for Inlet A, can be found below. A number of concerns were highlighted during this inspection from a corrosion, maintenance and safety aspect. All items identified were photographed and are referenced in the below report. For the report, findings have been summarized into main categories.

4.1. Exterior

A visual inspection was completed on the exterior portions of Inlet Air System A (GGA), structural and non-structural.

4.1.1. Exterior – Structural

Inlet Air system A was found to be in overall fair condition throughout the inspection (photo 1). The inlet air structure is constructed of structural steel plate and supported by concrete foundations. Foundations are in good condition with no visible signs of cracking or deterioration noted. All exterior structural steel was found to be in good condition. In regards to the coating condition on the exterior of the inlet system, it was noted to be in fair condition. Isolated areas of coating breakdown were also noted. Moderate levels of coating breakdown and small levels of corrosion were noted on the roof steel plating (photo 35). Steel cladding surrounding inlet air system are in fair condition throughout with isolated coating failures noted in isolated areas.

4.1.2. External Non-Structural

During the external visual inspection of Inlet Air System A, a number of items were identified as health, safety and potential to harm items. These are items are listed below:

- I. Loose wire hanging from underneath the North side inlet hood. Upon inspection, wire was found attached inside the hood. While inspectors were on site, this item was rectified and wire folded over into the inside of the hood (photos 40 and 41).
- II. One supporting brace member found to be in poor condition on the West side of the inlet. Weld found to be broken, causing a potential dropped object. This item was

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brought to the attention of HYDRO while EMIS technicians were on site, due to the severity of an incident if this was to occur. This item was flagged as a high priority and a plan was in place to fix this at the closest possible time (photo 42).

- III. As reported by HYDRO personnel, door hinges on the North access doors to the lower plenum were found to be in poor condition; this access door was not removed using inspection, however, low levels of corrosion were noted (photo 39).
- IV. Isolated fractures were noted in the coating on the West side of the inlet A (photos 36 and 37).
- V. Small amount of damage noted on the Northwest corner of structure (photo 38).

4.2. Internal Inlet Air filter room – West Side

A visual inspection was completed on the internal Inlet Air filter room, West side of the Inlet Air System A (GGA), structural and non-structural.

4.2.1. Internal Inlet Air filter room – West Side – Structural

Internals of the West side inlet air filter room are in good condition in regards to structural support and members. Equipment is also in good condition. Overall, deck plating was found with up to 3% coating breakdown. Rated using ASTM rust grade D610-08 as 5-S.

Steel deck plating is in good condition with the majority of coating found to be intact. New deck coating was applied in the summer of 2014. Small areas of rust staining were noted (photo 3).

All welded connections were visually assessed during the time of inspection and no anomalies or areas of concern for further investigation were noted.

Equipment inside of Inlet air filter room West is in overall good condition. Condition of the filters were found to be in very good condition as all filters were replaced in the summer of 2014 (photos 4 and 5). Cyclomatic Filtration unit found to have been removed (photo 2).

4.2.2. Internal Inlet Air filter room – West Side – Non-Structural

During visual inspection of Internal Inlet Air Filter room West side, a number of items were identified as health and safety with potential to harm. This item is listed below:

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- I. Air gap noted, exposing internal elements of the inlet air filter room to water ingress, located on the West side about the meshed section of wall (photo 9).
- II. Door seal found in poor condition allowing for water ingress (photo 6).
- III. Light casing found in fair condition with supporting brackets broken, causing a potential dropped object hazard (photo 7).
- IV. Minor coating breakdown noted on electrical wire casing (photo 8).

4.3. Internal Inlet Air filter room – East Side

A visual inspection was completed on the internal Inlet Air filter room East side of the Inlet Air System A (GGA), structural and non-structural.

4.3.1. Internal Inlet Air filter room – East Side – Structural

Internals of the East side inlet air filter room are in good condition in regards to structural support and members. Equipment is also in good condition. Overall, deck plating was found with up to 3% coating breakdown. Rated using ASTM rust grade D610-08 as 5-S.

Steel deck plating is in good condition with the majority of coating found intact. New deck coating was applied in the summer of 2014. Small areas of rust staining were found to be noted (photos 16 and 17).

All welded connections were visually assessed during the time of inspection and no anomalies or areas of concern for further investigation were noted.

Equipment inside of Inlet air filter room West is in overall good condition. The filters are in very good condition as all filters were replaced in the summer of 2014 (photos 4 and 5). Cyclomatic Filtration unit have been removed (photo 15).

4.3.2. Internal Inlet Air filter room – East Side – Non-Structural

During visual inspection of the Internal Inlet Air Filter room on the West side, a number of items were identified as health and safety with potential to harm. This item is listed below:

- I. Coating breakdown and light scaling noted on East side hatch door (photo 18).

