Southern Ontario Water Consortium – London Wastewater Facility at GPCC
Project Number: ES 1721
Tender Number: 13-26

ADDENDUM NO. 5
March 1, 2013
63 pages total

TO ALL TENDERERS

The following changes, additions, and/or deletions are hereby made a part of the TENDER DOCUMENTS. Include all costs for revisions or clarifications in the tender price.

NO. OF PAGES: 3 addendum pages and 60 attachment pages.

Note of Clarification – For all questions from plan takers, please provide the specific reference from the contract document front end, specification section, or drawing number, where applicable.

Note of Clarification – All tenderers are reminded that all addenda will be available on the City of London website and it is the responsibility for each tenderer to download and acknowledge each addenda in the tender submission.

Note of Clarification – The report titled “Report on Geotechnical Investigation, Proposed Odour Control Facility, Greenway Pollution Control Centre London, Ontario” dated February 23, 2009 by Golder Associates Ltd. is attached for information purposes.

Note of Clarification – The revised contract document ‘front end’ with revised 48-hour breakdown will be issued on Monday March 4, 2013.

Note of Clarification – Chemical tanks, pump tanks, and piping that is to be removed will be drained as best as possible.

Note of Clarification – The base bid shall include hazardous materials and abatement costs. A revised 48-hr breakdown will be provided to reflect this line item. The cash allowance for asbestos removal may only be released upon client approval.

Note of Clarification to Contract Documents:

Specifications, Division 13

Note of Clarification – Add the attached Specification Sections related to hazardous materials:
  - “13282 Asbestos Abatement – Outdoor Type 2 Procedures”;
  - “13285 PCB Packaging and Disposal”; and
Note of Clarification – The FRP tanks are specified in Section 13206.

Specifications, Division 15

Note of Clarification – In reference to Section 15852, replace “Haalson” with the following: “Haakon Industries”.

Note of Clarification – In reference to Section 15990, the TAB agencies listed shall be considered. Any consideration for other certified TAB agencies must follow Modification Procedures.

Note of Clarification – In reference to Section 15250, Clause 2.3.3 – all exterior ductwork is to be insulated.

Note of Clarification – In reference to Section 15250, Clause 2.4 and Clause 2.5 – insulation requirements within the specification are to be used.

Replace Section 15100 (Process Valves) Clause 2.8 with the attached Clause 2.8 (Detailed Valve Specification Sheet PLV).

Add to Specification 15100, Detailed Valve Specification Sheet CHV as per attached. Check valves CHV that are not covered under SCV are to adhere to the attached document.

Note of Clarification – KNV’s leading to ARV’s are to be 3” ANSI 150 Class flanged ends.

Specifications, Division 16

Note of Clarification – In reference to Specification 16 05 81 Clause 2.3 – Supply Point #2, Remove “PAV05”.

Replace the following Specification Section 16 09 00 (Instrumentation and Control) Clauses with the attached:
- Clause 2.6;
- Clause 2.7; and
- Clause 2.8.

Remove “MSA” from approved manufacturer from Specification Section 16 09 01.

Note of Clarification – There is no requirement or allowance for HVAC or security controls. All process control is covered under specification 16 09 00.

Note of Clarification – Division 16 supplies the Exhaust Fan and Control Panel.

Note of Clarification – Covers are to be provided on the outside cable trays only.

Note of Clarification – Provide a 100mm flange for the pressure transmitter for the FRP tanks.
Note of Clarification to Drawings

Note of Clarification – New ductwork internal to the pilot facility does not need to be welded.

Note of Clarification – In reference to drawing M101, all ductwork is to be stainless steel.

Note of Clarification – There is a total of seventy-one (71) helical piles required. A recommended depth for piling was not provided as geotechnical investigation reporting was not available.

Note of Clarification - The design loads for the support members are provided within the notes in Drawing S105.

Note of Clarification – It is anticipated that the support frames, trusses and towers are constructed of structural shapes including HSS section with bolted or welded connections. All have to be hot-dip galvanized.

Note of Clarification - Drawing S106 – Revise Grid Nos. 43 and 44 to read 44 and 45 respectively on the Plan shown under “Support Base Plan for Grids 44 & 45”

In reference to quantity of bollards on Drawing S108, Frame for Grids 10 & 11 (2 new bollards anchored to tank roof slab, detail is shown in S 107, Top left corner, Plan) and Frame for Grids 6 & 7 (2 new bollards on ground, detail shown in S105, top center, 3-section).

Note of Clarification – All exterior metal supports are to be hot-dip galvanized.

Note of Clarification – In reference to jamb and header details, information on the drawings is a solution and to be used as a guide. The metal stud wall designer is to develop a design to support the door and submit for review to engineer.

Note of Clarification – Drawing M106 – contractor will be required to determine gas routing and tie in requirements.

Note of Clarification - At Gridline 12, 13 & 14, contractor is to remove and reconstruct the sidewalk as required to suit the new construction. Similarly at Gridline 10 & 11, the existing retaining wall has to be removed and reconstructed to suit to new construction.

Note of Clarification - the Contractor can use Victaulic couplings wherever they feel it necessary for installation purposes. Piping system design shall submitted for review prior to construction.

Remove and replace Drawings PCGW-E101, PCGW-E103, and PCGW-E121 with the attached.

END OF ADDENDUM NO. 5
REPORT ON

GEOTECHNICAL INVESTIGATION
PROPOSED ODOUR CONTROL FACILITY
GREENWAY POLLUTION CONTROL CENTRE
LONDON, ONTARIO

Submitted to:

The Corporation of the City of London
Environmental Services -
Greenway Pollution Control Operations
109 Greenside Avenue
London, Ontario
N6J 2X5

DISTRIBUTION:

4 Copies - The Corporation of the City of London
2 Copy - Golder Associates Ltd.

February 23, 2009

08-1132-124-0-R01
February 23, 2009

The Corporation of the City of London
Environmental Services – Greenway Pollution Control Operations
109 Greenside Avenue
London, Ontario
N6J 2X5

Attention: Mr. P.A. Rose
Senior Engineering Technologist

RE: GEOTECHNICAL INVESTIGATION
PROPOSED ODOUR CONTROL FACILITY
GREENWAY POLLUTION CONTROL CENTRE
LONDON, ONTARIO

Dear Sirs:

This report provides the results of the geotechnical investigation carried out for the design of the proposed Odour Control Facility to be constructed at the Greenway Pollution Control Centre which is located in the City of London, Ontario as shown on the Key Plan Figure 1. The location of the site is shown on the Location Plan, Figure 1.

