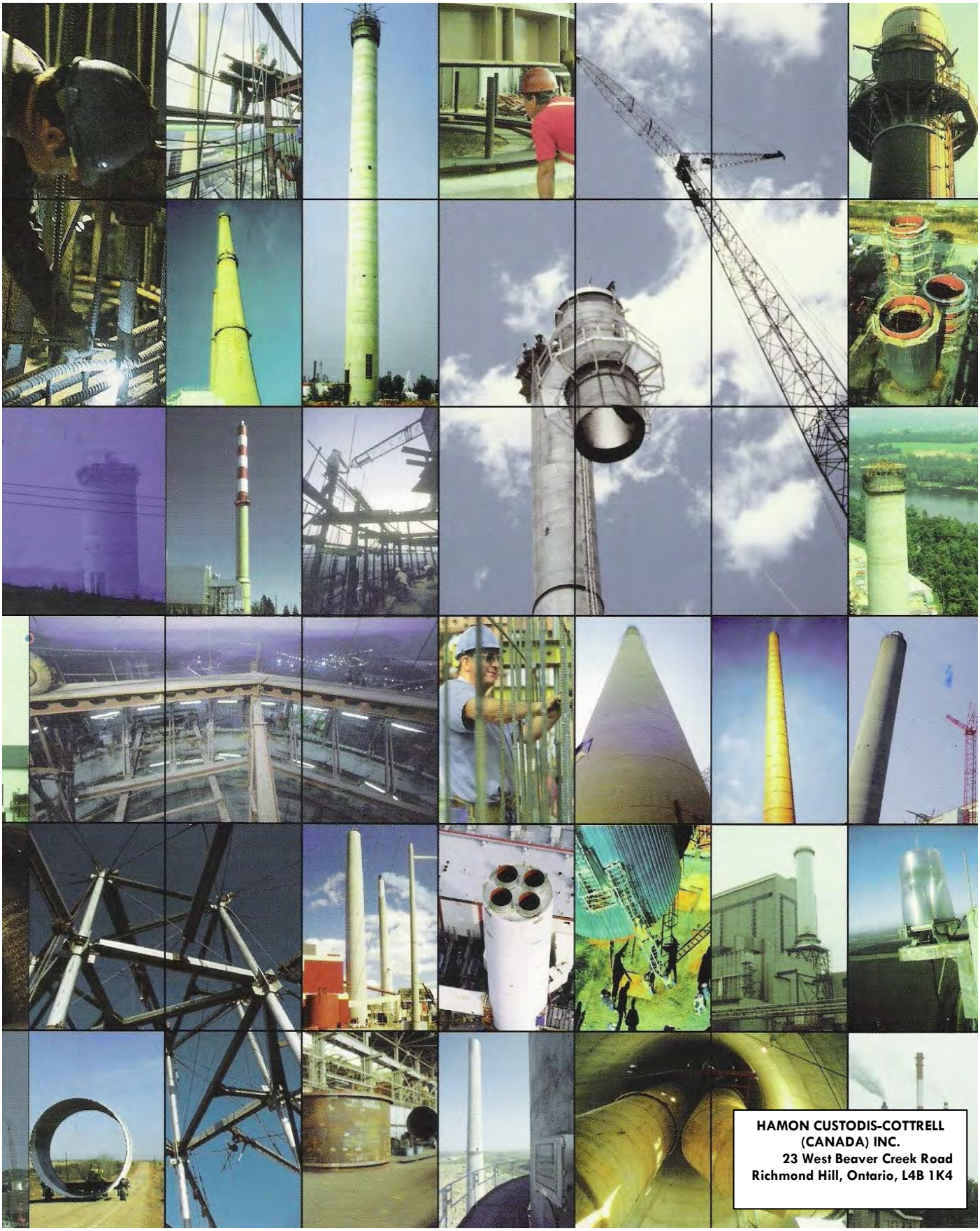

HAMON CUSTODIS-COTTRELL
(CANADA) INC.
23 West Beaver Creek Road
Richmond Hill, Ontario, L4B 1K4

INSPECTION REPORT

Tynes Bay Waste Treatment

FILE-1194

Nasir Wade

May 2017

HAMON CUSTODIS

Contents

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Glossary of Terms

Commonly used Terms:	Definition:
Acid	Acid, as referred by our inspectors, is a direct reference to process material. Typically, when flue gas is exposed to moisture or if its temperature falls below the dew point, it can have corrosive effects on any affected construction materials.
Air terminal	Air terminals are long metal rods which extend above the chimney for the purpose of protecting the structure against lightning strikes.
Breeching	The breeching is the ducting which vents the flue gas to the chimney/stack.
Brick - Brick Course	A course is a continuous horizontal layer of similarly-sized building material one unit high, usually in a wall. The term is almost always used in conjunction with unit masonry such as brick, cut stone, or concrete masonry units ("concrete block").
Cap	The cap sits on top of the liner and or the exterior column. The cap is typically used to prevent the ingress of water and to support the accompanying AWL system and/or LPS.
CEM - Continuous Emissions Monitoring.	The Ministry of the Environment has specific guidelines related to emissions for industrial applications that require Continuous Emissions Monitoring - CEM.
Circuit cable	The circuit cable is a copper cable, sometimes encased in lead/zinc that horizontally connects the downlead cables.
Concrete Spall	Spalling concrete is concrete that has broken up, flaked, or become pitted. This is usually the result of poor installation and/or environmental factors that stress the concrete, causing it to become damaged. On a low level, it can be purely cosmetic in nature, but it can also result in structural damage, such as damage to reinforcing steel inside the concrete which can increase the rate and occurrence of delamination. For this reason, it is important to address spalling when it first starts to appear.
Cone/ Nozzle	Some chimneys are designed or has since construction been modified with a cone or nozzle at the top of the chimney. This cone or nozzle is used to increase the velocity of the flue gas leaving to the chimney.
Construction Joint / Cold Joint	A construction joint is created every time a concrete pour is stopped and started again.
Corbel	A corbel is a projection jutting out from a wall to support a structure above it. For the construction of brick liners, a concrete corbel is used to support a section of a brick liner inside a concrete column.
Delamination	Concrete delamination is caused by the corrosion of reinforcing steel or freezing and thawing.
Downlead	The downlead is a copper cable, sometimes encased in lead/zinc that connects the air terminals to the grounding system. The diameter of the chimney will determine the number of downleads required.

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False Floor	A raised floor is a type of elevated structural floor that is typically installed just below the liners breeching opening.
Gunite	Gunite is a mixture of cement, sand, and water applied through a pressure hose, producing a dense hard layer of concrete. The Gunite mixture can be tailored to the specific process requirements and is used as a refractory material to line the inside of chimney liners.
Hairline crack	For the purpose of our inspection and reporting, a hairline crack is identified as any crack with a width of less than 1/8" or 3.175mm.
Honeycomb	Honeycombing is the term used to describe areas of the surface that are coarse and stony. It may be caused by insufficient fine material in the mix, perhaps due to incorrect aggregate grading or poor mixing. Alternatively, honeycombing may be caused by leakage of grout or mortar fraction from the concrete at construction or formwork joints. The obvious solution here is to ensure that joints are well sealed and leak-free.
International Orange and White paint	Painted horizontal bands which are used as a substitution or in tandem with aircraft warning lighting.
Jumpform	Jumpform is a method of concrete chimney construction. A jumpform chimney is constructed by pouring the chimney in sections, typically 7.5' high and then stopping, before pouring the section above.
Lightning Protection System - LPS	The lightning protection system protects the chimney or stack against lightning strikes. The LPS will include a buried grounding grid or grounding rods.
Process Material	Process material refers to the solid or liquid material which is being vented through the chimney. This material can usually be found on the interior of the liner and at the bottom of the liner.
Refractory	ASTM C71 defines refractories as "non-metallic materials having those chemical and physical properties that make them applicable for structures or as components of systems that are exposed to environments above 1,000 °F (811 K; 538 °C)".
Repointing	Repointing is the process of renewing the pointing, which is the external part of mortar joints, in masonry construction. Over time, weathering and decay cause voids in the joints between masonry units, usually in bricks, allowing the undesirable entrance of water.
Slipform	Slipform is a method of concrete chimney construction. A slipform chimney is constructed by continuously pouring the chimney without stopping until the chimney is complete.

HAMON CUSTODIS

INSPECTION REPORT

246'-0" Concrete Chimney
Units #1 & #2

Tynes Bay -
Waste Treatment Facility
Devonshire, Bermuda

Job No. S-1473/File No. 1194
May 2017

Hamon Custodis performed a complete set of inspections on the 246'-0" concrete chimney (units #1 & #2) in May of 2017. The purpose of these inspections was to determine current conditions of the unit. Plant personnel expressed a slight concern regarding the loss of steel thickness within the carbon steel liners.

These inspections consisted of visual observations of the exterior of the concrete column from two drops, spaced 180° from one another. The exterior inspections were conducted utilizing rope access and were performed from a boatswain's chair. One drop was performed inside each of the liners, also performed from a boatswain's chair. A comprehensive set of ultrasonic thickness measurements were taken at ten foot intervals throughout the height of the liners and are included in chart form within. One drop in the annular space was performed utilizing platforms, and the permanent ladder.

Photographs and videos were taken and are referenced. (Ref. video – TynesBay.Exterior. 2017.. (44))

Repairs performed at the time of this inspection:

- None

Section 1: Unit Description
Section 2: Inspection Observations
Section 3: Ultrasonic Thickness Measurements
Section 4: Recommendations
Section 5: Photographs

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Section 1: Unit Description

Construction: 246'-0" x 17'-0" Top OD, slipform, reinforced concrete column with two, fully insulated, mild steel liners. The concrete column is 240'-0" in height, constructed mostly plumb between the 46'-0" to 240'-0" elevations. The base of the chimney tapers inward significantly between 0'-0" and 46'-0". The base OD measures 26'-3" and tapers in to 18'-4" at the 46'-0" elevation. A 1'-0" thick concrete roof slab rests atop the concrete column. The entirety of the exterior column has been painted with two coats of a "crystal" coloured, "ARPAX M50" protective coating.

Liner: The concrete column contains two, roof supported, mild steel liners. Both liners are fully insulated. The top 11'-10" of the liners protrude above the concrete roof slab and are insulated with 4" of mineral wool insulation, encapsulated by 1/25" stainless steel cladding. Both liners are 246'-0" in height with a 3'-7" top ID. The top 15'-0" of both liners are comprised of ¼" stainless steel plate. The access door to theses liners are located within the horizontal duct work, approximately 30' from the base on the liner. Test port penetrations are located at the 40'-0" and 90'-0" elevations on both liners. Each liner accommodates three, 1½" diameter, flue suspension bars, equally spaced (120°), braced at the concrete roof deck and spanning to a 4" x ¾" thick stiffener bar, welded to the liner shell at the 215'-3" elevation. Each liner contains an expansion bellows system, located at approximately 25'-0". The bottom portion of the liner is supported by the concrete foundation.

Ladder: The annular Space contains a permanent, column mounted, stainless steel ladder. The ladder is fully enclosed with a stainless steel ladder cage throughout the height of the chimney. The access ladder is located on the west side of the column. Rest balconies are located 16'-6" apart, the ladder orientation is staggered at balcony elevations. There is not a safety climb system associated with the permanent ladder.