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- II. Air gap, exposing internal elements of the inlet air filter room to water ingress, was present on the West side about three meshed section of wall.
- III. All light casings located inside East side filter room are in fair to poor condition. Supporting brackets are broken causing a potential dropped object hazard (photo 19).
- IV. Minor coating breakdown noted on electrical wire casing (photo 20).

4.4. Internal Emergency Air filter

A visual inspection was completed on the internal emergency Inlet Air filter of the Inlet Air System A (GGA), structural and non-structural.

4.4.1. Internal Emergency Air Filter – Upper Plenum – Structural

The internal elements of the Emergency Air Filter room are in good condition from an extensive visual inspection which was conducted.

Inspections revealed very minor coating breakdown on deck plating in isolated spots. Deck plating and all internals were recoated in the summer of 2014. Rated using ASTM rust grade D610-08 as 7-S (photo 13).

100% coating breakdown noted on section of welded steel on the North side (photo 14).

From inspections, it was noted that on supporting vertical members of structural steel, tack welds were broken on the top sections of the verticals. Photos 11 and 12 show the difference between the bottom and top sections of the vertical supporting steel members.

4.4.2. Internal Emergency Air Filter – Upper Plenum – Non-Structural

During visual inspection of Internal Inlet Air Filter room west side, no items were identified as health and safety with the potential to harm.

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4.5. Internal of turbine room

A visual inspection was completed on the internal of the turbine room on the Inlet Air System A (GGA), structural and non-structural.

4.5.1. Internal of Gas Turbine room - Structural

Concluding from extensive visual inspection inside of the turbine room, all structural steel was found to be in good condition with no coating breakdown or corrosion noted.

Two fractures were noted on the lower north side of Exhaust A which is located in the Gas Turbine room. These were on the East and West corners, noted in this report however will be mentioned again in the report for Exhaust A (photos 31 and 33).

The lower Plenum was accessed using a confined space entry permit and removal of a small hatchway. It was noted that very small levels of corrosion were found to be evident on the North portion of the flooring (photo 21).

In addition to the visual inspection which was completed, it was requested that an MPI inspection be completed on the 2 lifting lugs which were located inside the lower plenum of Inlet A. From inspections, no anomalies were noted (Attachment 1 and photos 24-27).

4.5.2. Internal of Gas Turbine room – Non-Structural

During the external visual inspection of Inlet Air System A, one item was identified as health and safety with potential to harm items. These are items are listed below:

- I. Door closure mechanisms were broken on the East and West access doors (photo 32).

4.6. Platforms and access ladders

A visual inspection was completed on the platforms and access ladders of the Inlet Air System A (GGA), structural and non-structural.

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4.6.1. Platforms and access ladders- Structural

Platforms and ladders were found to be in overall good condition in relation to their structural content. One small section of deck grating located on the top level on the East side was found loose.

Small isolated areas of coating breakdown with very low level of corrosion noted on all decks. Rated using ASTM rust grade D610-08 as 4-S for all platforms located on Inlet A.

4.6.2. Platforms and access ladders – Non-structural

During the external visual inspection of Inlet Air System A, no items were identified as, health and safety with potential to harm items.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 1 – General overview looking East.



Photo 2 – Overview of West side Air Filter room looking north from doorway.



Photo 3 – Rust staining and very amount of coating breakdown noted.

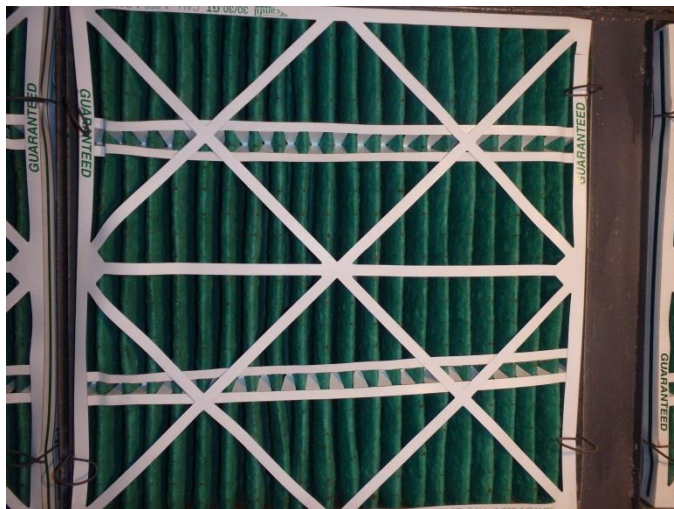


Photo 4 – Filter found in good condition.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 5 – Filter found in good and clean condition.