The purpose of the investigation was to determine the subsurface soil and groundwater conditions at the site and to provide geotechnical engineering recommendations for the design of the proposed odour control facility.

Authorization to proceed with the investigation was provided by Mr. P.A. Rose during our September 26, 2008 site meeting. Following the site meeting, our proposed work plan and cost estimate was provided in a letter dated September 29, 2008.

Important information on the limitations of this report is attached.
1.0 PROCEDURE

The field work for this investigation was carried out on October 31, 2008 at which time three boreholes were drilled at the approximate locations shown on the Location Plan, Figure 1. In addition three dynamic cone penetration tests were carried out, one adjacent to borehole one and two, numbered 101 and 102, at midpoint in the proposed facility footprint the, results of borehole 2 (Golder Associates Ltd. Report No. 73366 entitled "Subsurface Investigation, Greenway Pollution Control Centre, London Ontario", dated August, 1973) which was drilled adjacent to the site have been included in Appendix A in its original Imperial format.

The boreholes and dynamic cone tests were advanced using a truck mounted power auger supplied and operated by a specialist drilling contractor. The stratigraphy encountered in the boreholes is shown on the Record of Borehole sheets following the text of this report. Dynamic cone penetration tests were carried out to complement the standard penetration testing and the results are shown on the Record of Dynamic Cone Penetration sheets.

Standard penetration testing and sampling was carried out at suitable intervals of depth in each of the boreholes using 35 millimetre inside diameter split spoon sampling equipment. All of the samples obtained during the investigation were brought to our laboratory for further examination and representative classification testing. The results of the field and laboratory testing are shown on the Record of Borehole sheets and on Figure 2.

Groundwater seepage conditions were observed in the boreholes during drilling. Upon completion of testing and sampling, the boreholes were backfilled in general accordance with Ontario Regulation 903 amended to Ontario Regulation 128/03.

The boreholes were located in the field by members of our engineering staff who also supervised the drilling, logged the boreholes, cared for the samples obtained and surveyed the ground surface elevations at the borehole and dynamic cone penetration test locations. The service locates were obtained by City of London personnel.

The ground surface elevations at the borehole locations were referenced to a benchmark provided by the Corporation of the City of London. The benchmark is described as a brass tablet in the north east corner of the overflow channel from Section # 3 north of Parshall Flume as shown on the Location Plan, Figure 1. The elevation of this point is understood to be 235.269 metres referred to geodetic datum.
2.0 SUBSURFACE CONDITIONS

2.1 General

The subsurface conditions encountered in the boreholes are shown in detail on the Record of Borehole sheets. The following discussion has been simplified in terms of major soil strata for the purposes of geotechnical design.

The soil boundaries indicated are inferred from non-continuous samples and observations of drilling resistance and may represent a transition from one soil type to another and should not be interpreted to represent exact planes of geological change. Further, subsurface conditions may vary between and beyond the borehole locations.

2.2 Soil Conditions

The soil conditions encountered in the boreholes generally consisted of surficial topsoil underlain by an extensive deposit of fill materials varying in gradation from sandy silt to sand, which is underlain by sand, silty fine sand, and sandy silt.

2.2.1 Topsoil

Topsoil was encountered at ground surface in all of the boreholes. The topsoil ranged from 210 to 370 millimetres in thickness at the borehole locations with an average thickness of about 260 millimetres.

2.2.2 Fill

Fill materials were encountered beneath the topsoil in all of the boreholes. The fill varied in grain size from sandy silt to sand. The fill materials extended to depths of 3.9 to 5.6 metres below ground level at the borehole and cone test locations.

Sandy silt fill was encountered beneath the topsoil in boreholes 1 and 2 and at depth in borehole 3. The sandy silt fill ranged in thickness from 0.4 to 1.5 metres and had measured N values as determined by the standard penetration testing of 1 to greater than 100 blows per 0.3 metres. The sandy silt fill had water contents ranging from 9 to 15 per cent. Cobbles were encountered in the sandy silt fill.

All of the boreholes encountered sand fill layers ranging in thickness from 2.0 to 4.9 metres. The sand fill had measured N values ranging from 3 to 9 blows 0.3 metres, and water contents of from 9 to 12 per cent.
2.2.3 Sand

Sand layers ranging from 1.2 to 1.9 metres in thickness were encountered beneath the fill materials in all boreholes drilled at the site. The sands varied in grain size from fine sand to fine to medium sand. The sands had N values of 9 to 35 blows per 0.3 metres and average natural water contents of about, 4 and 20 per cent above and below, respectively.

A grain size distribution curve for a sample of the fine sand recovered from the standard penetration testing is shown on Figure 2.

2.2.4 Silty Fine Sand

Borehole 1 encountered a layer of silty fine sand beneath the sand. The borehole was terminated in the silty fine sand after exploring it for some 0.6 metres. The silty fine sand had an N value of 23 blows per 0.3 metres and a natural water content of 17 per cent.

2.2.5 Sandy Silt

Sandy silt was encountered beneath the sand in boreholes 2 and 3. Boreholes 2 and 3 were terminated in the sandy silt after exploring it for about 0.6 to 1.2 metres. The sandy silt had N values of 28 to 30 blows per 0.3 metres and natural water contents of 19 to 30 per cent.

2.2.6 Rock

Available geological and geotechnical data indicate that the sand and silt became very dense with depth and sand to the bedrock surface. In the area of the site, the rock surface is at about elevation 205 metres or some 27 metres below the general level of the flood plain. The bedrock is reported to consist of limestone belonging to the Dundee Formation of Middle Devonian Age.

2.3 Groundwater

Groundwater was encountered in all of the boreholes at depths of 6.1 to 6.3 metres below ground surface or between elevation 229.1 and 229.3 metres.

The water level in the Thames River just east (upstream) of the site was at about elevation 228.4 metres on June 24, 2008.
The water level in the Thames River just north of the site was at about elevation 230.03 metres on November 21, 2008. The low river level which would have prevailed during the borehole drilling program is typically about elevation 228.0 metres. The normal summer river water level adjacent to the Greenway facility is at about elevation 229.6 metres but may rise to elevation 230.5 metres.