Platforms: Four interior (annular space) platform locations. One full opacity meter platform at elevation 37'-5"; One full CEMS platform at 86'-7", One full AOL service platform at 135'-10"; One full platform at 185'-0". The roof slab is located at the 234'-3" elevation.

Breeching Ducts: Two 3'-7" ID, breeching ducts enter the concrete column at approximately the 10'-7" elevation on the south-east and east sides of the structure. Provisions have been made for a third flue to enter the column on the north-east side of the column.

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LPS: Two interior (annular space) copper downlead cables, located on the east and west sides of the concrete column. Three circuit cables spanning the circumference of the column are found at 2'-0", 136'-0" and 240'-0".

AOL: Eight aircraft obstruction lights are located at various elevations throughout the entire height of the chimney. Four, single obstruction lights, equipped with red globes, are located at the 138'-0" elevation, spaced 90° from one another (north, east, south and west). Four dual lights, equipped with red globes, are mounted on top of the concrete column at the 240'-0" elevation. These AOL's are spaced 90° from one another (north, east, south and west).

Access Doors: Access to each flue duct is located within the horizontal ductwork approximately 30' from the base of the column. The 2'-8" x 2'-1" access doors can be found beneath the cladding covers and insulation.

Section 2: Observations

Concrete Column Exterior:

1. Overall the condition of the concrete column was found to be exceptional. The concrete wall was hammer tested at various elevations to determine the composition and the hardness of the concrete. All the square footage which was observed and tested during the two exterior inspection drops, proved to be intact and solid. (Ref. videos – TynesBay.Exterior.2017.. (2),(5),(10),(21),(25))

2. The "crystal" coloured protective coating, which covers the entirety of the exterior column is badly weathered in regions. The most prominent deterioration to the paint was observed throughout the top 50' of the exterior wall. Between the 190' and 240' elevations the paint coverage was estimated to be a mere 30% intact. Large areas of bare concrete are visible within this area. The paint appears to have "washed" off the wall rather than peeled away. In areas where the paint is still present, there appears to be a firm bond to the concrete. The paint coverage between the 140' and 190' elevations is much more consistent, the coverage was estimated to be 85% intact. Below 140', the paint appears unscathed, besides the small amount of staining from fall-out. (Ref. videos – TynesBay.Exterior.2017.. (1),(4),(6),(16),(20),(28))

3. The blue protective coating covering the 3'-5" x 4'-10" vent coverings was found to be severely weathered. The paint on the vents displays approximately 15% coverage. In areas where the primer coat has deteriorated, heavy rust and pitting is visible on the steel members beneath. Corrosion holes are visible towards the bottom of many of the steel channels. (Ref. videos – TynesBay.Exterior.2017.. (3),(19) & TynesBay.Annulus.2017.. (4))

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4. A Persistent amount of brown staining was visible throughout the "crystal" coloured protective coating, covering the exterior column wall. The stains are approximately the size of a nickel and are consistently spaced between the 100' and 200' elevations. These stains appear to be more prominent on the north and east sides of the structure. While staining was found below 100', it was not as noticeable as it was at higher elevations. These small, brown stains can be attributed to fall-out from inside the liners. Small pieces of scale from the interior wall exit through the top of the flue. These pieces land on and stick to the exterior wall when moisture is present. The rust colour bleeds into the paint and the scale is then blown away when the exterior wall dries. (Ref videos – TynesBay.Exterior.2017.. (7).(9),(11), (22),(23))

5. A few irregularities were noticeable on the concrete wall at approximately the 100' elevation on both the north and south sides of the column. On the north side the concrete appears rough in one localized area. The deficiency was hammer tested and was found to be solid. It is possible that concrete stuck to the forms in this location during the construction of the column, leaving a small blemish behind. Also at 100', on the south and east sides, a series of hairline cracks are visible within the concrete. These minute cracks form a circle approximately 2'-0" by 1'-6" in size. The concrete inside and around the defect was tested with a hammer and found to be solid. (Ref. videos – TynesBay.Exterior.2017.. (12),(26),(27))

6. As per construction design the bottom 46' of the concrete column is noticeably tapered. The OD difference between 0' and 46' is 7'-11". The top 194' of the column is fairly plum, the difference in OD between 46' and 240' is 1'-4". (Ref. videos – TynesBay.Exterior.2017.. (13), (14),(29))

AOL:

7. The aircraft obstruction lights at the 150' elevation on the north and south sides of the chimney were found to be in satisfactory condition. The steel casing on the north light appears to be severely corroded, as is evidenced by the rust and scaling visible. All mounting hardware, cable connections and globe lanyards were inspected and discovered to be in sound condition. The blue paint on the AOL mounting brackets is mostly deteriorated, an estimated 25% of the original coating remains. (Ref. video – TynesBay.Exterior.2017.. (8),(24))

8. All four pairs of AOL's that rest a top the concrete cap were examined during the inspection. One red globe on the north side light was found to be missing. Red pieces of glass were discovered on the concrete roof slab, suggesting that the globe fell inwards. The AOL's on the south side had an unsecured globe on the western light and a

significant crack was found in the steel casing on the eastern light. Both these fixtures were temporarily repaired by the inspection crew to prevent them from falling. The condition of the globes was communicated to the customer immediately. The AOL's all appeared to be off while the inspections were completed. A sensor activates the units at dusk. (Ref. videos – TynesBay.Exterior.2017.. (17),(38))

Breeching Ducts:

9. Two breeching ducts penetrate the concrete column at approximately 10'-7". The exterior of these ducts are fully insulated and cladded. In general the cladding was found to be in satisfactory condition. A small void can be seen on the top of flue #1 where the two overlapping sections of cladding have separated exposing the insulation underneath. The inside of both ducts were found to be clean with minimal process material build-up in the bottom. There were no glaring deficiencies noted inside the duct work. (Ref. video – TynesBay. Exterior.2017.. (30) & TynesBay.Interior.F2.2017.. (18))

Rain Caps:

10. The rain cap on top of the concrete column was found to be fully intact. All welds connecting the cap pieces were found to be of high quality without signs of cracking, deformities or excess wear. Seven ⅜" anchor bolts used to secure the cap to the interior wall of the concrete column were found to be missing. The blue paint covering the rain cap was found to be badly weathered and has deteriorated over 50% of the accessory exposing the red primer underneath. (Ref. video - TynesBay.Exterior. 2017.. (40))

11. Welds securing the flue rain caps to the liner wall and to the exterior cladding were found to be cracked in areas. On the top of flue #1 a crack approximately 5' long was observed in the weld between the rain cap and the exterior cladding. On flue #2 approximately 300° of weld connecting the rain cap to the cladding was found to be cracked causing a large misalignment between the two components. A crack approximately 3' long was also observed in the weld connecting the cap to the liner wall on flue #2. Both rain caps appear moderately corroded and display significant deterioration to the protective coating and pitting to the stainless steel. (Ref. videos – TynesBay.Exterior. 2017.. (31),(32),(34))

Drain Pipe:

12. The two drains accommodating the roof slab can be found on the east and west sides of the chimney. The east drain opening was found to be free of obstructions. The drain cover is level with the concrete floor and it appears as though the drain functions as per design. The drain on the west had to be extracted from a blanket of dirt and debris. The drain cover is depressed approximately ½" into the concrete creating a catch basin for debris. The west drain appeared to be plugged at the time of inspection. (Ref. video – TynesBay.Exterior.2017.. (36),(37))

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13. The horizontal member of the drain system connecting the east roof drain opening to the downspout on the west side of the structure is securely affixed to the roof carrier beam in the annular space. The drain pipe rests inside three pipe hangers which are clamped to the bottom flange of the support beam. The clamps appear moderately rusted and pitted, however the hardware was considered to be in satisfactory condition without sign of any major defects. The down spout of the drain system is attached to the interior concrete wall on the west side of the column and is anchored at 5' intervals. A number of these anchor points were found to be disconnected or broken throughout the height of the column (Ref. videos – TynesBay.Annulus. 2017.. (3),(6))

14. A break in the drain pipe was visible at 156'. It appears as though the PVC pipe has cracked at a connection point leaving a ⅜" gap, 360° around the pipe. It is evident from the staining on the concrete wall below the break, that a considerable amount of rain water is exiting the drain at this elevation causing water damage to the annular components below. (Ref. videos – TynesBay.Annulus.2017.. (19),(25), (29))

LPS:

15. Connections which ground the liner and other chimney components into the lightning protection system were thoroughly examined during the inspection. Flue #2 does not appear to be grounded into the LPS. An obsolete cable with no termination point was found to be tucked behind the circuit cable at the roof slab elevation. It is assumed that this cable was once secured to the stainless steel skirt on Flue #2. While the ground termination to Flue #1 was found to be fully intact, when the cable was traced back to the downlead it was discovered to be completely sheared near the terminus. This serious deficiency was immediately reported to Tynes Bay personnel who in turn, promptly organized a crew to repair this deficiency. (Ref. video – TynesBay. Exterior.2017.. (35))

16. Two out of ten lightning points, which are secured to the top of the interior column wall, were found to be missing. The lightning points are evenly spaced throughout the entire circumference of the chimney and attach into a circuit cable which feeds into the downlead cables. An eleventh, unmounted lightning point was found to be loosely tied into the LPS and resting behind other steel members at the roof slab elevation. (Ref. video – TynesBay.Exterior.2017.. (39))

17. Rest balconies, sampling platforms and the permanent access ladder are not tied into the lightning protection system. (Ref. video – TynesBay.Annulus.2017.. (9))

18. The two copper downlead cables, located on the east and west sides of the annular space, were both observed to be in sound condition. The connection to the circuit cable at 136' is properly terminated. All anchors on both the downlead and circuit cables are properly spaced with the copper cable fastened securely inside the anchor. (Ref. videos – TynesBay.Annulus.2017.. (14),(20))

Electrical: (Lights/Wiring)

19. All electrical wiring which services the AOL's is properly secured in a cable tray throughout the height of the chimney. The wiring which services the satellite transmitters located at the top of the column are fastened to pieces of horizontal angle iron which are supported by the ladder stand-offs . It appears as though the wiring for the old transmitters has been severed, the cut ends of obsolete wires can be found hanging at approximately 210'. The remainder of the wiring below 210' appears to be poorly supported throughout the height of the chimney. The wiring for both the AOL's and transmitters exit the annular space through two holes drilled in the roof slab. Expandable foam was used to plug these holes to help eliminate moisture penetration into the annulus. Much of the foam appears to have deteriorated leaving a slight void behind. (Ref. videos - TynesBay. Annulus.2017.. (1),(8),(11),(18))

20. The lighting system, located alongside the access ladder inside the annulus, was found to be fully intact. A single light fixture located at approximately 135' was found to be open with the cover and bulb removed. This light is located directly below the leak in the drain pipe. It is likely that moisture penetration into the unit has caused damage inside the light casing. Provisions have been made for an exterior light on the south side of the exterior of the column at approximately the 10' elevation. It does not look as though an exterior light has ever been present in this location. The junction box was observed to be moderately corroded and the light pivot was found to be damaged. (Ref. videos – TynesBay.Exterior.2017.. (15) & TynesBay.Annulus. 2017.. (26))