Photo 6 – Broken seal around access door.



Photo 7 – Broken connection found located at light.



Photo 8 – Coating breakdown noted on casing for electrical wires.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 9 – Gap noted at top of mesh, allowing for water ingress.



Photo 10 – General overview of emergency air filter room looking North from access door.

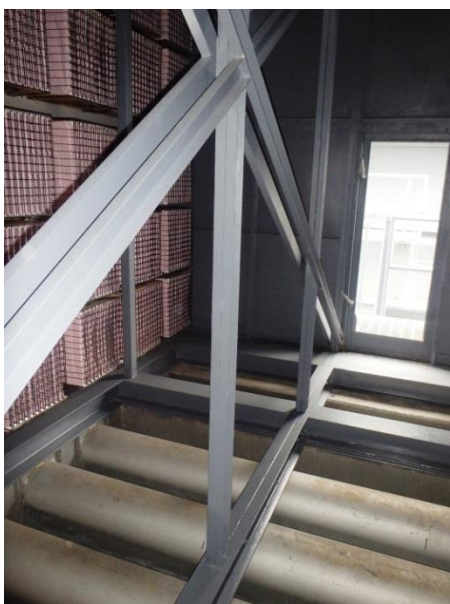


Photo 11 – General overview of emergency air filter room looking South towards access door.



Photo 12 – Overview of supporting steel members and ceiling steel work.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 13 – Isolated area of coating breakdown.



Photo 14 – Corrosion noted on steel insert plate.



Photo 15 – General overview of East Side air Filter room looking North from access door.



Photo 16 – Rust staining with low levels of coating breakdown noted on deck plating.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 17 – Rust staining noted on deck plating.



Photo 18 – Coating breakdown and low levels of scaling noted on top section of East side hatch way access panel.



Photo 19 – Light found to be in poor condition with broken supporting member.



Photo 20 – Coating breakdown noted on electrical wire casing.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 21 – Light coating breakdown noted on floor.



Photo 22 – Coating found to be in good condition with no signs of coating breakdown or scale.



Photo 23 – Condition of weld for lifting lug prior to MPI inspection.



Photo 24 – MPI inspections in progress.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 25 – No indications noted on bottom weld.



Photo 26 – No indications noted on centre weld.



Photo 27 – No indications noted on top weld.



Photo 28 – General overview of Turbine room looking East.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 29 – General overview of Turbine room.



Photo 30 – Overview of fracture found present South corner of Turbine room, bottom section of Exhaust A.



Photo 31 – Close up of Fracture noted on bottom section of Exhaust A.



Photo 32 – Broken access door closing attachment.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 33 – Overview of fracture found present South corner of Turbine room, bottom section of Exhaust A.



Photo 34 – Close up of fracture noted on bottom section of Exhaust A.



Photo 35 – Roofing steel plating in fair condition with coating breakdown and scale noted.

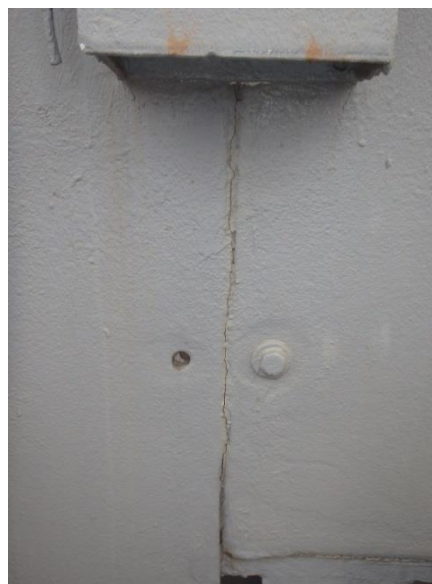


Photo 36 – Facturing noted on sealane throughout Inlet A structure.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 37 – Facturing noted on sealane throughout Inlet A structure.



Photo 38 – Damage noted on structure at Northwest corner.



Photo 39 – Door hinges in poor condition.



Photo 40 – Loose cable found to be hanging from inlet hood.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 41 – Cable tied back into place during inspections.



Photo 42 – Broken weld on supporting member, potential falling object hazard.