Groundwater levels are expected to fluctuate seasonally and are expected to be higher during periods of sustained precipitation, spring melt conditions, or changes in the water level in the river due to changes in river flow and/or downstream dam operations. As a result, a groundwater level at elevation 230.5 metres should be assumed for foundation design purposes.

3.0 DISCUSSION

This section of the report provides our interpretation of the factual geotechnical data obtained during the investigation and it is intended for the guidance of the design engineer. Where comments are made on construction, they are provided only to highlight those aspects which could affect the design of the project. Contractors bidding on or undertaking the works should make their own interpretation of the subsurface information provided as it affects their proposed construction methods, equipment selection, scheduling and the like.

3.1 Foundations

Based on the results of the boreholes and the depth of the existing fill materials associated with the construction of the existing Sludge Disposal Building and related features immediately west of the proposed Odour Control Facility, conventional shallow spread footings are not considered feasible. The proposed building may be supported by the following foundation alternatives.

3.1.1 Deep Foundations

The proposed building could be supported by driven steel pipe piles bearing in the native, undisturbed fine sand at or below elevation 228 metres. Driven Steel pipe piles with a minimum diameter of 0.3 metres driven closed ended and filled with concrete founded in the native fine sand may be designed with a factored bearing resistance at Ultimate Limit States (ULS) of 350 kilonewtons (kN) per pile and a bearing resistance at Serviceability Limit States (SLS) of 275 kN per pile. Care must be taken to ensure that the piles fully penetrate the fill materials to bear on the undisturbed fine sand.

Alternatively, the structure could be founded on helical piles, driven steel, H-piles or timber piles.
3.1.2 Engineered Fill

Alternatively, the proposed Odour Control Facility foundation could be supported on an engineered fill. Following the removal of the existing fill materials, the exposed fine sand subgrade should be inspected by the geotechnical engineer. The proposed Odour Control Facility base should then be brought to proposed founding level with engineered fill comprised of Granular A. The Granular A engineered fill should be placed in maximum 200 millimetre thick loose lifts and uniformly compacted to at least 98 per cent of standard Proctor maximum dry density. The engineered fill should extend beyond the proposed facility foundation a minimum of 1 metre plus the depth of engineered fill.

Due to the proximity of the existing Sludge Disposal Building and the presently proposed facility footprint, the minimum lateral clearance of 1 metre plus the depth of engineered fill may not be achieved. Further, the excavation required for removal of the existing fill may extend below the ground water level thus requiring pro-active dewatering by a vacuum well point system or the like.

The subgrade preparation and engineered fill placement will require full-time geotechnical inspection and testing.

Foundations bearing on a minimum of 1 metre of Granular A engineered fill constructed as detailed above may be designed using a factored geotechnical resistance at ULS of 300 kilopascals and a bearing resistance at SLS of 150 kilopascals.

3.1.3 Drilled Concrete Piles

Consideration may be given to supporting the proposed Odour Control Facility or drilled, cast in place concrete piles (caissons) founded at least one metre or one pile diameter below the surface of the native sand or founded at about 229.4 metres. Based on the subsurface conditions encountered in the boreholes a factored end bearing geotechnical resistance of 400 kilopascals at ULS and a bearing resistance at SLS of 275 kilopascals may be used for design. Shaft resistance should be neglected when assessing vertical load carrying capacity.

The caissons must be founded above the groundwater level at the time of construction. This would require that construction be carried out when the river water level is low, or proactive groundwater lowering using vacuum well points may be required.

It is considered that driven pipe piles are preferable from a geotechnical perspective and may also be advantageous given the site access limitations and underground services.
3.2 Slabs-on-Grade

Based on the results of the boreholes and dynamic cone penetration tests, the fill is not suitable for the support of conventional slabs-on-grade unless some post construction settlements can be tolerated. Depending on the foundation alternative selected, the floor slabs associated with the proposed Odour Control Building, it could be supported by the piles.

Should the engineered fill alternative be selected for the support of the foundations, the engineered fill could be utilized to support the slabs on grade.

3.3 Excavations

Excavations for the proposed building foundations will encounter surficial topsoil, sandy silt fill, sand fill, and fine sand. All excavations should be carried out in accordance with the current Occupational Health and Safety Act and Regulations for Construction Projects. Excavation side slopes should be maintained at inclinations of 1 horizontal to 1 vertical or flatter. Based on the results of the boreholes, all fill materials would be classified as Type 3 soils. The native fine sand above the groundwater level would be classified as Type 2 soils.

Depending on the water level in the river, significant groundwater seepage into the excavation may be expected. Effective groundwater control may be required to maintain groundwater levels at a minimum of 0.5 metres below the base of the excavation. Suitable methods of controlling groundwater in the fine sands and silts include appropriately spaced, properly filtered vacuum well points. All surface water should be directed away from the excavation.

4.0 GEOTECHNICAL INSPECTIONS AND TESTING

A regular program of geotechnical inspections and materials testing should be carried out during construction to confirm that the subsurface conditions encountered are consistent with the investigation, that the intent of this report is met, and that the various material and project specifications are being achieved. Geotechnical input should continue throughout the design stage of the project due to the less than ideal founding conditions and other site constraints.
We trust that this report contains all of the geotechnical information that you require to proceed with the design of the proposed works. Should any point require further clarification at this time, or when we can be of additional assistance, please contact this office.

Yours truly,

GOLDER ASSOCIATES

D.R.P. BABCOCK
100109319

Provincial Engineer


Philip R. Bedford, P.Eng.

Attachments:

- Limitations
- List of Abbreviations
- List of Symbols
- Records of Boreholes
- Records of Dynamic Cone Penetration Tests
- Figures 1 to 2
- Appendix A
IMPORTANT INFORMATION AND LIMITATIONS
OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder can not be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder’s express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client can not rely upon the electronic media versions of Golder’s report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Golder Associates
LIST OF ABBREVIATIONS

The abbreviations commonly employed on Records of Boreholes, on figures and in the text of the report are as follows:

I. SAMPLE TYPE

| AS  | Auger sample |
| BS  | Block sample |
| CS  | Chunk sample |
| SS  | Split-spoon |
| DS  | Denison type sample |
| FS  | Foil sample |
| RC  | Rock core |
| SC  | Soil core |
| ST  | Slotted tube |
| TO  | Thin-walled, open |
| TP  | Thin-walled, piston |
| WS  | Wash sample |

II. PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:
The number of blows by a 63.5 kg (140 lb.) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split spoon sampler for a distance of 300 mm (12 in.).