21. The support masts and hardware which accommodated the old satellite transmitters show signs of heavy corrosion. While a number of these support pipes have already been removed, there are two on the north side which display extreme amounts of rust and scaling steel. The posts which have been removed are resting on the roof slab adding to the clutter which has accumulated on top of the roof over the years. (Ref. video – TynesBay.Exterior.2017.. (41))

Ladder:

22. The permanent ladder mounted to the interior (annulus) wall elevation 0' to the top of the column, elevation 240', was found to be in exceptional condition. Ladder stand-offs were inspected and found to

be properly torqued and secure. All components of the access ladder, including rungs, side rails, ladder cage and stand-offs are all composed of 316L stainless steel. There are no signs of deterioration throughout the height of the ladder. This access ladder contains only a ladder cage and does not accommodate a safety climb system. (Ref. videos – TynesBay.Annulus.2017.. (10),(33))

Platforms:

23. Rest platforms are located approximately 16'-5" apart throughout the height of the access ladder. The rest platforms are comprised of carbon steel with a hot galvanized coating. The coating and platform components were all found to be in satisfactory condition. Anchor bolts securing the platforms to the concrete wall are all present and properly torqued. A mild amount of deterioration was visible within the galvanized coating on the platforms below the break in the drain pipe. Rain water has leaked down the concrete wall over the past several years and has created a small blemish on the rest platform support braces beneath. (Ref. videos – TynesBay.Annulus.2017.. (27),(34))

24. Complete platforms are located approximately 50' from one another inside the annular space. The first full platform, located at 37'-5", is home to opacity meters on both flue #1 and flue #2. These opacity meters were installed while the 2017 chimney inspections were being performed. The second platform is found at 86'-7". This platform is a gas sampling platform with test port locations on both flues. Overhead support braces have been installed over each test port to help accommodate the CEMS equipment. It appears as though the handrail around the ladder opening was obstructing one of the monitoring devices and hence needed to be cut. A large portion of the top horizontal handrail and the vertical support post is missing. The removed pieces can be found resting on the platform. At 135'-10", a full platform is used to service the aircraft warning lights at this elevation. Steel plates are fastened to the interior wall, below the light mounts to help eliminate moisture penetration into the annular space. While two of these plates were found to be in position, two were found to have been removed and to not have been replaced. All four platforms are outfitted with horizontal stabilizers for the liners. Each liner is furnished with four stabilizers located 90° from one another. These stabilizers consist of a system to keep the liners centered and allows for the liners to expand and contract during thermal expansion without damaging the insulation or wire mesh. All forty of the stabilizers were inspected and found to be fully intact. Platform components are all hot galvanized and were observed to be in sound condition. The galvanized coating on the support beams, handrail and grating is largely intact on each of the platforms. All platform connections and anchoring are in place and are properly torqued. All welds were found to be intact without sign of any defects. Support

steel has been omitted in the bay where a third liner is anticipated. The grating has been removed from these locations many times in the past for hoisting purposes. In many of these locations the grating was found to be loose and misaligned with the rest of the grating. (Ref. videos – TynesBay.Annulus.2017.. (13),(15),(21),(22),(23),(24),(30),(31),(35))

Interior Concrete Column:

25. From elevations 225'-8" to 232'-7" the thickness of the concrete wall increases by 7⅞", nearly doubling in thickness. The increase is visible inside the annular space. The reason for the wall increase is to help support the weight of the roof slab and liners. This "shelf" also supports the main carrier beam of the concrete roof slab. The carrier beam was observed to be in sound condition with no evidence of deterioration to the galvanized coating. The beam is properly anchored into the concrete. The Q-decking beneath the concrete floor is fully intact and shows no signs of deterioration. Mild rust stains were visible below the vent opening on the north orientation. (Ref. videos – TynesBay.Annulus.2017.. (2),(5))

26. The concrete wall was tested at various elevations to determine the composition and hardness of the concrete. Overall, the interior concrete wall was found to be in exceptional condition. Below 156' on the west orientation, the concrete wall is visibly stained below the break in the drain pipe. This rust stain is visible all the way to the foundation. (Ref. videos – TynesBay.Annulus.2017.. (16),(28))

Access Doors:

27. The access door located in the base of the concrete column measures 6'-11" high by 6'-7" wide. There are two hinged man doors which swing inwards to allow access into the annular space. Overall the doors were found to be in good working condition. The blue paint over the vent portion of the doors is badly deteriorated in areas, exposing significant rust and scale beneath. The vent located above the door is similarly rusted with corrosion holes noticeable in the steel channel components of the vent. (Ref. video – TynesBay.Exterior.2017.. (43))

28. The liner access doors are located within the horizontal ductwork, approximately 30' from the base of the chimney. The covers and insulation for the doors were both found to be fully intact when removed. The clips which secure the cladded covers to the rest of the ductwork were found to be mildly rusted and seized. The twenty-eight ½" bolts securing the door covers to the steel flanges were all found to be extremely corroded on both flues. The bolts were cut by a maintenance crew in order to gain access into the interior of the liners. All the bolts on both access doors were replaced with new ½" bolts when the doors were closed. (Ref. videos - TynesBay.Interior.F1.2017.. (20) & TynesBay.Interior.F2.2017.. (19))

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Liner Exterior:

29. The stainless steel cladding which makes up the top 11'-10" portion of the flues, which protrude above the concrete roof slab were at one time painted blue. The paint has almost completely deteriorated from the cladding on both flues. The stainless steel cladding located in the top 5' of both flues is severely pitted. Large corrosion holes were observed 360° around the top of flue #2. The rate of corrosion is not as pronounced on the top of flue #1 however, pock marks within the cladding are near penetrating through to the insulation underneath. (Ref. videos – TynesBay.Exterior.2017.. (18),(33))

30. Each flue is supported by three flue suspension bars spanning between the roof slab and a support ring located at 215'-3". The support bars are 1½" in diameter and approximately 18'-4" long. The connection points on the concrete roof are encased inside white, plastic containers. These containers are sealed and appear to be full of concrete. This makes a visual inspection of the terminus virually impossible. The support ring attachment is encapsulated in insulation. There was no evidence of any damage or distortion to these suspension bars. Each suspension bar was found to be wrapped with one layer of Densotape and one layer of Densotherm to help protect the bars from corrosion. Both protective components were found to be present and fully intact. (Ref. videos – TynesBay.Exterior.2017.. (42) & TynesBay.Annulus.2017.. (7),(12))

31. Throughout the height of both flues the insulation and chicken wire were generally found to be in place and intact. (Ref. videos – TynesBay. Annulus.2017.. (17),(32),(36))

Liner Interiors:

32. **#1 Flue** – Ultrasonic thickness measurements were taken at 1' intervals within the top 10' of the carbon steel section of the liner and at 10' intervals throughout the remainder. The top 15'-0" of #1 flue is composed of stainless steel. The readings taken in this region ranged between .253 and .258. These readings are consistent with .250 (¼"), which original fabrications drawings indicate to be the plate thickness at these elevations. The remainder of the liner is composed of carbon steel, which was originally fabricated at a thickness of .250 (¼") as well. Readings taken during the #1 flue interior inspection range between .213 and .239 through the top 95' of the carbon steel liner. Below 150', the readings taken range between .232 and .258. Layers of scale were first removed with a chipping hammer in order to find measurable steel. The average steel loss within the top 100' of #1 flue is estimated to be 10%. The average steel loss below 145' is estimated to be approximately 3%. (Ref. videos – TynesBay.Interior.F1. 2017.. (1),(3),(5),(7),(10))

– The horizontal weld connecting the carbon steel section of the liner to the stainless steel portion was closely examined during the inspection. As was typical with all of the horizontal welds throughout the liner, a significant amount of rust and scale had to first be removed in order to access the welds. The transition weld displayed severe undercut within the stainless portion of the liner. The weld appeared rusted and pitted with severe scaling throughout. Horizontal welds were cleaned and inspected at various elevations. All the welds below had a similar appearance, although the severe undercut was not noticeable within these locations. The welds which were examined displayed excess wear and mild deformities. However, they contained a consistent profile without signs of cracking. (Ref. videos – TynesBay. Interior.F1. 2017.. (4),(8),(12),(14))

– The carbon steel, interior flue wall displays a substantial amount of scaling throughout the entire height of the structure. While the scaling was considered less in #1 flue than was found in #2 flue, large areas of scale are easily removed from the wall and the deficiency is notable from below the stainless steel transition to the bottom of the liner. The worst areas of flue deterioration were identified close to the top of the carbon steel portion as is evidenced by the UT readings taken. (Ref. videos – TynesBay.Interior.F1.2017.. (2),(6),(9),(11))

– Test port penetrations were found at the 40' and 90' elevations. The 90' test port opening appears to be a flow meter opening. The opening at the 40' elevation accommodates the opacity meters. There was no noticeable damage or deformities around the test port openings, the ports appeared to be solely welded from the exterior of the flue. (Ref. videos – TynesBay.Interior.F1.2017.. (13),(15))

– An expansion joint, referred to as expansion bellows in the design prints, is located between the 25' and 32' elevations. This system allows the flue duct to expand and contract. The bellows contains two overlaps with a section in between. There appears to be approximately a ¼" gap between the edge of the bellows and the next section of liner so that they may slide during thermal expansion. The horizontal joints above and below the slider sections appear to be welded from the exterior of the flue. The joint has either been sealed with a high temperature cement or has accumulated process material over the years. The material filling the joint was found to be hard and mostly intact. (Ref. videos – TynesBay.Interior.F1.2017.. (16),(17),(18))

– A substantial amount of scale and debris has built-up within the base of the liner. A measurement of accumulation was attempted and found to be in excess of 16". There is a clean-out door in the base of #1 flue which allows for access to the underside of the false floor/hopper. The hopper appears to be plugged with scale. A threaded nozzle is visible on the bottom of the hopper. The threads have corroded badly over the years making it virtually impossible to thread a cap onto the nozzle. UT readings were taken on the underside of the floor which closely corresponded with ¼" plate. (Ref. videos – TynesBay.Interior.F1. 2017.. (19),(21))

33. #2 Flue - Ultrasonic thickness measurements were taken at 1' intervals within the top 10' of the stainless steel portion of the liner and at 10' intervals throughout the remainder. The top 15'-0" of #2 flue is composed of stainless steel. The readings taken in this region ranged between .255 and .263. These readings are consistent with .250 (¼"), which original fabrications drawings indicate to be the plate thickness at these elevations. The remainder of the liner is composed of carbon steel, which was originally fabricated at a thickness of .250 (¼") as well. Readings taken during the #2 flue interior inspection range between .213 and .250 through the top 95' of the carbon steel liner. Below 150', the readings taken range between .232 and .253. Layers of scale were first removed with a chipping hammer in order to find measurable steel. The average steel loss within the top 100' of #2 flue is estimated to be 6%. The average steel loss below 145' is estimated to be approximately 2%. (Ref. videos – TynesBay.Interior.F2. 2017.. (1),(2),(5),(7),(13))