List of Attachments

Attachment 1: MPI Inspection Report
Attachment 2: A1-33.3-M-142 (CVI)
Attachment 3: A1-333-M-142 (MPI)

INSPECTION REPORT

EM&I Stantec

Magnetic Particle Inspection

Location:	Stephenville	EMIS Report No.:	STV-GGA-150723-DB-MPI
Client Name:	Nalcor – NL Hydro	Client Ref No.:	STV-133546845-001-GGA
Client Rep.:	Alberta Marche	Inspector Name:	David Bisset
WO No.:	133546845	Inspection Date:	July 23, 2015
Inspection Time:	Various		
Workscope No.:	MPI inspection of lifting lugs	System:	Inlet
Previous Report No.	NA	EMIS Job No:	2015000032
Ref. Drawing No.:	A1-333-M-142	Item Inspected:	Lifting Lugs
Technician Certifications:	PCN MPI II	Certification Expiry Date:	June 26, 2017
Inspection Code:	ASME V	Inspection Procedure:	MT401ASME Rev. 10
Acceptance Criteria:	ASME V	MPI Technique:	Contrast
Material:	CS	Surface Cond.:	Clean
Lighting Type:	Artificial	Temperature:	Ambient
Black Light S/N:	NA	Field Indicator:	NA
White Light Meter S/N:	NA	Light Level:	NA
Black Light Meter S/N:	NA		
Contrast:	Manufacturer: Sherwin	Type: Dub-Chek CP-2	Batch: 038-H23
Ink:	Manufacturer: Sherwin	Type: Dub-Chek Black Oxide #1	Batch: 32-J42
Dry Powder:	Manufacturer: NA	Type: NA	Batch: NA
Equipment:	Type: NA	S/N: NA	Calibration Due: NA
			Current Type: NA

Inspection Summary

Restriction?	☒ Yes	☐ No	Comments: Side welds could not be accessed due to mesh obstructing access
---------------------	---	-----------------------------	--

Scope:

MPI to be performed on lifting lugs which are used very rarely for the lifting of the mono rail beam for removal of Gas Turbine

Results:

MPI inspections were completed on both lifting lugs which were found to be located inside of the lower plenum, North and South.

Contrast method of inspection was utilized. Using 2 directions of testing, making sure the yorke was turned 180 degrees to each other for the 2 tests which were conducted at each test location.

No rejectable or recordable indications were noted on both North and South lifting lugs.

See photos below for condition of lifting lugs before and after inspections were completed.

INSPECTION REPORT

EM&I Stantec

Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 1 – Condition of weld prior to inspections



Photo 2 – White contrast paint applied for MPI inspections.



Photo 3 – No indications noted on bottom weld.



Photo 4 –No indications noted on center weld.

INSPECTION REPORT

EM&I Stantec**Detail of Findings**

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings

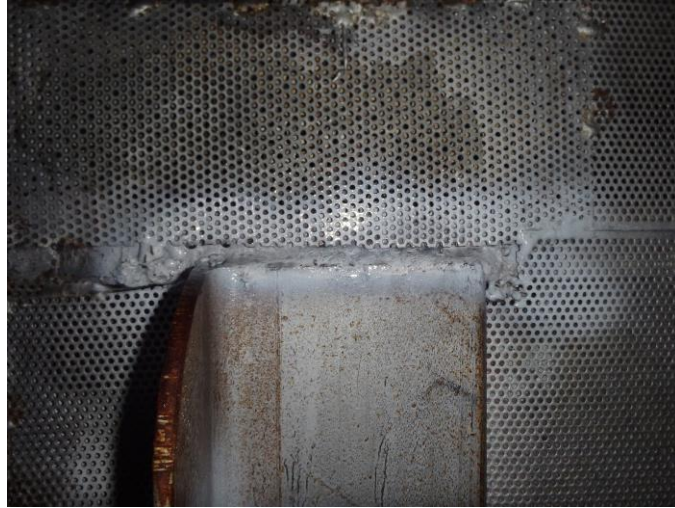
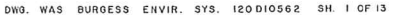


Photo 5 – No indications noted on top weld.

End of Report



SCALE	N. T. S.	DESIGNED	DRAWN	W. H.
CHECKED		APPROVED	DATE	1987-10-09
WG 4a		DWG No	A1- 333-M-142	

[illegible]



DWG. WAS BURGESS ENVIR. SYS. 120 D10562 SH. 1 OF 13



SCALE	N. T. S.	DESIGNED	DRAWN	W. H.
CHECKED		APPROVED	DATE	1987-10-09
WG No	DWG No A1- 333-M-142			REV 0

333 - M - 144	GAS TURBINE PLATFORM
333 - M - 143	GAS TURBINE PLATFORM LOCATION GAS TURBINE SIDE

No	DATE	DESCRIPTION	BY	CHKD
REVISIONS				



APPENDIX D

VISUAL INSPECTION REPORT: INLET AIR SYSTEM B (AT STEPHENVILLE)

	Visual inspection of Inlet Air System B (GGB)		
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Visual inspection of Inlet Air System B (GGB)