Dynamic Cone Penetration Resistance; Nₜ:
The number of blows by a 63.5 kg (140 lb.) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to “A” size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

Piezoe-Cone Penetration Test (CPT):
A electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm² pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (Qₜ), porewater pressure (PWP) and friction along a sleeve are recorded electronically at 25 mm penetration intervals.

III. SOIL DESCRIPTION

(a) Cohesionless Soils

<table>
<thead>
<tr>
<th>Density Index</th>
<th>Blows/300 mm or Blows/ft.</th>
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</thead>
<tbody>
<tr>
<td>Very loose</td>
<td>0 to 4</td>
</tr>
<tr>
<td>Loose</td>
<td>4 to 10</td>
</tr>
<tr>
<td>Compact</td>
<td>10 to 30</td>
</tr>
<tr>
<td>Dense</td>
<td>30 to 50</td>
</tr>
<tr>
<td>Very dense</td>
<td>over 50</td>
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</table>

(b) Cohesive Soils

Consistency kPa c_n (°)

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<thead>
<tr>
<th></th>
<th>kPa</th>
<th>c_n (°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very soft</td>
<td>0 to 12</td>
<td>0 to 250</td>
</tr>
<tr>
<td>Soft</td>
<td>12 to 25</td>
<td>250 to 500</td>
</tr>
<tr>
<td>Firm</td>
<td>25 to 50</td>
<td>500 to 1,000</td>
</tr>
<tr>
<td>Stiff</td>
<td>50 to 100</td>
<td>1,000 to 2,000</td>
</tr>
<tr>
<td>Very stiff</td>
<td>100 to 200</td>
<td>2,000 to 4,000</td>
</tr>
<tr>
<td>Hard</td>
<td>over 200</td>
<td>over 4,000</td>
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IV. SOIL TESTS

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>w</td>
<td>water content</td>
</tr>
<tr>
<td>w_p</td>
<td>plastic limit</td>
</tr>
<tr>
<td>w_l</td>
<td>liquid limit</td>
</tr>
<tr>
<td>C</td>
<td>consolidation (oedometer) test</td>
</tr>
<tr>
<td>C_l</td>
<td>chemical analysis (refer to text)</td>
</tr>
<tr>
<td>CID</td>
<td>consolidated isotropically drained triaxial test</td>
</tr>
<tr>
<td>CIU</td>
<td>consolidated isotropically undrained triaxial test with porewater pressure measurement</td>
</tr>
<tr>
<td>D_r</td>
<td>relative density (specific gravity, G_s)</td>
</tr>
<tr>
<td>DS</td>
<td>direct shear test</td>
</tr>
<tr>
<td>M</td>
<td>sieve analysis for particle size</td>
</tr>
<tr>
<td>MH</td>
<td>combined sieve and hydrometer (H) analysis</td>
</tr>
<tr>
<td>MPC</td>
<td>Modified Proctor compaction test</td>
</tr>
<tr>
<td>SPC</td>
<td>Standard Proctor compaction test</td>
</tr>
<tr>
<td>OC</td>
<td>organic content test</td>
</tr>
<tr>
<td>SO_4</td>
<td>concentration of water-soluble sulphates</td>
</tr>
<tr>
<td>UC</td>
<td>unconfined compression test</td>
</tr>
<tr>
<td>UU</td>
<td>unconsolidated undrained triaxial test</td>
</tr>
<tr>
<td>V</td>
<td>field vane (LV-laboratory vane test)</td>
</tr>
<tr>
<td>γ</td>
<td>unit weight</td>
</tr>
</tbody>
</table>

Note: 1 Tests which are anisotropically consolidated prior to shear are shown as CAD, CAU.

Golder Associates
**RECORD OF BOREHOLE 1**

**LOCATION:** See Location Plan

**SAMPLER HAMMER:** 63.5 kg, DROP, 760 mm

**BORING DATE:** October 31, 2008

**DATUM:** GEODETIC

**PENETRATION TEST HAMMER:** 63.5 kg, DROP, 760 mm

<table>
<thead>
<tr>
<th>DEPTH SCALE</th>
<th>BORING METHOD</th>
<th>SOIL PROFILE</th>
<th>SAMPLES</th>
<th>DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m</th>
<th>HYDRAULIC CONDUCTIVITY, mD</th>
<th>INSTALLATION AND GROUNDWATER OBSERVATIONS</th>
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</thead>
<tbody>
<tr>
<td>METRES</td>
<td></td>
<td>DESCRIPTION</td>
<td>NUMBER</td>
<td>TYPE</td>
<td>DENSITY</td>
<td>BLOW</td>
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<tr>
<td>0</td>
<td></td>
<td>GROUND SURFACE</td>
<td>230.46</td>
<td></td>
<td></td>
<td>0.00</td>
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<tr>
<td>0.20</td>
<td></td>
<td>Brown sandy TOPSOIL</td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>0.70</td>
<td></td>
<td>Loose brown and grey sandy silt, some gravel, trace clay (FILL)</td>
<td>1 ss 9</td>
<td></td>
<td></td>
<td>233.78</td>
</tr>
<tr>
<td>1.20</td>
<td></td>
<td>Very loose brown fine sand, some silt, trace gravel (FILL)</td>
<td>3 ss 4</td>
<td></td>
<td></td>
<td>234.18</td>
</tr>
<tr>
<td>1.70</td>
<td></td>
<td>Compact to very dense brown and grey sandy silt, trace clay, trace gravel, trace glass, with cobbles, with clayey silt layers (FILL)</td>
<td>5 ss 22</td>
<td></td>
<td></td>
<td>231.80</td>
</tr>
<tr>
<td>2.20</td>
<td></td>
<td>Compact brown becoming grey below about elev. 225.1m fine SAND, trace to some silt, trace gravel</td>
<td>7 ss 22</td>
<td></td>
<td></td>
<td>230.28</td>
</tr>
<tr>
<td>2.70</td>
<td></td>
<td>Compact grey SILTY FINE SAND, trace gravel</td>
<td>8 ss 28</td>
<td></td>
<td></td>
<td>228.75</td>
</tr>
<tr>
<td>3.20</td>
<td></td>
<td>END OF BOREHOLE</td>
<td>9 ss 23</td>
<td></td>
<td></td>
<td>228.14</td>
</tr>
</tbody>
</table>