– The horizontal weld connecting the carbon steel section of the liner to the stainless steel portion was closely examined during the inspection. As was typical with all of the horizontal welds throughout the liner, a significant amount of rust and scale had to first be removed in order to access the welds. The transition weld displayed severe undercut within the stainless portion of the liner. The weld appeared rusted and pitted with severe scaling throughout. Horizontal welds were cleaned and inspected at various elevations. All the welds below had a similar appearance, although the severe undercut was not noticeable within these locations. The welds which were examined displayed excess wear and mild deformities. However, they contained a consistent profile without signs of cracking. (Ref. videos – TynesBay. Interior.F2. 2017.. (3),(6),(8),(10))

– The carbon steel, interior flue wall displays a substantial amount of scaling throughout the entire height of the structure. Large areas of scale are easily removed from the wall and can be removed in large sheets. The thickness of the scale removed from the higher elevations

was found to be near 1/16". This deficiency is notable from below the stainless steel transition to bottom of the liner. The amount of scaling decreased as one descended within the liner. The worst areas of flue deterioration were identified close to the top of the carbon steel portion as is evidenced by the UT readings taken. (Ref. videos – TynesBay. Interior.F2.2017.. (4),(9),(11))

– Four small bulges were noticeable at approximately the 100' elevation. These bulges were found to be parallel to one another, evenly spaced and could be seen 360° around the inside circumference of the liner. It appears as though these bulges/ridges are the result of stiffener rings or platform components welded to the exterior shell. (Ref. video – TynesBay.Interior.F2.2017.. (12))

– Test port penetrations were found at the 40' and 90' elevations. The 90' test port opening appears to be a flow meter opening. The opening at the 40' elevation accommodates the opacity meters. There was no noticeable damage or deformities around the test port openings, the ports appeared to be solely welded from the exterior of the flue. (Ref. video – TynesBay.Interior.F2.2017.. (14))

– An expansion joint, referred to as expansion bellows in the design prints, is located between the 25' and 32' elevations. This system allows the flue duct to expand and contract. The bellows contains two overlaps with a section in between. There appears to be approximately a ¼" gap between the edge of the bellows and the next section of liner so that they may slide during thermal expansion. (Ref. videos – TynesBay.Interior.F2.2017.. (15),(16))

– A substantial amount of scale and debris has built-up within the base of the liner. A measurement of accumulation was attempted and found to be in excess of 16". There is a clean-out door in the base of #2 flue which allows for access to the underside of the false floor/hopper. The hopper appears to be plugged with scale. A threaded nozzle is visible on the bottom of the hopper. The threads have corroded badly over the years making it virtually impossible to thread a cap onto the nozzle. UT readings were taken on the underside of the floor which closely corresponded with ¼" plate. (Ref. videos – TynesBay.Interior.F2. 2017.. (17),(20))

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Section 3: Ultrasonic Measurements

Flue #1 – UT Readings

Location	Elevation	UT Reading(s)	Design
West	245'	.258 (SS)	.250
West	240'	.256 (SS)	.250
West	235'	.253 (SS)	.250
West	230'	.215	.250
West	229'	.213	.250
West	228'	.218	.250
West	227'	.223	.250
West	226'	.225	.250
West	225'	.225	.250
West	224'	.227	.250
West	223'	.227	.250
West	222'	.225	.250
West	221'	.232	.250
West	220'	.232	.250
West	210'	.242	.250
South	205'	.235 & .237	.250
West	200'	.230	.250
West	190'	.237	.250
West	180'	.242	.250
West	170'	.242	.250
West	160'	.239	.250
West	150'	.253	.250
West	140'	.232	.250
West	130'	.242	.250
West	120'	.251	.250
West	110'	.258	.250
West	100'	.237	.250
West	90'	.237	.250
West	80'	.253	.250
West	70'	.247	.250
West	60'	.253	.250
West	50'	.242	.250
West	45'	.232 & .237	.250
West	40'	.240	.250
West	30'	.237 & .242	.250
West	20'	.258	.250

† Please note that there is a 10' difference between actual elevations and the elevations displayed within the report's photo library. This discrepancy is due to the fact that the inspector believed that the top of the liner was 256'-0" instead of 246'-0".

*** .310 denotes 5/16" plate**
.250 denotes ¼" plate
.187 denotes 3/16" plate

‡ (SS) – Refers to stainless steel plate.

Note - This inspection is an indication of the inspector's opinion of the condition of the structure resulting from his best efforts to gain safe access to remote areas of the chimney as of the date of this report. No warranty or guarantee of the conditions described in this report is expressed or implied by the inspector to anyone requesting, authorizing or interested in this report. The inspector, Hamon Custodis, Inc., will not be held liable or responsible for defects not uncovered in the inspection due to obscurity, inaccessibility, and/or changes in the condition of the structure. In addition, this inspection did not include a review pertaining to compliance with any provincial or local building codes. In no event shall liability extend beyond the fee for services provided.

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Flue #2 – UT Readings

Location	Elevation	UT Reading(s)	Design
West	245'	.255 (SS)	.250
West	244'	.260 (SS)	.250
West	243'	.263 (SS)	.250
West	242'	.263 (SS)	.250
West	241'	.258 (SS)	.250
West	240'	.253 (SS)	.250
West	239'	.258 (SS)	.250
West	238'	.263 (SS)	.250
West	237'	.255 (SS)	.250
West	236'	.258 (SS)	.250
West	235'	.258 (SS)	.250
West	230'	.258 (SS) & .213	.250
West	220'	.227	.250
West	210'	.242	.250
South & West	200'	.237 & .235	.250
East & South	190'	.240 & .247	.250
West	180'	.250	.250
West	170'	.232	.250
West	160'	.240	.250
East & West	150'	.237 & .239	.250
West	140'	.253	.250
West	130'	.242	.250
East & West	120'	.250 & .255	.250
West	110'	.239	.250
West	100'	.242	.250
West	90'	. 253 & .258	.250
West	80'	.253	.250
West	70'	.249	.250
West	60'	.237	.250
West	50'	.250	.250
West	40'	.237	.250
West	30'	.253 & .237	.250
West	20'	.253	.250

† Please note that there is a 10' difference between actual elevations and the elevations displayed within the report's photo library. This discrepancy is due to the fact that the inspector believed that the top of the liner was 256'-0" instead of 246'-0".

*** .310 denotes 5/16" plate**
.250 denotes ¼" plate
.187 denotes 3/16" plate

‡ (SS) – Refers to stainless steel plate.

Note - This inspection is an indication of the inspector's opinion of the condition of the structure resulting from his best efforts to gain safe access to remote areas of the chimney as of the date of this report. No warranty or guarantee of the conditions described in this report is expressed or implied by the inspector to anyone requesting, authorizing or interested in this report. The inspector, Hamon Custodis, Inc., will not be held liable or responsible for defects not uncovered in the inspection due to obscurity, inaccessibility, and/or changes in the condition of the structure. In addition, this inspection did not include a review pertaining to compliance with any provincial or local building codes. In no event shall liability extend beyond the fee for services provided.

Section 4: Recommendations

All recommendations are given a priority number from 1-3 along with a green, yellow or red colour code. A green #1 code expresses that no immediate action is necessary and that the deficiency is minor in nature. A yellow #2 indicator suggests that these recommendations should be closely monitored over the coming years and that action will eventually need to be taken to correct the issue. A red #3 priority indicates that action is highly recommended during your next inspection/repair cycle.

Exterior:

1. Remove peeling paint from top 50' of column exterior. Apply two coats of an appropriate and similar coloured protective coating. (Ref. photos – TynesBay.Exterior. 2017. (3),(6),(8),(9),(11),(39),(41),(42)) – (Level 2)

2. Mechanically clean all four vent covers. Assess the level of corrosion to the steel channels and weld reinforcement if necessary. Apply two coats of an appropriate and similar coloured protective coating. (Ref. photos – TynesBay. Exterior.2017. (4),(5), (36),(37),(38) & TynesBay.Annulus.2017 (6),(14)) – (Level 2)

3. Mechanically clean 360° of the concrete rain cap at 240' and all four AOL light mounts at 138'. Apply two coats of an appropriate and similar coloured protective coating. (Ref. photos – TynesBay.Exterior.2017. (1),(16), (32),(97),(104)) – (Level 1)

4. Remove rain cap from the top of #2 flue. Fabricate a new 316L stainless steel cap and weld into place. It is very possible that steel cladding at the top of flue #2 will be too thin to weld to. Therefore, it is also recommended that new, 1/16", 316L stainless steel cladding be rolled and welded over the severely corroded existing cladding, between the top of the skirt and the top of the liner. A height of approximately 11'-0". (Ref. photos – TynesBay.Exterior.2017. (75),(76),(77),(80),(81),(82),(84)) – (Level 3)

5. Mechanically clean and repair 5'-0" of cracked weld attaching the #1 flue rain cap to the exterior cladding. The top of #1 flue is moderately corroded as well, eventually new stainless steel cladding will be required to encapsulate the existing cladding. (Ref. photos – TynesBay.Exterior.2017. (66),(67),(71),(74)) – (Level 2)

6. Repair the sheared ground cable attaching the liner grounds to the downlead. Ensure that #2 flue is properly grounded into the LPS. (Ref. photos – TynesBay.Exterior.2017. (85),(87)) – (Level 3)

7. Remove obsolete satellite masts which are currently mounted to the concrete wall and protrude approximately 10'-0" above the top of the concrete column. (Ref. photo – TynesBay.Exterior.2017. (101)) – (Level 3)

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8. Ensure that all aircraft obstruction light globes and components are securely attached. Consideration should be given into installing a new LED system. (Ref. photos – TynesBay.Exterior.2017. (17),(33),(90),(91),(94),(100)) – (Level 3)

9. Remove trash, debris and scrap material from concrete roof deck. Clean around drains and raise NW drain cover so that it is level with the concrete floor. (Ref. photos – TynesBay.Exterior.2017. (88),(89),(92),(99),(103)) – (Level 2)

Interior:

10. Sandblast the interior of both flues between the elevations of 12' and 230' to remove all scale from the liner wall. Apply an appropriate protective coating to the clean, liner walls. (Ref. photos – TynesBay.Interior.F1.2017. (7),(9),(18),(25),(26),(37),(44) & TynesBay.Interior.F2.2017. (9),(11),(14),(17),(18),(26),(27),(29),(47)) – (Level 2)

Note: Ultrasonic Thickness measurements taken at higher elevations revealed as much as 15% steel thickness loss. Review of an inspection report from 1998 indicates that 0% steel loss was found during that inspection. While it is difficult to estimate the rate at which the carbon steel will deteriorate in the future, it is safe to say that the corrosion of the liner has accelerated since 1998. Future repair scenarios dictate either plating over the severely corroded areas or if severe corrosion is consistent throughout the height of the liner then it may be necessary to replace the entire liner. Cleaning and coating the interior walls of the liner will add a significant amount of life expectancy to the flues by temporarily protecting the liner against further corrosion.