For Nalcor – NL Hydro

Prepared By	DB	 Digitally signed by David Bisset DN: cn=David Bisset, o=EM&I Stantec Ltd., ou, email=david.bisset@stantec.com, c=CA Date: 2015.08.07 12:33:15 -03'00'
Reviewed By	SI	 Digitally signed by shannon.irving@stantec.com Date: 2015.08.07 13:21:17 -03'00'
Approved By	JS	 Digitally signed by Jim Smith DN: cn=Jim Smith, o=EM&I Stantec Ltd., ou, email=jim.smith@stantec.com, c=CA Date: 2015.08.07 11:24:56 -03'00'

 newfoundland labrador a nalcor energy company	Visual inspection of Inlet Air System B (GGB)		
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	Visual inspection of Inlet Air System B (GGB)		
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1.0 Scope of Work

The scope of work includes internal and external visual inspection of Inlet Air System B (GGB), at the Stephenville Gas Turbine Plant, followed by the preparation of an inspection report, including refurbishment drawings. Inspection of the Inlet Air System B will take place July 2015.

2.0 Inspection Findings

The gas turbine plant in Stephenville is was placed in service in 1975, and is the sister unit to the Gas Turbine at Hardwoods. Like Hardwoods, the Stephenville Gas Turbine operates as both a generator – peaking/emergency backup – and a synchronous condenser, the latter being the dominant operating mode.

The Facility consists of two Rolls Royce Olympus C, 25 MW Gas Generator Engines (A and B) fired on #2 Diesel Oil, each driving a crtiss Wright Power Turbine equipped with a SSS size 208T clutch. Each Gas Generator has an air intake structure and each power turbine has an Exhaust stack. Gas Generator Engine B was overhauled in 2000. Gas Generator A has never been overhauled since going into service in 1975. It is our understanding that both exhaust stacks were replaced in 1992.

The previous inspection, which was completed was completed in 2007 by Hatch and Stantec, included items that were highlighted in the report for repair. Following the report, 2 years later in 2009, the whole facility underwent a huge overhaul and the majority of the issues raised in the report were rectified.

3.0 Introduction

EMIS technician performed a visual inspection of the inlet air filter systems A and B at the Stehpenville Gas Turbine Facility starting July 20, 2015. The objective of this inspection is to provide HYDRO with recommendations on the best course of actions for any issues which may be identified in the inspection.

 a nalcor energy company	Visual inspection of Inlet Air System B (GGB)		
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4.0 Findings

An extensive visual inspection was conducted on both inlets A and B. Results from this for Inlet B, can be found below. A number of concerns were highlighted during this inspection from a corrosion, maintenance and safety aspect. All items identified were photographed and are referenced in the below report. For the report, findings have been summarized into main categories.

4.1. Exterior

A visual inspection was completed on the exterior portions of Inlet Air System B (GGB), structural and non-structural.

4.1.1. Exterior – Structural

Inlet Air system A was found to be in overall fair condition throughout the inspection (photo 1). The inlet air structure is constructed of structural steel plate and supported by concrete foundations. Foundations are in good condition with no visible signs of cracking or deterioration noted. All exterior structural steel was found to be in good condition. Coating on the exterior of the inlet system was noted to be in good condition with isolated areas of coating breakdown noted (photo 32). Light coating breakdown and small levels of corrosion were noted on the roof steel plating (photo 31). Steel cladding surrounding inlet air system are in fair condition throughout with isolated coating failures noted in isolated areas.

4.1.2. External Non-Structural

During the external visual inspection of Inlet Air System B, a number of items were identified as health, safety and potential to harm items. These are items are listed below:

- I. Poor connection was noted during the inspection with lack of protrusion on nozzle located on the East side (photo 33).
- II. Hole found in South side of arc flash electrical allowing for water ingress (photo 34).
- III. Steel plate never replaced on West side after maintenance work was completed (photo 36).
- IV. Corrosion noted on newly installed steel plating on West side (photo 37).
- V. Loose drain connection noted on West side (photo 38).

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4.2. Internal Inlet Air filter room – West Side

A visual inspection was completed on the internal Inlet Air filter room, West side of the Inlet Air System B (GGB), structural and non-structural.

4.2.1. Internal Inlet Air filter room – East Side – Structural

Internals of the East side inlet air filter room are in good condition in regards to structural support and members. Equipment is in good condition. Overall, deck plating was found with up to 3% coating breakdown. Rated using ASTM rust grade D610-08 as 5-S.

Steel deck plating is in good condition with majority of coating found to be intact. New steel deck coating applied in the summer of 2014. Small areas of rust staining was noted (photo 3).

Ceiling steel deck plating found in fair condition with isolated areas of coating breakdown (photo 5).