**GROUNDWATER encountered at about elev. 229.1m during drilling on October 31, 2008.**
### Record of Borehole 2

**Location:** See location plan

**Sampler Hammer:** 83.5kg, DROP, 760mm

**Boring Date:** October 31, 2008

**Datum:** Geodetic

**Penetration Test Hammer:** 83.5kg, DROP, 760mm

#### Soil Profile

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Soil Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Brown silty TOPSOIL</td>
<td></td>
</tr>
<tr>
<td>235.35</td>
<td></td>
<td>GROUND SURFACE</td>
</tr>
<tr>
<td>235.37</td>
<td>Grey sandy silt, trace gravel (FILL)</td>
<td></td>
</tr>
<tr>
<td>234.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>233.00</td>
<td>Very loose to loose brown fine sand, some silt, trace gravel (FILL)</td>
<td></td>
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<tr>
<td>232.00</td>
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<tr>
<td>231.00</td>
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<tr>
<td>230.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>229.00</td>
<td>Compact to dense brown becoming grey at about elev. 229.1m fine SAND, trace to some silt, trace gravel</td>
<td></td>
</tr>
<tr>
<td>228.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>227.80</td>
<td>Compact grey SANDY SILT, trace gravel</td>
<td></td>
</tr>
<tr>
<td>227.27</td>
<td></td>
<td>END OF BOREHOLE</td>
</tr>
</tbody>
</table>

#### Dynamic Penetration Resistance, Blows/0.3m

<table>
<thead>
<tr>
<th>Elev.</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>235</td>
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<tr>
<td>227</td>
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</tbody>
</table>

#### Hydrometric Conductivity

<table>
<thead>
<tr>
<th>Elev.</th>
<th>10^5</th>
<th>10^4</th>
<th>10^3</th>
<th>10^2</th>
<th>10^1</th>
<th>10^0</th>
</tr>
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<tbody>
<tr>
<td>0.00</td>
<td></td>
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<tr>
<td>235</td>
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<td>227</td>
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</tbody>
</table>

#### Water Content Percent

- **Wp:**
  - 10
  - 20
  - 30
  - 40

- **Wc:**
  - 10
  - 20
  - 30
  - 40

---

Groundwater encountered at about elev. 229.1m during drilling on October 31, 2008.

---

**Logged:** DB  
**Checked:** D.B.
# Record of Borehole 3

**Boring Date:** October 31, 2009

**Penetration Test Hammer:** 63.5kg; DROP, 760mm

## Soil Profile

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Soil Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Ground Surface</td>
<td>Brown silty topsoil</td>
</tr>
<tr>
<td>3.88</td>
<td>1</td>
<td>Very loose to loose brown fine sand, some silt, with silt pockets, trace gravel (fill)</td>
</tr>
<tr>
<td>4.88</td>
<td>5</td>
<td>Very loose brown sandy silt, trace clay, trace gravel (fill)</td>
</tr>
<tr>
<td>6.19</td>
<td>7</td>
<td>Compact brown fine to medium sand, trace silt, trace gravel</td>
</tr>
<tr>
<td>7.32</td>
<td>9</td>
<td>Compact grey sandy silt, trace gravel</td>
</tr>
</tbody>
</table>

**Elevation:**

- **Soil Type:** SS
- **Elevation:** 229.31 to 235.41

**Dynamic Penetration Resistance, Bows/0.3m:**

<table>
<thead>
<tr>
<th>Elevation</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>229.31</td>
<td></td>
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<tr>
<td>229.00</td>
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<td>230.00</td>
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<tr>
<td>232.31</td>
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<tr>
<td>233.41</td>
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</tr>
</tbody>
</table>

**Hydraulic Conductivity, k, cm/s:**

- **Elevation:** 229.31 to 235.41

**Water Content Percent:**

- **Elevation:** 229.31 to 235.41

**Installation and Groundwater Observations:**

- Groundwater encountered at about elev. 229.3m during drilling on October 31, 2009.

**Logged by:** DB

**Checked by:** D.B.
<table>
<thead>
<tr>
<th>Soil Profile</th>
<th>Strata Plot</th>
<th>Elevation</th>
<th>Hammer Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Surface</td>
<td>1.00</td>
<td>235.41</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.50</td>
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<tr>
<td></td>
<td>1.00</td>
<td>231.50</td>
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<td>229.00</td>
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<td>1.00</td>
<td>228.09</td>
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<td>1.00</td>
<td>228.09</td>
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<tr>
<td></td>
<td>1.00</td>
<td>7.32</td>
<td></td>
</tr>
<tr>
<td>Dynamic Cone Tested</td>
<td>1.00</td>
<td>235.41</td>
<td></td>
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<td></td>
<td>1.00</td>
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<td>1.00</td>
<td>228.09</td>
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<tr>
<td></td>
<td>1.00</td>
<td>7.32</td>
<td></td>
</tr>
</tbody>
</table>

**Description:** Possibly very loose to loose fine sand (FILL)
 Possibly compact to dense FINE SAND

**Hammer Drop:** 63.5kg, DROP, 760mm

**Location:** See Location Plan

**Boring Date:** October 31, 2008

**Datum:** Geodetic

**Golder Associates**
**RECORD OF DYNAMIC CONE PENETRATION TEST**

**LOCATION:** SEE LOCATION PLAN

**BORING DATE:** October 31, 2008

**PROJECT:** 08-1132-124-0

**SAMPLER HAMMER, 63.5kg, DROP, 760mm**

**PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm**

<table>
<thead>
<tr>
<th>DEPTH SCALE METRES</th>
<th>SOIL PROFILE</th>
<th>SAMPLES</th>
<th>DYNAMIC PENETRATION RESISTANCE, BLOW/0.3m</th>
<th>HYDRAULIC CONDUCTIVITY, k, cm/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAXA PLOT</td>
<td>DESCRIPTION</td>
<td>NUMBER</td>
<td>type</td>
<td>BLOWN/0.3m</td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

- **GROUND SURFACE**
  - Depth: 0.00
  - Soil: Possibly very loose to loose fine sand (FILL)

- **Dynamic Cone Uncovered**
  - Depth: 3.00
  - Soil: Possibly compact to dense FINE SAND

- **END OF PENETRATION TEST**
  - Depth: 6.71
LEGEND

SYMBOL  BOREHOLE  SAMPLE  ELEV (m)