11. Remove the accumulation of debris and scale from the base of both flues. (Ref. photos – TynesBay.Interior.F1.2017. (59),(60),(61),(62),(63) & TynesBay.Interior.F2. 2017. (61),(62)) – (Level 1)

Annulus:

12. Tie all rest balconies, sampling platforms and the permanent access ladder into the chimney's lightning protection system. (Ref. photos – TynesBay.Annulus.2017. (10), (21),(34)) – (Level 3)

13. Repair crack in the drain pipe at the 156' elevation. Consideration should be given to installing a drain pipe expansion joint at this elevation. Replace or re-anchor drain pipe support brackets where damaged. (Ref. photos – TynesBay. Annulus.2017. (44),(45)) – (Level 3)

14. Repair the handrail around the ladder opening at the 86'-7" platform. If the test ports are no longer in use then the removed hand rail section should be welded back into place. If these test ports are still being used and the handrail creates an obstruction, then another means such as a removable chain should be installed to protect the opening. (Ref. photo – TynesBay.Annulus.2017. (52)) – (Level 3)

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15. Remove obsolete satellite wiring from the base to the top of the concrete column. (Ref. photos – TynesBay.Annulus.2017. (15),(17),(56)) – (Level 1)

Exterior and interior inspections should be performed on a regularly scheduled basis or sooner should circumstances dictate. A thorough inspection should be performed to monitor the stack's structural condition and the findings compared to previous inspection report.

Overview of Tynes Bay 246' chimney. Inspections were performed inside both liners, ultrasonic thickness measurements were taken throughout the height of both liners. Exterior inspections were conducted on the north & south sides from a boatswain's chair. One annular inspection was performed from the access ladder.

250' N—Area of bare concrete is visible where rigging would have been placed during original painting of column. The protective coating is badly worn throughout the top 50' of the chimney.

250' N—View looking down the exterior of the concrete column displays significant paint deterioration. Paint coverage within the top 50' was estimated to be 30% in tact.

242' N—The blue paint protecting the steel vent cover appears severely weathered. Paint coverage on the steel cover was estimated to be 50% in tact. Areas of significant rust and pitting are visible on the steel channels.

230' N—A large area of bare concrete is visible at this elevation. The remainder of the coating is weathered, the paint appears to be "washing" off the concrete rather than peeling.

200' N—The protective coating below 200' is more consistent. Paint coverage was estimated to be 85% intact between the 150' to 200' elevations. The concrete was hammer tested throughout the height of the column and was discovered to be in sound condition.

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180' N—Below 200' a spotty brown staining is visible throughout the exterior coating. These stains can be attributed to steel scale being blown out the interior of the liners. The staining is more prominent on the north side of the column and diminishes as one descends towards the base.

150' N—Aircraft obstruction light is in satisfactory condition. The bottom casing is significantly rusted and showing signs of corrosion. The blue paint covering the mounting channel is approximately 25% in tact. The light appears to be off during the daytime hours.

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125' N—The exterior of the concrete column was found to be in excellent condition throughout the height of the structure. No cracks or evidence of spalling were observed during the north inspection drop.

100' N—Areas of rough concrete were observed in this localized area. This minor deficiency can be attributed to concrete sticking to the forms during the original slipforming of the column. These areas were tested with a hammer for hardness and were found to be solid.

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50' N—View looking down towards the base of the chimney displays minimal about of paint staining at lower elevations. The concrete wall tapers outwards below this elevation

10' N—A small electrical junction box appears as though it once housed an exterior light or intended to. The junction box is moderately rusted and pitted, the pivot head was found to be damaged.

250' S—Two small areas of bare concrete are noticeable below the rain cap. Paint on the cap is badly worn, red primer is visible beneath blue top coat. Aircraft obstruction light casing appears cracked and severely deteriorated.

242' S—The paint on the vent cover is weathered. The paint on the vents displays approximately 15% coverage. In areas where the primer coat has deteriorated rust, scaling and corrosion holes are visible.

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225' S—The protective coating directly beneath the annular vent has completely deteriorated for approximately 25'. The paint to the right of the vent displays a much more consistent finish.

225' S—The concrete wall was hammer tested at various elevations to determine the composition and the hardness of the concrete. All the square footage which was observed and tested during the two exterior inspection drops, proved to be intact and solid.

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175' S—Paint staining is widespread throughout the height of the column. The staining is most noticeable towards the east side of the structure and diminishes as one descends towards the base.

150' S—Aircraft obstruction light and components are all in satisfactory condition. The paint on the mounting bracket is badly worn.

125' S—View looking down the wall shows significantly less staining to the paint than at higher elevations. Breeching ducts enter the concrete column on the east and south east sides of the structure.

100' S—A series of hairline cracks are visible within the concrete. These minute cracks form a circle approximately 2'-0" by 1'-6" in size. The concrete inside and around the defect was tested with a hammer and found to be solid.

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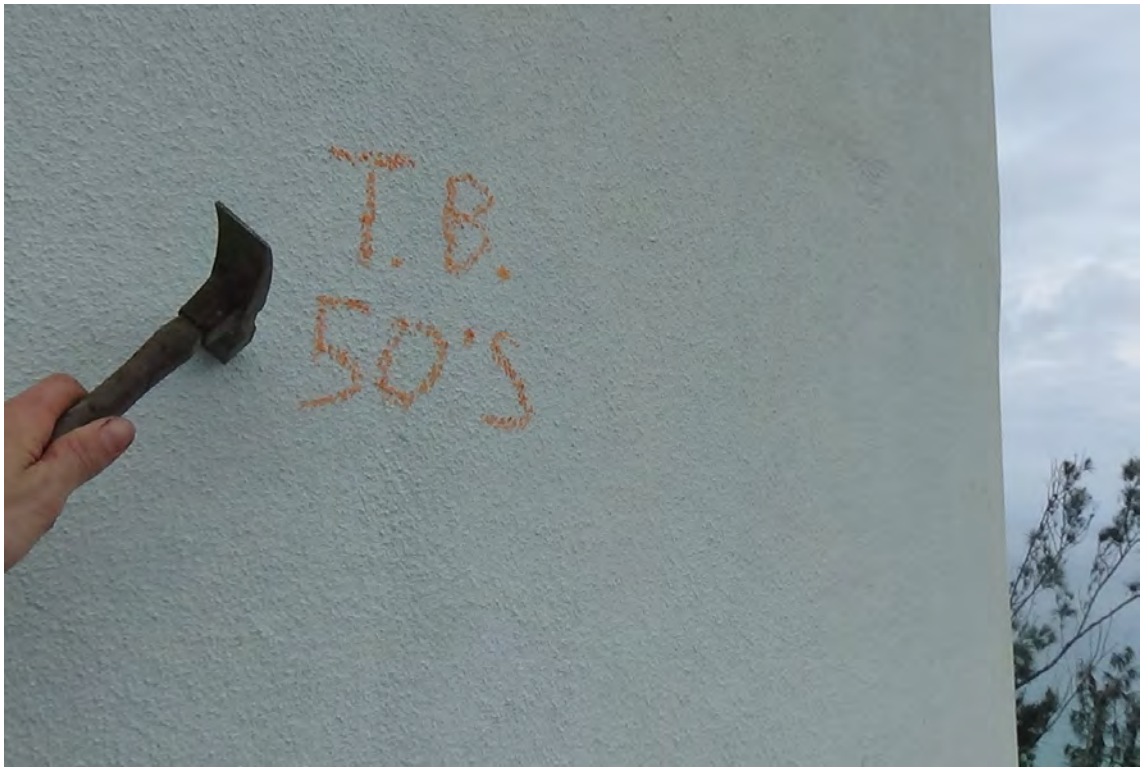

50' S—The concrete wall was hammer tested at various elevations to determine the composition and the hardness of the concrete. All the square footage which was observed and tested during the two exterior inspection drops, proved to be intact and solid.

13' SE—Flue #1 enters the concrete column. No deficiencies were noticed around the opening or on the duct cladding.

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13' SE—View looking at the top of flue #1 ductwork displays no major damage or deficiencies. A small void can be seen on the top of flue duct where the two overlapping sections of cladding have separated exposing the insulation underneath.

0' W—The two man doors providing access to the annular space were found to be in good working order. The blue paint over the vent portion of the doors is badly deteriorated, exposing significant rust and scale beneath.

8' W—The vent covering over the annular space access door displays significant amounts of peeling paint, exposing rusted and pitted steel beneath. Corrosion holes are visible towards the bottom of the steel channels.

10' NE—Provisions have been made for a third flue to enter the column in this location. A cover plate has been anchored the interior wall to help keep out the elements and wildlife.

250' NW—The concrete rain cap measures 8 ½" in width. The top coat of blue paint appears weathered throughout the entire rain cap. The red primer is visible beneath the worn paint.

250' W—Photo taken on the roof deck shows that the ground cable connecting the liner grounds to the copper downlead has been sheared.

250' E—A disconnected ground cable was found to be tucked behind the electrical conduit. The cable is believed to have serviced flue #2. There was not a ground connection on flue #2 found during the inspection. Notice the wear to the lead casing on the ground and circuit cable.

250' N—A stray lightning point was found to be tied into the LPS on the north side. The point is not mounted and was discovered to be tucked in behind the angle iron seen on the left side of the photo.

245' SE—The drain cover on the south east side is free of obstructions. The cover plate is level with the concrete floor and appears to functioning properly. Notice the amount of trash and debris that has accumulated on the roof over the years.

245' NW—An outline of the north west drain is visible on the left side of the photo. A fair amount of dirt and debris has settled in this area, clogging the drain pipe. The drain cover is depressed approximately ½" into the concrete creating a catch basin for debris.

245’ N—Trash and scrap material has compiled on the roof deck giving an air of untidiness and creating tripping hazards.

250’ NW—An extreme amount of rust and scale are visible on the post and hardware of the obsolete, satellite transmitter mast.

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250' N—. One red globe on the north side light was found to be missing. Red pieces of glass were discovered on the concrete roof slab, suggesting that the globe fell inwards.

250' S—The red globe on the right side of the AOL was found to be unsecured, the casing on the light on the right was discovered to be cracked 360°. Both globes were removed to eliminate a falling object hazard. They were later replaced and secured with electrical tape as a temporary fix.

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255' W—The top of flue #1 displays a moderate amount of pitting and corrosion within the top 5' of the stainless steel cladding. The blue arrows point to corrosion holes in the cladding.

255' N—View looking at the top of flue #1 rain cap. The cap measures 6" in width and displays a moderate amount of deterioration throughout. The top of the liners were at one time painted. That may explain the blotchy appearance as the primer coat has mostly deteriorated.

250' S—View looking across to the top of flue #1. A crack in the weld connecting the rain cap to the cladding can been seen in the very bottom right hand corner of the photo.

250' NW—Close-up of the cracked weld mentioned in the photo above. The crack continues for approximately 5'-0". The corrosion below the crack appears to be deteriorated paint.

250' W—The exterior cladding of flue #1 was painted blue in the past. A minimal amount of original paint is still visible. The top 5' of the cladding displays a moderate amount of corrosion. Pock marks within the cladding are near penetrating through to the insulation underneath. Corrosion holes are visible near the top.

245' W—The ground connection to the skirt of flue #1 is present and intact. The same ground cable was found to be severed near the connection point to the downlead. This appears to be the only location in which the liner is grounded.