All welded connections were visually assessed during the time of inspection and no anomalies or areas of concern for further investigation were noted.

Equipment inside of Inlet air filter room East is in overall good condition. The filters were found to be in very good condition as they were all replaced in the summer of 2014. Cyclomatic Filtration unit has been removed (photo 2).

4.2.2. Internal Inlet Air filter room – East Side – Non-Structural

During visual inspection of Internal Inlet Air Filter room East side, a number of items were identified as health and safety with potential to harm. This item is listed below:

- I. Moderate coating breakdown noted on electrical wire casing (photo 6).
- II. Coating breakdown and scale up to 8mm noted on lower ledge of South end meshed section on West wall (photo 4).

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4.3. Internal Inlet Air filter room – West Side

A visual inspection was completed on the internal Inlet Air filter room West side of the Inlet Air System B (GGB), structural and non-structural.

4.3.1. Internal Inlet Air filter room – West Side – Structural

Internals of the West side inlet air filter room are in good condition in regards to structural support and members. Equipment is in good condition. Overall, deck plating was found with up to 3% coating breakdown. Rated using ASTM rust grade D610-08 as 5-S.

Steel deck plating is in good condition with majority of coating found to be intact. New deck coating was applied in the summer of 2014. Small areas of rust staining was noted (photos 12 and 13).

All welded connections were visually assessed during the time of inspection and no anomalies or areas of concern for further investigation were noted.

Equipment inside of Inlet air filter room West, is in overall good condition. The filters were found to be in very good condition as all were replaced in the summer of 2014 (photo 14). Cyclomatic Filtration unit has been removed (photo 11).

4.3.2. Internal Inlet Air filter room – West Side – Non-Structural

During visual inspection of Internal Inlet Air Filter room West side, a number of items were identified as health and safety with potential to harm. This item is listed below:

- I. Pin holes noted in welds and steel plate of hatch access door in Northwest corner (photo 13).
- II. Electrical cover plate missing from electrical wire casing (photo 16).
- III. 80% coating breakdown noted on all electrical wire casings throughout inspection (photo 15).

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4.4. Internal Emergency Air filter

A visual inspection was completed on the internal emergency Inlet Air filter of the Inlet Air System B (GGB), structural and non-structural.

4.4.1. Internal Emergency Air Filter – Upper Plenum – Structural

The internal elements of the Emergency Air Filter room were found to be in good condition from an extensive visual inspection which was conducted.

Inspections revealed very minor coating breakdown (isolated spots) on deck plating. Deck plating and all internals were recoated in the summer of 2014. Rated using ASTM rust grade D610-08 as 7-S (photo 10).

From inspections it was noted that on supporting vertical members of structural steel, tack welds were broken on the top sections of the verticals. Photos 7 and 8 show the difference between the bottom and top sections of the vertical supporting steel members.

4.4.2. Internal Emergency Air Filter – Upper Plenum – Non-Structural

During visual inspection of Internal Inlet Air Filter room West side, no items were identified as health and safety with the potential to harm.

4.5. Internal of turbine room

A visual inspection was completed on the internal of the turbine room on the Inlet Air System B (GGB), structural and non-structural.

4.5.1. Internal of Gas Turbine room - Structural

Concluding from extensive visual inspection inside of the turbine room, all structural steel was found to be in good condition with no coating breakdown or corrosion noted.

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Two fractures were noted on the lower South side of Exhaust B which is located in the Gas Turbine room, these were noted on the East and West corners, noted in this report however will be mentioned again in the report for Exhaust B (photos 23 and 24).

The lower Plenum was accessed using a confined space entry permit and removal of a small hatchway. No corrosion or coating breakdown noted on floor inside this space. A small fracture (140mm in length) noted in the concrete in this space (photo 18).

4.5.2. Internal of Gas Turbine room – Non-Structural

During the external visual inspection of Inlet Air System B (GGB), no items were identified as health and safety with potential to harm items.

4.6. Platforms and access ladders

A visual inspection was completed on the platforms and access ladders of the Inlet Air System B (GGB), structural and non-structural.

4.6.1. Platforms and access ladders- Structural

Platforms and ladders were found to be in overall good condition in relation to their structural content.

Small isolated areas of coating breakdown with moderate corrosion and scale up to 8mm noted on access ladders (photo 27). Low level of coating breakdown and scale noted on all decks. Rated using ASTM rust grade D610-08 as 4-S for all platforms located on Inlet B (photo 28).

4.6.2. Platforms and access ladders – Non-structural

During the external visual inspection of Inlet Air System B, a number of items were identified as, health and safety with potential to harm items.