●  3  7  229.9
APPENDIX A

RECORD OF PREVIOUS BOREHOLE

(GOLDER ASSOCIATES LTD. PROJECT NO. 73366)
# Record of Borehole

**Location:** See Figure 1  
**Boring Date:** July 25, 1973  
**Datum:** Geodetic

**Sampler Hammer Weight:** 140 lb., drop 30 in.  
**Penetration Test Hammer Weight:** 140 lb., drop 30 in.

<table>
<thead>
<tr>
<th>Elev'N</th>
<th>Description</th>
<th>Soil Profile</th>
<th>Samples</th>
<th>Dynamic Penetration Resistance, Blows/ft.</th>
<th>Coefficient of Permeability, K(s), CM/sec.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Number</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Type</td>
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<td></td>
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<td>Elev'N</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Scale</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: This drawing has been reduced and is in Imperial Units

---

**Piezometer or Standpipe Installation:**

- **Ground Surface**
- **Plastic Tubing**
- **Sand Backfill**
- **Standpipe**
- **Water Level**

---

**Golder Associates**
PART 1  GENERAL

1.1  General and Related Work

.1  Read this section in conjunction with all other sections so as to comply with the requirements of Division 1 and the General Conditions of the Contract.

.1  Related Work Specified Elsewhere

Division 13, Section 13285  Mercury Packaging and Disposal
Division 13, Section 13286  PCB Packaging and Disposal

.2  The site conditions identify the location and condition of all known asbestos-containing materials (ACM) to be disturbed by the work of this contract. The specification fulfills the requirements of the report required by O.Reg. 278/05.

.3  Unless otherwise shown or specified it is the intent that work performed as per this section will result in the removal and disposal or decontamination of all ACM included in work of this section and all materials which have been contaminated by ACM either during or prior to work of this section.

1.2  Recommended Bidders

.1  The following is a list of recommended bidders by The Corporation of the City of London in conjunction with Pinchin Environmental Ltd. to complete the Division 13 hazardous materials abatement work as outlined in the contract documents:

.1  JoBi Construction Ltd. (519)485–6181
.2  JMX Environmental Inc. (905)426-8315
.3  Quantum Murray 1-800-251-7773
.4  Biggs and Narciso (519)433-9998
1.3 Site Conditions

.1 Parging cement, containing chrysotile asbestos, is present on pipe fittings in the following locations:

.1 Pipe fittings (elbows, valves, and tees) insulated with asbestos-containing parging cement are present on the Supply and Return pipe systems of the Boiler(s) in the Basement of the building.

.2 Pipe insulated with friable asbestos-containing insulations may be present in inaccessible locations such as above solid ceilings, in chases, column enclosures and within shafts.

.3 The renovation scope of work is not expected to impact these pipe systems, however; should any work potentially disturb an asbestos-containing material or suspect asbestos-containing material stop work and notify the City of London project manager immediately.

.2 Tar containing chrysotile asbestos is on the exterior of the building in the following locations:

.1 A thin layer of the tar is present behind the paint finish on the corrugated steel cladding.

.2 The tar is present on panelling that extends approximately forty (40) feet up, removal will require a man-lift, genie boom, or scaffolding for access.

.3 Asbestos cement panels, containing asbestos of a type other than chrysotile, are present in the following locations:

.1 Approximately 15,000 square feet of asbestos-containing Transite cement panels are present under the steel cladding of the building.

.2 Transite panels extend approximately forty (40) feet up, removal will require a man-lift, genie boom, or scaffolding for access.

Heat and Smoke detectors to remain live throughout work.

1.4 Outline of Work

.1 Using Type 2 procedures of this section, remove and dispose of the following:

.1 Approximately 7,500 square feet of a thin layer of the tar present behind the paint finish on the corrugated steel cladding of the building.

.2 Approximately 7,500 square feet of asbestos-containing Transite cement panels under the steel cladding of the building.

1.5 Schedule

.1 Start work on:

.1 To be determined, refer to project schedule

.2 Complete work by:

.1 To be determined, refer to project schedule

.3 Quiet hours are defined as Weekends and 6:00 PM to 6:00 AM, Monday to Friday.
1.6 Definitions

.1 Asbestos: Any of the fibrous silicates defined in Regulation 278/05 including actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite.

.2 Asbestos Abatement Consultant: Owner’s Representative providing inspection and air monitoring.

.3 Asbestos Abatement Contractor: Contractor or sub-contractor performing work of this section.

.4 Asbestos-Containing Material(s) (ACM): Material(s) identified under Site Conditions including debris, fallen material and settled dust.

.5 Asbestos Work Area: Area where work takes place which will, or may, disturb ACM.

.6 Authorized Visitors: Prime Contractor, Building Owner or Representatives, Asbestos Abatement Consultant, and persons representing regulatory agencies.

.7 Competent Worker: A worker who is qualified because of knowledge, training and experience to perform the work, is familiar with Regulation 278/05 and the Occupational Health and Safety Act, and has knowledge of the potential or actual danger to health and safety in the work.

.8 DOP Testing (or HEPA Integrity Test): Testing performed on HEPA Filtered Negative Pressure Machines and HEPA vacuums using DOP or equivalent. Testing shall ensure that total penetration from the unit does not exceed 0.03%, or 99.97% efficient of airborne particulate removal. DOP Testing must be in compliance with ASME N510-1989 (1995) and must be performed using a Temporary Mixing Chamber with installed baffles to allow uniform mixing of challenge aerosol.

.9 Fitting: Section of pipe other than straight uninterrupted sections including elbows, valves, tees, hangers, nipples, union or ends.

.10 Friable Material: means a material when dry can be crumbled, pulverized or powdered by hand pressure or is crumbled, pulverized or powdered.

.11 HEPA Filter: High Efficiency Particulate Arresting filter that is at least 99.97 percent efficient in collecting a 0.3 micrometre aerosol.

.12 PCM: Phase Contrast Microscopy.

.13 Polyethylene: Either polyethylene sheeting or rip-proof polyethylene sheeting (as specified) with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide a continuous polyethylene membrane to protect underlying surfaces from damage, and to prevent escape of asbestos fibres through sheeting into Occupied Areas.

.14 Occupied Area: Any area of the building outside the Asbestos Work Area.

.15 Personnel: All contractors employees, sub-contractors employees, supervisors.

.16 Remove: Remove means remove and dispose of (as applicable type of waste) unless followed by other instruction (e.g. remove and turn over to Owner).