255' W—The top 5' of the stainless steel cladding on flue #2 is severely corroded. Approximately 300° of weld connecting the rain cap to the cladding was found to be cracked causing a large misalignment between the two components.

255' NE—A crack approximately 3' long was observed in the weld connecting the cap to the liner wall on flue #2. The corrosion at the top of flue #2 appears to be more profound than that of flue #1.

255' E—Close up photos of the cracked weld which attaches the rain cap to the interior flue wall. This particular crack continues for approximately 3'-0".

255' W—Small corrosion holes are visible in the stainless steel cladding throughout the top of flue #2. The insulation between the cladding and the liner wall is partially exposed.

255' S—Large area of corroded cladding on the south side of flue #2. The pitting of the stainless steel is very noticeable in this location.

255' NE—More areas of corroded cladding at the top of flue #2. The void in the top right corner of the photo is near 8" in length. The horizontal weld attaching the rain cap to the cladding has cracked in this area. A small amount of overhang is visible which displays the misalignment between the components.

245' W—Expandable foam was used to seal the holes where the electrical and satellite cables exit the concrete column. Much of the foam appears to have deteriorated leaving a slight void behind.

240' W—Field measurements of the vent cover are indicated. The blue paint is peeling towards the bottom of the channels due to rust and scale build-up.

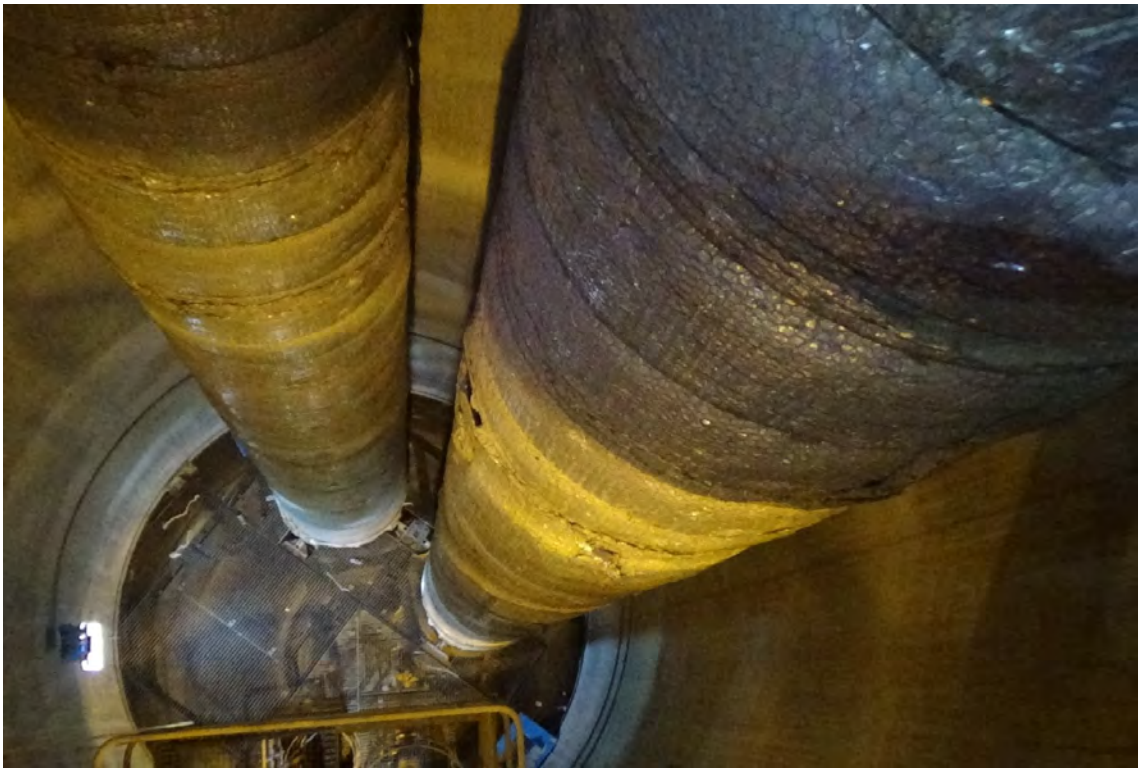
230' W—The drain pipe below the roof elevation is fully intact and properly secured. Notice the interior wall thickness increase of 7⅞". This wall increase is necessary to carry the weight of the roof slab, carrier beam and flues.

230' E—View looking down the flue ducts towards the connection between the flue suspension bars and the liners. The insulation and wire mesh is generally intact throughout the top 50'. Small tears are noticeable in localized areas.

210' W—The wiring for the obsolete satellite transmitters has been severed at this elevation. The loose wires have been left hanging in the annular space.

200' E—Each liner is furnished with four horizontal stabilizers located 90° from one another. These stabilizers consist of a system to keep the liners centered and allows for the liners to expand and contract during thermal expansion. All stabilizers were found to be intact, with all components in sound condition.

200' N—The grating which is located within the bay allotted for a third flue, appears loose and misaligned with the rest of the grating on the platform. It is believed that this grating is removed from time to time to hoist material to the upper elevations.



185' E—View looking down shows the the insulation and wire mesh on both flues appears to be fully intact with no sign of damage.

156' W—A break in the drain pipe was visible at this elevation. It appears as though the PVC pipe has cracked at a connection point leaving a ⅜" gap, 360° around the pipe.

150' E—Horizontal stabilizers were thoroughly inspected during the inspection. All support bolts, welds on the stabilizer plates and teflon pads were all found to be in satisfactory condition.

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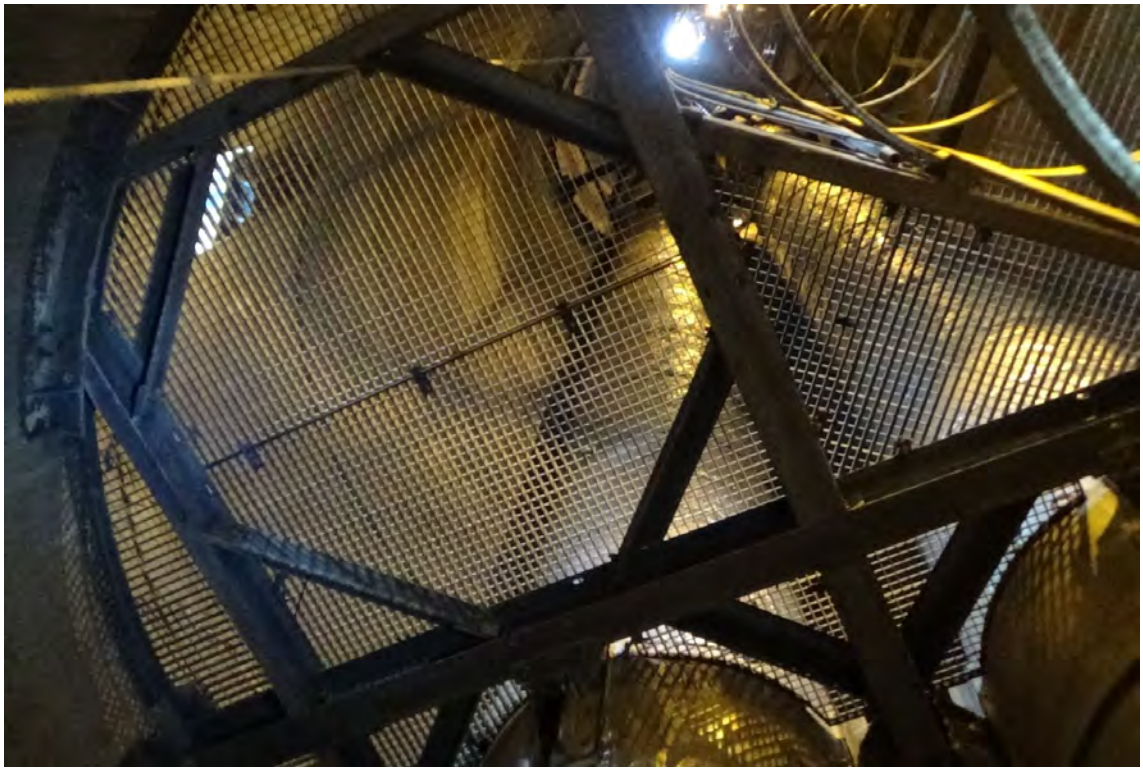
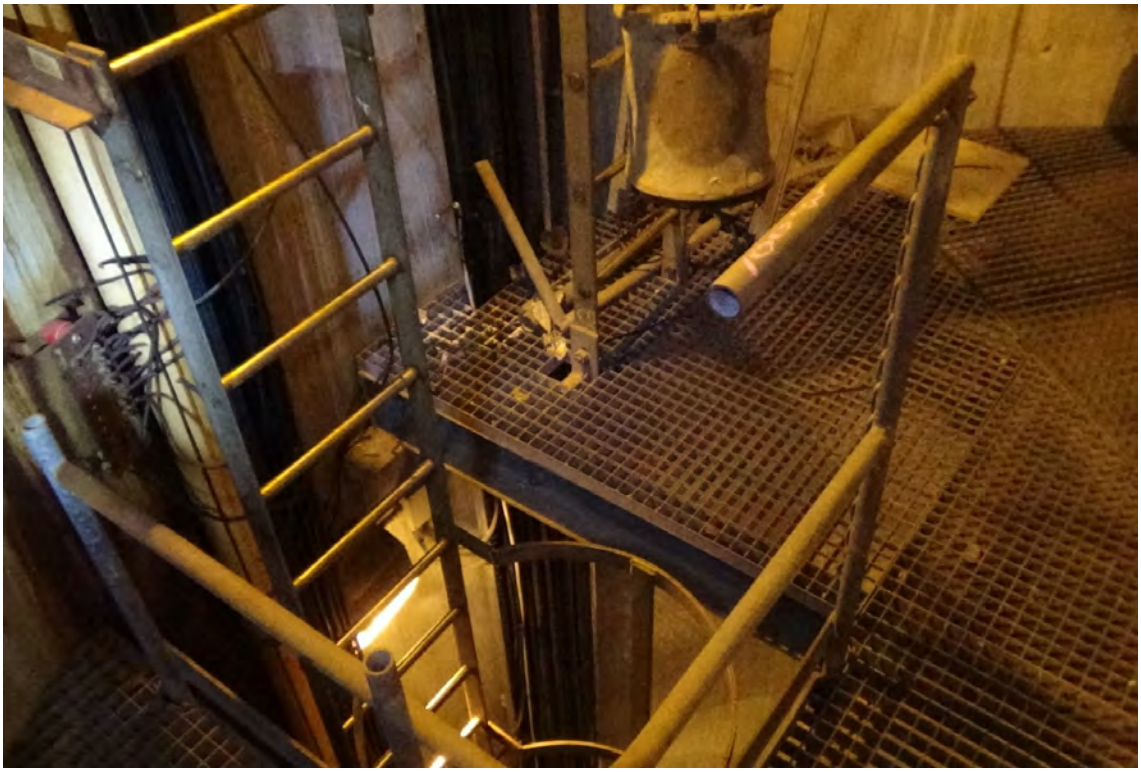


135' N—Provisions have been made in the platform support steel to accommodate a third flue. The amount of support steel is sparse in these areas. Otherwise, the support members are all in sound condition. All platform anchoring is in place and appears to be properly torqued.