- I. Handrails on all decks were noted to be 36" in height (photo 30). Regulation height is 42".
- II. Lifting lugs located on the middle deck causing a tripping hazard (photo 29).

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 1 – General overview of Inlet B looking East.



Photo 2 – General overview of West air filter room.



Photo 3 – Rust staining and isolated areas of coating breakdown.



Photo 4 – Coating breakdown and scale noted on lower mesh ledge.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 5 – Isolated coating breakdown on ceiling steel plating.



Photo 6 – Isolated coating breakdown on electrical wire casing.



Photo 7 – General overview of emergency air filter room.



Photo 8 – General overview of steel work inside of emergency air filter room in good condition.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 9 – Filters found to be in good condition.



Photo 10 - Isolated spots of coating breakdown on steel deck plating.



Photo 11 – General overview of East side air filter room, looking South from access door.



Photo 12 – Rust staining and isolated spots of coating breakdown noted on steel deck plating.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 13 – Rust staining on deck plating and 4 x pin holes noted on top weld of access hatch door.



Photo 14 – Filters in good condition.



Photo 15 – Coating breakdown noted on electrical wire casing.



Photo 16 – Electrical casing box top missing allowing for direct contact to electrical wiring.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 17 – Coating on deck of lower plenum in good condition.



Photo 18 – Small fracture noted in concrete floor of lower plenum.



Photo 19 – Top section of lower plenum in good condition with no signs of coating breakdown or corrosion.



Photo 20 – Isolated coating breakdown/corrosion around main access doors on the South side.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 21 – General overview of Gas Turbine room.



Photo 22 – Fracture noted at bottom of Exhaust B.



Photo 23 – Fracture noted at bottom of Exhaust B.



Photo 24 – Fracture noted at bottom of exhaust B.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 25 – Fracture noted at bottom of exhaust B.



Photo 26 – General overview of top platform looking East.



Photo 27 – Coating breakdown and scale in isolated areas on access ladders.



Photo 28 – Isolated coating breakdown on supporting members for platforms.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 29 – Tripping hazards on middle access platform.



Photo 30 – Handrails at a height of 36".



Photo 31 – Isolated coating breakdown and light scaling on inlet roof plating.



Photo 32 – Low levels of coating breakdown noted in isolated areas on East side of inlet.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 33 – Lack of protrusion noted on nozzle connection.



Photo 34 – Hole noted on South side of arc flash box allowing for water ingress.



Photo 35 – Missing anchor bolt below main access doors on South side.



Photo 36 – Missing steel plating on West side.

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Detail of Findings

Instructions: With the aid of Drawing(s), Sketch(es) and Photo(s) describe findings



Photo 37 – Corrosion on steel insert plates.

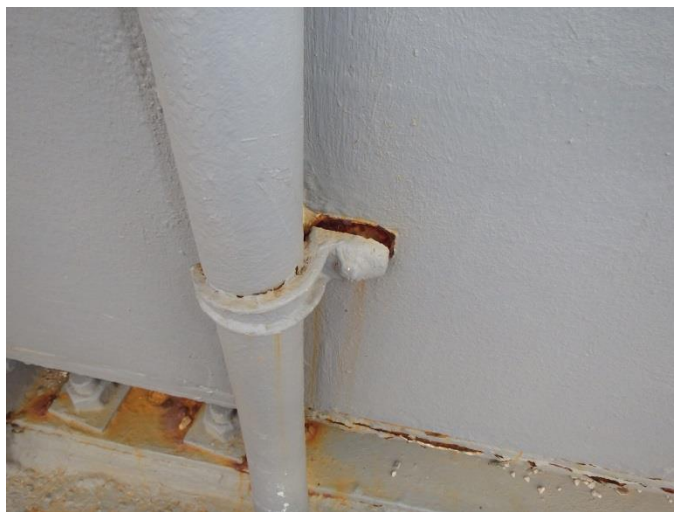


Photo 38 – Loose connection.

List of Attachments

Attachment 1: B1-333-M-140

Attachment 2: A1-333-M-142

BILL OF MATERIALS		
ITEM NO	QUANT.	DESCRIPTION
1	1	75mm & SCH 40 PIPE - 1840mm LONG
2	1	50x50.5 ASTM A-36 ANGLE - 75mm LONG
3	3	50x50.5 ASTM A-36 ANGLE - 75mm LONG
4	3	38x38.5 ASTM A-36 ANGLE - 895mm LONG
5	1	38x5 ASTM A-36 FLAT BAR - 690mm LONG
6	1	38mm EXPANDED METAL GRATING - 900mm x 1205mm
7	1	50x50.5 ASTM A-36 ANGLE - 1200mm LONG
8	1	50x50.5 ASTM A-36 ANGLE - 1295mm LONG
9	2	50x50.5 ASTM A-36 ANGLE - 895mm LONG
10	1	38x5 ASTM A-36 FLAT BAR - 1295mm LONG
11	1	38x38.5 ASTM A-36 ANGLE - 1300mm LONG
12	1	38x38.5 ASTM A-36 ANGLE - 900mm LONG