1.7 Submittals

.1 Submit prior to starting work:
  .1 Schedule.
  .2 Workplace Safety and Insurance Board Clearance Certificate.
  .3 Insurance certificates.
  .4 Copy of Company Health and Safety Policy and applicable programs.
  .5 Ministry of Labour Notice of Project form.
  .6 Copy of Certificate of Approval for disposal of asbestos waste and location of landfill.
  .7 Pre-removal survey of damage in all areas where asbestos abatement will take place or waste will be transported.

.2 Submit the following information regarding personnel prior to starting work:
  .1 Resumes of the supervisory personnel.
  .2 Proof in the form of a certificate that supervisory personnel have attended a training course on asbestos removal (2 day minimum duration) or are certified as supervisors under the Ministry of Training, Colleges and Universities course 253S.
  .3 WHMIS training certificates for all personnel.
  .4 Written statement that personnel have had instruction on hazards of asbestos exposure, the use of respirator, protective clothing, worker and waste decontamination procedures, use of Glove Bags and all aspects of work procedures and protective measures.
  .5 Certificate proving that each worker on site has been fit tested for the respirator appropriate for the work being performed.

.3 Submit the following information regarding HEPA filtered devices prior to construction of enclosure or asbestos abatement:
  .1 Performance data on HEPA filtered vacuums including DOP tests no more than 3 months old.
  .2 Performance data on HEPA filtered dust collection devices including DOP tests no more than 3 months old.
  .3 DOP tests to be performed by an independent testing company.
    .1 DOP testing company is required to submit a detailed technical report of testing protocol, including Introduction, Methodology, Results, Conclusions, and Recommendations, including results of the Air-Aerosol Mixing Uniformity test as per ASME N510-1989 (1995).
    .2 DOP testing company must also provide calibration certificates from an independent calibration firm or from the manufacturer of the testing equipment for both the aerosol photometer and the pressure gauge on the aerosol generator dated within 1 calendar year from the on-site testing date.
.3 DOP testing company must also provide the National Sanitation Foundation (NSF) certification name and number of the on-site technician performing the testing.

.4 Proof of calibration of DOP testing equipment.

.4 Submit the following prior to isolating the work area:

.1 Written statement that the Ground Fault Interrupter Panels use CSA approved parts and have been inspected by the Electrical Safety Authority.

.2 Material Safety Data Sheets for chemicals or material used in the course of the Asbestos Abatement Project.

.5 Submit the following upon completion of the work:

.1 Manifests, waybills, bills of lading etc. as applicable for each type of waste.

1.8 Regulations

.1 Comply with Federal, provincial, and local requirements, provided that in any case of conflict among those requirements or with these Specifications the more stringent requirements shall apply. Work shall be performed under regulations in effect at the time work is performed. Regulations include but are not limited to the following:

.2 Ministry of Labour Occupational Health and Safety Act Regulations for Construction Projects including Revised Statutes of Ontario 1990, Chapter 0.1 and Ontario Regulation 278/05.

.3 Ministry of Transportation Regulations for the transport of asbestos waste, including the Transportation of Dangerous Goods Act.


1.9 Supervision

.1 Provide on site, a supervisor, with authority to oversee all aspects of the work, including but not limited to, health and safety, methods, scheduling, labour and equipment requirements.

.2 The supervisor must be on site at all times during work at risk of disturbing ACM. Failure to comply with this requirement may result in a stoppage of work, at no cost to the Owner.

.3 Provide a minimum of one supervisor for every 10 workers.

.4 Replace supervisory personnel, with approved replacements, within 3 working days of a written request from the Asbestos Abatement Consultant. Asbestos Abatement Consultant reserves the right to request replacement of supervisory personnel without explanation.

.5 Do not replace supervisory personnel without written approval from the Asbestos Abatement Consultant.
1.10 Quality Assurance

.1 Ensure the removal and handling of ACM or asbestos contaminated materials is performed by persons experienced in the methods, procedures and industry practices of asbestos abatement.

.2 Complete work so that at no time airborne asbestos, visible solid residue, or water runoff contaminates areas outside Asbestos Work Area. Asbestos Abatement Consultant is empowered to order a shutdown of work when a leak has occurred or is likely to occur. Cost of additional work by Asbestos Abatement Contractor and/or Asbestos Abatement Consultant to rectify unsatisfactory conditions shall be charged to the Asbestos Abatement Contractor.

.3 Perform all work involving other trades such as electrical, mechanical, carpentry, glazing etc. using licensed persons experienced and qualified for the work required.

.4 The Asbestos Abatement Consultant will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs required for the Work in accordance with the applicable construction safety legislation, other regulations or general construction practice. The Asbestos Abatement Consultant will not be responsible for or have control or charge over the acts or omissions of the Asbestos Abatement Contractor, his Subcontractors or their agents, employees or other persons performing any of the Work.

1.11 Notification

.1 Notify Sanitary Landfill site as per Ontario Regulation 347 as amended.

.2 Inform all sub trades of the presence of ACM identified in the contract documents.

.3 Notify the Owner or Owners Representative, the Joint Occupational Health and Safety Committee and the Ontario Ministry of Labour, as required by Regulation 278/05, if friable materials not identified in the contract documents are discovered during the course of the work. Stop work in these areas immediately.

1.12 Instruction and Training

.1 Provide instruction and training to all workers including the following:

.1 Hazards of asbestos.

.2 Use, care and disposal of protective equipment (including but not limited to respirators and filters) and clothing that would be used and worn during abatement work, including:

.1 Limitations of equipment.

.2 Inspection and maintenance of equipment.

.3 Proper fitting of equipment.

.4 Disinfecting and cleaning of equipment.

.3 Personal hygiene to be observed when performing the work.

.4 The measures and procedures prescribed by this section including decontamination of the worker.

.5 Instruction and training must be provided by a competent person.
1.13 **Personal Protection**

.1 Protect all personnel at all times when possibility of disturbance of ACM exists.

.2 Provide workers with full-face respirators with P100 high efficiency (HEPA) cartridge filters during entry into ceiling space with asbestos-containing sprayed fireproofing and during the use of HEPA filtered power tools to remove or disturb other non-friable ACM.

.3 Provide workers, at a minimum, with non-powered half-face respirators with P100 high efficiency (HEPA) cartridge filters for all other work of this section.