135' W—Substantial staining is noticeable on the concrete below the break in the drain pipe. This staining is visible from approximately the 156' elevation to the ground. The concrete was hammer tested in multiple areas throughout the stain and was found to be intact and solid.

135' W—A single lighting fixture located at approximately 135' was found to be open with the cover and bulb removed. This light is located directly below the leak in the drain pipe. It is likely that moisture penetration into the unit has caused damage inside the light casing.



100' W—The handrail around the ladder penetration opening has be cut and removed to accommodate CEMS testing equipment. If these test ports are obsolete the handrail should be welded back into place.

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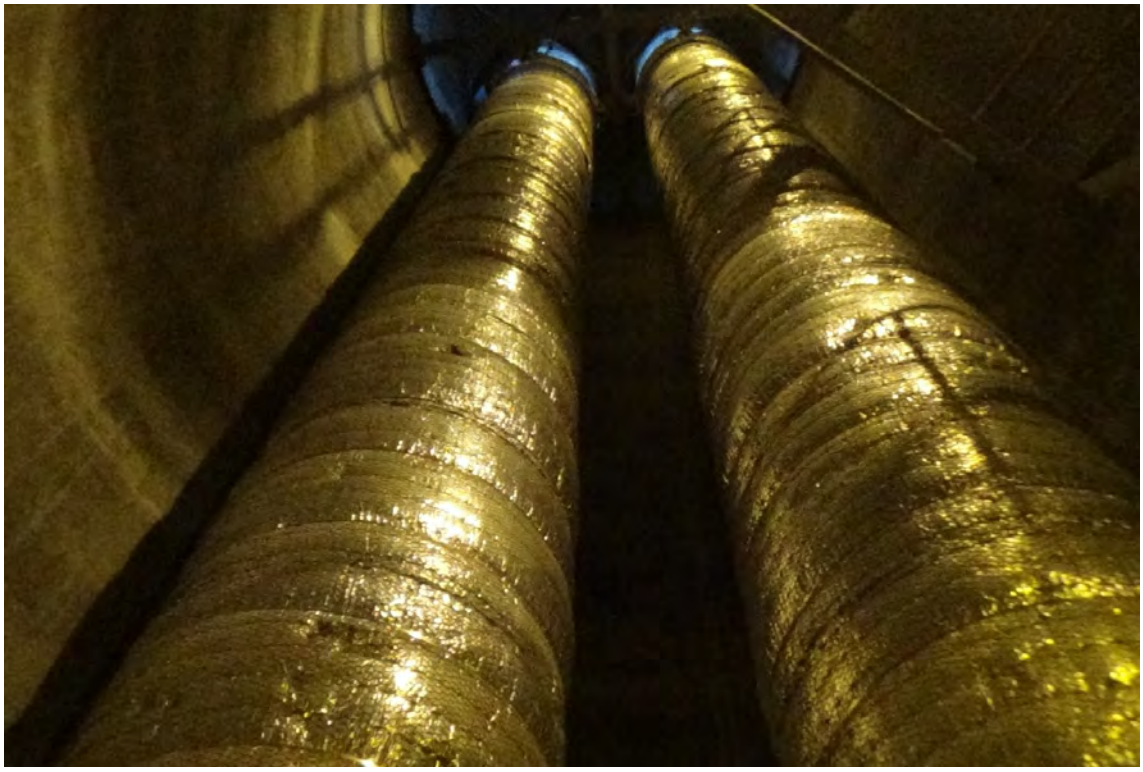
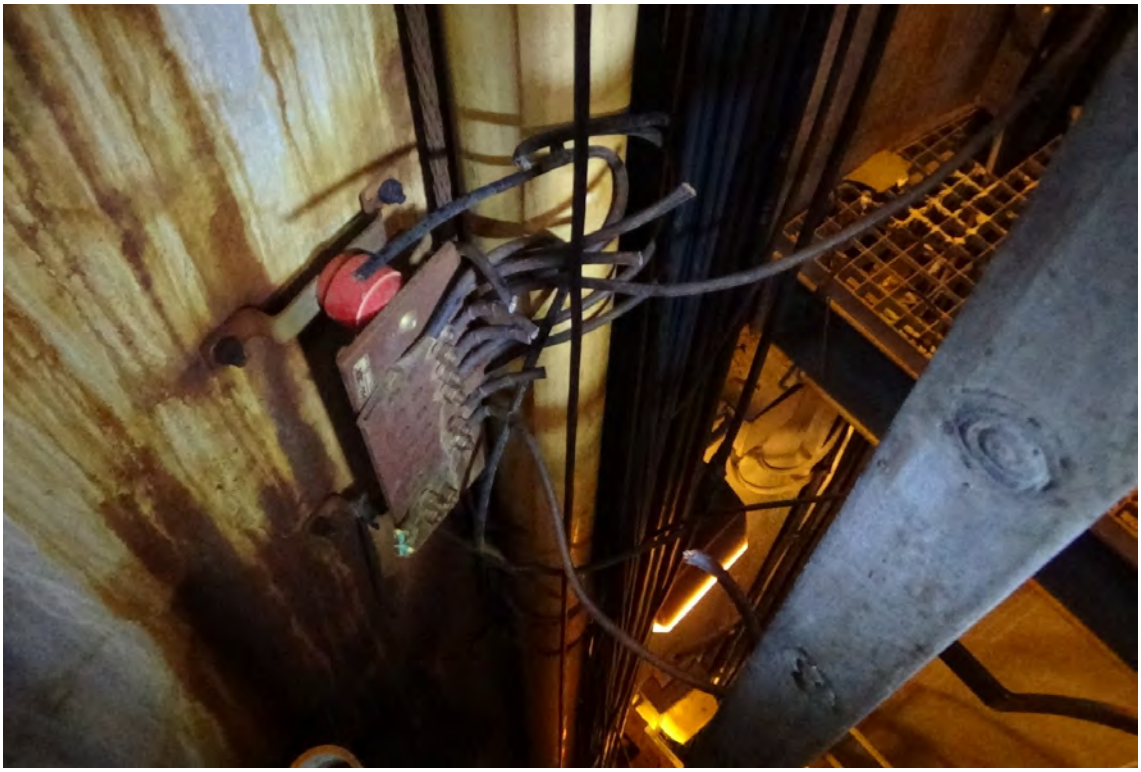


100' E—View looking up at the flues indicates no damage or deterioration to the insulation and wire mesh encapsulating the two flues.



100' W—What appears to be an old termination board for the satellite transmitters is still anchored to the interior wall at this elevation. All the wiring has been severed and the board is obsolete.

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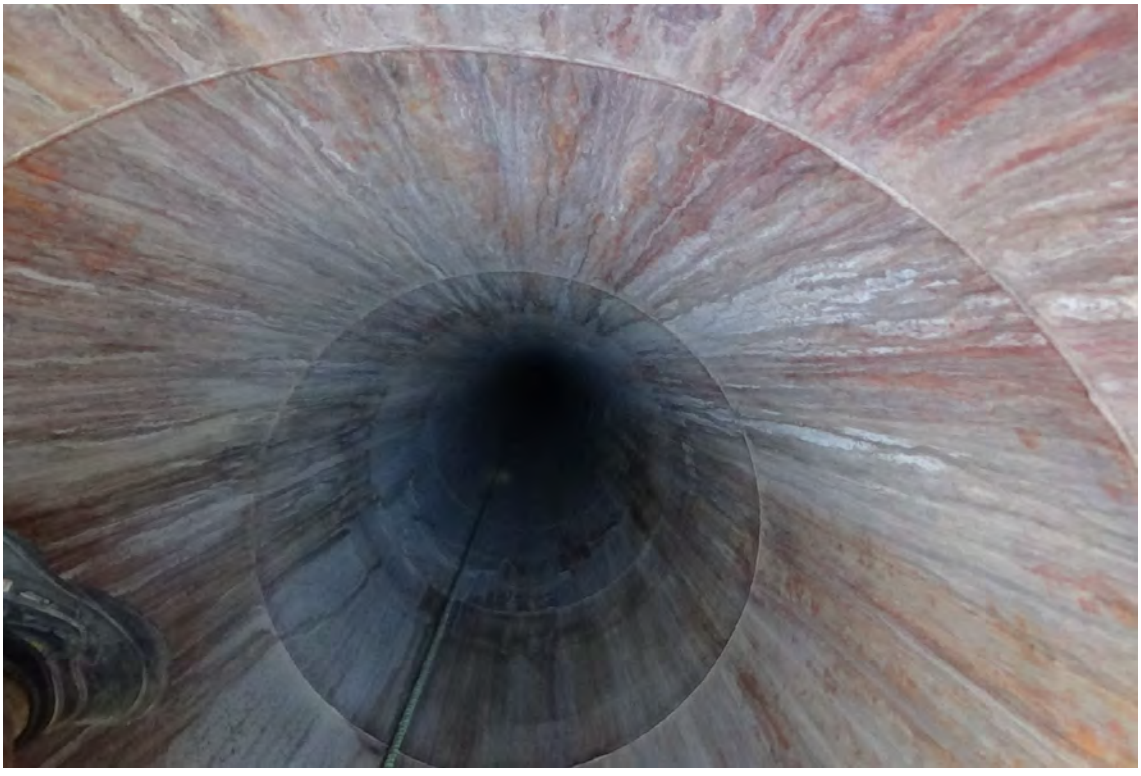
50' N—Photo of the new opacity meters which were installed during the same time as the 2017 inspections were being performed.

10' SE—Flue #1 breeching duct enters the concrete column on the south east side of the structure. A stainless steel plate is anchored to the concrete in order minimalize moisture penetration into the base. It appears as though the insulation has snagged on cover plate at some point in time tearing a small piece.

1' E—The circuit and electrical cables are properly secured to the concrete column in a tidy fashion .

1' N—A steel drain pipe exits the base of flue #1. The drain pipe has a valve in order to remove standing water from the base of the liner. This drain works in conjunction with the hopper drain for the base of the flue. Both drain pipes appeared to be clogged at the time of the inspection.

255' W/F1—UT measurements were taken at 5' intervals within the top 15', stainless steel portion of the liner. The measurement at the top elevation (.258) corresponds with ¼" plate thickness.



255' W/F1—View looking down at the stainless steel portion of flue #1. Other than the water stains which are clearly visible, the top 15' of the flue appears to be in sound condition.

240' W/F1—Heavy scaling is visible to the carbon steel wall beneath the carbon to stainless steel transition. The scale was easily removed from the liner wall as is evidenced from the large piece being displayed by the inspector. The heaviest amount of scale was found near the top of the carbon steel portion of the flue.

240' W/F1—Ultrasonic thickness measurements were taken at 1' intervals below the carbon to stainless transition. The measurements directly below the transition weld indicate approximately 15% steel thickness loss in the region.

240' W/F1—Heavy scale needed to be removed from the transition weld in order to perform a visual inspection. The weld is extremely rusted and pitted, a significant amount of undercut is visible within the stainless steel portion of the liner. No cracks or separation were visible within the weld.