1. ALL WELDS TO BE 4-75mm FILLET WELDS UNLESS OTHERWISE SPECIFIED.
2. USE A 660H WELDING ELECTRODE FOR ALL WELDS
3. WELD BOTH SIDES. GRIND FLUSH ON GRATING SIDE.
4. ALL FLOOR ANGLES SHOULD BE WELDED TO GT MODULE WHERE POSSIBLE.

SCALE, 1:20

SCALE 1-20

WELD ONTO MODULE —
ALONG WHOLE LENGTH

NTS

SCALE, 1:20

[illegible][illegible]

REGISTERED PROFESSIONAL ENGINEER

M.C. HUNTER

SIGNATURE

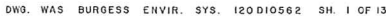
PROVINCE OF NEWFOUNDLAND

ELECT	CIVIL	TRANS	MECH
PASSED			

NEWFOUNDLAND AND LABRADOR HYDRO

HARDWOODS TERMINAL STATION
GAS TURBINE
AIR FILTER HOUSE CATWALK &
LADDER DETAILS

SCALE AS SHOWN	DESIGNED	DRAWN RTCG	
CHECKED <i>K. J.</i>	APPROVED <i>[Signature]</i>	DATE 86-11-20	
W.O. No.	DWG No.	REV	
	81- 333-M.-140	0	



SCALE	N. T. S.	DESIGNED	DRAWN	W. H.
CHECKED		APPROVED	DATE	1987-10-09
WO No	DWG No A1- 333-M-142			REV 0

333-M-144	GAS TURBINE PLATFORM				
333-M-143	GAS TURBINE PLATFORM LOCATION	GAS TURBINE SIDE			
333-M-141	GAS TURBINE ACTUATOR ACCESS PLATFORM				
DWG No	TITLE				
REFERENCE DRAWINGS					

No	DATE	DESCRIPTION	BY	CKD
REVISIONS				

C. GAS TURBINES	1332, 1403	2017	2018	2019	2020	2021	TOTAL
2017							
Replace Fuel Piping - HWD&SVL		267.0					267.0
Hardwoods Gas Turbine Life Extension							
Upgrade Filtration - HWD		169.2	139.5				308.7
Upgrade Instrumentation - HWD		506.1	141.9				648.0
Stephenville Gas Turbine Life Extension							
Replace Alternator Bed Heaters -SVL		222.4	266.6				489.0
Upgrade Filtration - SVL		130.1	100.2				230.3
Upgrade Instrumentation - SVL		495.0	138.9				633.9
2018							
Upgrade Electrical Systems - HWD			907.7	1,178.5			2,086.2
Inspect/Align PT Bearing - HWD			241.5	68.7			310.2
Replace Demister - HWD			96.2	147.4			243.6
Replace Demister - SVL			95.9	147.5			243.4
Replace Compressors - HWD			120.0				120.0
Upgrade Air Intake and Exhaust Stack - SVL, HWD			400.0	400.0			800.0
Install Alternator Cooler VFD - SVL			20.0	80.0			100.0
2019							
Install Infrared Scanning Ports - HWD				250.0			250.0
Refurbish Bus Duct - HWD				150.0			150.0
Upgrade Control System - HWD				100.0	1,500.0		1,600.0
Overhaul Engine - HVY				100.0	1,000.0		1,100.0
Replace 15kV Cable to 750kVA Transformer - HWD				50.0			50.0
Purchase Spare Parts & Heated Lube Oil Storage - HWD, SVL				200.0			200.0

2020

Replace Fuel Unloading Pumps - HWD, SVL				50.0	50.0	100.0
Inspect Power Turbine Clutch A and B - HWD				100.0	100.0	200.0
Install Infrared Scanning Ports - SVL				250.0		250.0
Refurbish Bus Duct - SVL				150.0		150.0
Upgrade Control System - SVL				100.0	1,531.0	1,631.0
Inspect Power Turbine Clutch - HVY				200.0		200.0

2021

Overhaul Gas Turbine End A - HWD					1,100.0	1,100.0
Install Infrared Scanning Ports - HVY					250.0	250.0
Inspect PT - HVY					50.0	50.0
Replace Lube Oil and Glycol Pumps - HVY					100.0	100.0
Replace Snow Doors - HVY					350.0	350.0
Replace Voltage Regulator - HVY					50.0	50.0