215' S/F1—A small area of scale was removed in order to take an ultrasonic measurement. Multiple layers of scale needed to be removed with a chipping hammer before measureable steel was found. Steel thickness measurements were found to be deteriorated but within acceptable ranges.

190' W/F1—View looking down the liner displays a consistent amount of scale throughout the height of the liner. The scale is easily removed from the wall in large sheets.

150' W/F1—Another area of heavy scale was removed in order to record a proper UT measurement. Please refer to Section 3 in the inspection report for a chart referring to elevations, thickness readings taken and original design specifics.

100' W/F1—Vertical and horizontal welds were cleaned and visually inspected at regular intervals. A heavy amount of scale was initially removed to view the weld. As was similar with other horizontal joints, the weld was found to be substantially rusted and pitted. Excess wear can best describe the condition of the weld.

60' W/F1—Scale still needs to be removed to attain a UT measurement. Notice the outline of the scaling steel on the left side of the photo and the rusted surface beneath. The UT measurement taken is consistent with ¼" plate.

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55' W/F1—UT readings were taken around the opacity meter opening. Measurements were a bit lower than other readings taken in the area. However, the measurements are within acceptable levels. No deformities were noticed around the openings.

30' W/F1—No observable issues at the expansion bellows. All aspects of the expansion joint appear to be fully functional. As is the case with the rest of the liner, scale and rust are prominent at this elevation.

30' E/F1—The horizontal joints above and below the slider sections appear to be welded from the exterior of the flue. The joint has either been sealed with a high temperature cement or has accumulated process material over the years. The material filling the joint was found to be hard and mostly intact.

20' E/F1—View looking up the interior of flue #1 shows no signs of bulging or buckling within the liner wall. The expansion bellows system can be seen directly above.

10'/F1—A substantial amount of scale and debris build-up was found in the base of flue #1. A depth measurement of the build-up was attempted. The measurement was found to be over 16" of build-up. The false floor wasn't reached.

4' N/F1—The access door to flue #1 is located in the horizontal breeching duct approximately 30' from the base of the chimney. The opening measures 32" by 25". All the ½" bolts securing the access door were extremely corroded and were cut with a grinder/torch in order to remove the door.

0'/F1—The build-up in the bottom of flue #1, under the false floor is extremely hard. The drain in the middle of the floor is plugged with a concrete like substance.

7' E/F1—The hopper portion of the false floor was measured to be 7' from the base of the liner. The nozzle on the hopper is open and appears to be corroded. A look up into the nozzle displays the scale build-up visible from within the flue.

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255' W/F2—UT readings were taken at 1' intervals throughout the top 10' of the liner. Measurements were then taken at 10' intervals for the remainder of the flue. All measurements taken within the stainless steel portion closely correspond to ¼" thick plate.

250' W/F2—The horizontal welds within the stainless steel portion of the liner were found to be consistent with a smooth profile. No cracking or other deformities were noticed. There does appear to be a mild amount of pitting to the stainless above and below the weld.

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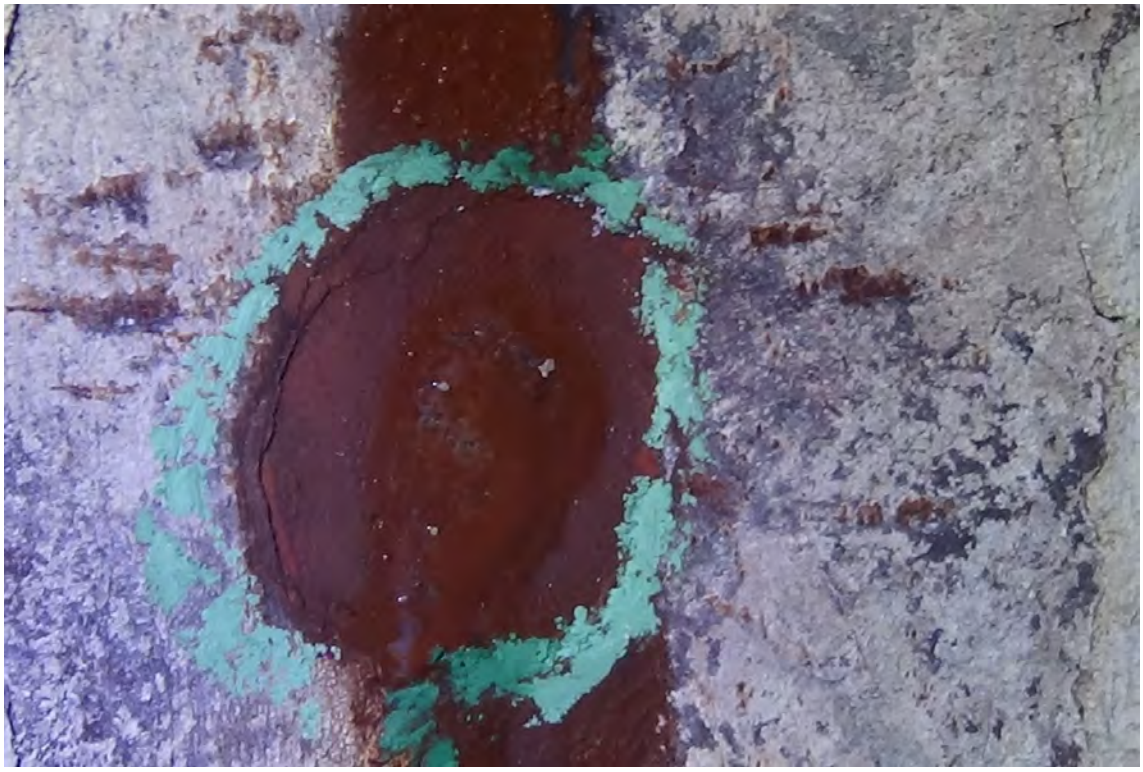
240' W/F2—UT readings taken above and below the transition weld illustrates the moderate steel thickness loss within the carbon steel section of the liner. The reading taken (.213) represents an approximate 15% loss in plate thickness at this elevation.

240' S/F2—View looking down the flue wall displays large regions of scale. The scaling appeared to be more prominent inside flue #2 and at higher elevations.

230' S/F2—Loose scale was removed from previous picture. Beneath the loose scale the carbon steel wall appears extremely rusted with multiple layers of scale.

220' W/F2—Horizontal welds were cleaned and inspected at various elevations. The heavy scale had to first be removed in order to view the welds, which appeared rusted and pitted. However, they contained a consistent profile without signs of cracking.



190' W/F2—Multiple layers of scale was removed before UT readings could be taken. Notice the pitting located within the clean steel.

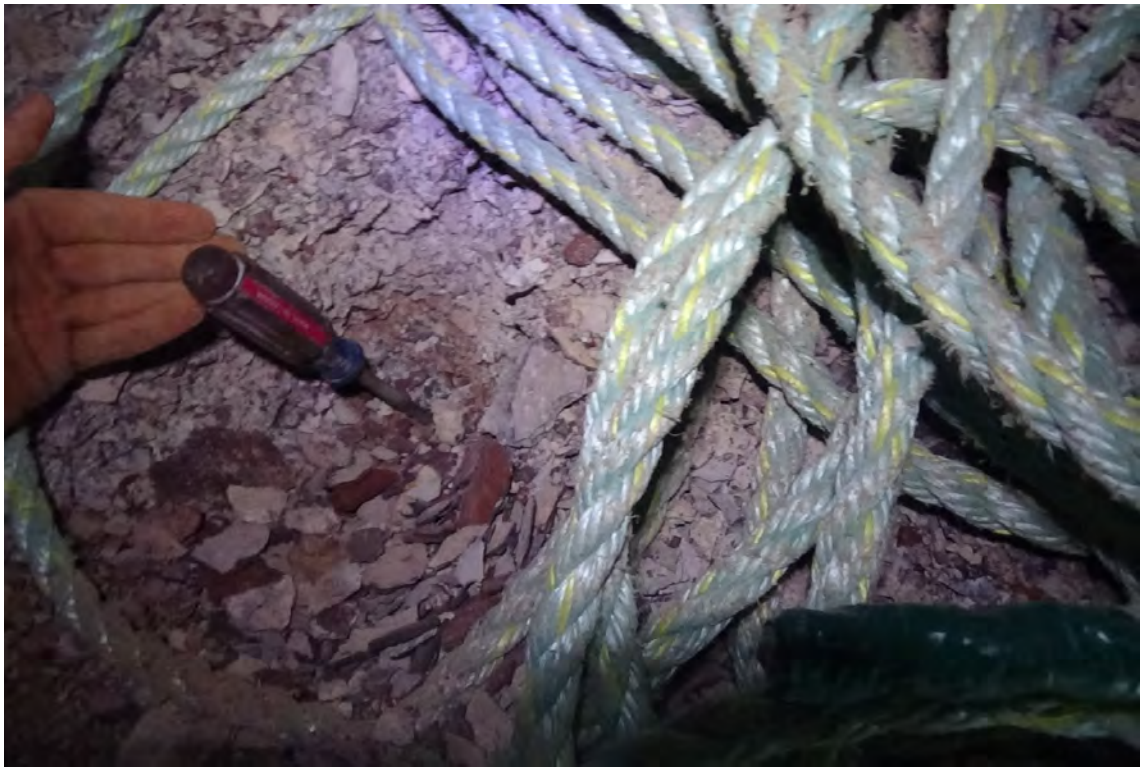
170' W/F2—Scaling is typical throughout the height of the liner. A piece of scale approximately 1/16" thick is displayed by the inspector. This was a common sight during both flue inspections.

160' W/F2—A small area of scale was removed in order to take an ultrasonic measurement. Multiple layers of scale needed to be removed with a chipping hammer before measureable steel was found. Steel thickness measurements were found to be deteriorated but within acceptable ranges.

80' S/F2—View looking down the interior wall illustrates that scaling is less noticeable at lower elevations.

55’ W/F2—Opacity meter test port displays minimal process build-up inside the port hole. Test ports appear to be solely welded from the exterior.

20’ W/F2—View looking up the interior of flue #2 shows no signs of bulging or buckling within the liner wall. The expansion bellows system can be seen directly above.



10'/F2—A substantial amount of scale and debris build-up was found in the base of flue #2. A depth measurement of the build-up was attempted. The measurement was found to be over 16" of build-up. The false floor wasn't reached.

0' E/F2—The flue access door is approximately 30' away from the base of the chimney. The access door is the opening near the stairs to the bridge.

4' N/F2—The access door to flue #2 is located in the horizontal breeching duct approximately 30' from the base of the chimney. The opening measures 32" by 25". All the ½" bolts securing the access door were extremely corroded and were cut with a grinder/torch in order to remove the door.

7' /F2—View looking at the hopper under the false floor. The cap for the hopper is missing, the pipe is clogged with scale and debris. UT readings were taken on the underside of the floor and correspond with ¼" plate thickness.

0' S/F2—A ring of scale approximately 6" wide is visible in the base of liner #2. This deficiency suggests that standing water was present in the base in the past.

2' E/F2—The access door to the base of flue #2 measures 23" wide by 39" high. The door opens and closes freely. It is secured by three ⅜" bolts with wingnuts.