.4 Respirators shall be:

.1 Certified by the National Institute of Occupational Safety and Health (NIOSH) or other testing agency acceptable to the Ministry of Labour.

.2 Fitted so that there is an effective seal between the respirator and the worker’s face. Ensure that no person required to enter an Asbestos Work Area has facial hair which affects the seal between respirator and face.

.3 Assigned to a worker for their exclusive use.

.4 Maintained in accordance with manufacturer’s specifications.

.5 Cleaned, disinfected and inspected by a competent person after use on each shift, or more often if required.

.6 Repaired or have damaged or deteriorated parts replaced.

.7 Stored in a clean and sanitary location.

.8 Provided with new filters as necessary, according to manufacturer's instructions.

.1 Replace cartridge filters for negative pressure respirator every 16 hours of wear unless tested on site.

.2 Replace PAPR cartridge filters every 8 hours of wear unless tested on site.

.3 Mark filters for rotation and regular replacement.

.9 Worn by personnel who have been fit checked by qualitative or quantitative fit-testing. Instruction must be provided by a competent person as defined by the Occupational Health and Safety Act.

.5 Provide protective clothing, to all personnel which:

.1 Is made of a material that does not readily retain nor permit penetration of asbestos fibres.

.2 Consists of head covering and full body covering that fits snugly at the ankles, wrists and neck.

.3 Is replaced or repaired if torn or ripped.

.4 Is disposed of as ACM.

.6 Decontaminate clothing or protective clothing by using a HEPA Vacuum, or by damp wiping prior to leaving the Asbestos Work Area:

.7 Wear hard hats, safety shoes and other personal protective equipment required by applicable construction safety regulations.
Provide soap, towels and facilities for washing of hands and face, which shall be used by all personnel when leaving the Asbestos Work Area.

Prohibit smoking, eating, drinking, chewing in the Asbestos Work Area.

1.14 Authorized Visitor Protection

1. Provide clean protective clothing and equipment, and approved respirators to Authorized Visitors.

2. Ensure Authorized Visitors have received required training prior to granting entry into Asbestos Work Area.

1.15 Inspection

1. From commencement of work until completion of clean-up operations, the Asbestos Abatement Consultant may be present periodically on site both inside and outside the Asbestos Work Area.

2. The following Milestone Inspections will take place, at the Owner's cost:

   1. Milestone Inspection A - Clean Site Preparation
      1. Inspection of preparations and set-up prior to contaminated work in the Asbestos Work Area.

   2. Milestone Inspection D - Visual Clearance
      1. Inspection of Asbestos Work Area after removal of all asbestos, but prior to application of lock-down agent.

3. Do not proceed with next phase of Work until written approval of each milestone is received from the Asbestos Abatement Consultant.

4. In addition to the Milestone Inspections, inspection of the Asbestos Work Area may be performed to confirm the Asbestos Abatement Contractor's compliance with the requirements of the contract documents and governing authorities. Any deviations from these requirements that have not been approved in writing, may result in a stoppage of work, at no additional cost to the Owner.

5. The Asbestos Abatement Consultant is empowered by the Owner to inspect for final cleanliness at completion. Additional labour or materials expended by the Asbestos Abatement Contractor to provide satisfactory performance to the level specified shall be at no additional cost.

6. Inspection s performed as a result of Asbestos Abatement Contractor's failure to perform satisfactorily regarding quality, safety, or schedule may be charged to the Asbestos Abatement Contractor at the Owner’s discretion.

PART 2 PRODUCTS AND FACILITIES

2.1 Materials and Equipment

1. All materials and equipment brought to work site must be in good condition and free of asbestos, asbestos debris, and fibrous materials.

2. Airless Sprayer: AC powered pressure washer that allows wetting agent to mix with water, uses no air or compressed air, and has a nozzle to regulate power and pressure.
.3 **Amended Water:** Water with wetting agent added for purpose of reducing surface tension to allow thorough wetting of ACM.

.4 **Asbestos Waste Container:** An impermeable container acceptable to disposal site and Ministry of the Environment comprised of one of the following:

.1 A 6 mil (0.15 mm) labelled yellow sealed polyethylene bag, inside a second clear 6 mil (0.15 mm) sealed polyethylene bag.

.2 A 6 mil (0.15 mm) sealed polyethylene bag, positioned inside or outside a rigid sealed container of sufficient strength to prevent perforation of the container during filling, transportation and disposal.

.3 Labelled containers as required by the Ontario Ministry of the Environment Reg. 347 as amended and Regulation 278/05.

.5 **HEPA Vacuum:** High Efficiency Particulate Arresting (HEPA) filtered vacuum equipment with a filter system capable of collecting and retaining spherical particles greater than 0.3 microns at 99.97% efficiency.

.6 **Ground Fault Panel:** Electrical panel as follows:

.1 Ground fault circuit interrupters of sufficient capacity to power temporary electrical equipment and lights in Asbestos Work Area.

.2 Interrupters to have a 5 mA ground fault protection.

.3 Necessary accessories including main switch disconnect, ground fault interrupter lights, test switch to ensure unit is working, and reset switch.

.4 Openings sealed to prevent moisture or dust penetration.

.5 Inspected by the Electrical Safety Authority.

.6 Panel uses CSA approved parts and been constructed, inspected and installed by a licensed electrician.

.7 **OSB:** Oriented Strand Board.

.8 **Polyethylene Sheeting:** 6 mil (0.15 mm) minimum thickness unless otherwise specified in sheet size to minimize joints. New materials only.

.9 **Post Removal Sealant (or Lockdown):** Sealant that when applied to surfaces serves the function of trapping residual asbestos fibres or other dust. Product must have flame spread and smoke development ratings both less than 50. Product shall leave no stain when dry. Post Removal Sealant shall be compatible with replacement insulation or fireproofing where required and capable of withstanding service temperature of substrate. Apply to manufacturer’s instructions.

.10 **Protective Clothing:** Disposable full body coveralls complete with hoods manufactured of a material which does not permit penetration of asbestos fibres. Coveralls to fit snugly at ankles, wrists and neck. Acceptable materials: Dupont Tyvek or Kimberly Clark Kleenguard.

.11 **Rip-Proof Polyethylene Sheeting:** Minimum requirements 8 mil (0.20 mm) fabric made up from 5 mil (0.13 mm) weave and 2 layers of 1.5 mil (0.05 mm) poly laminate or approved equal. In sheet size to minimize on-site seams and overlaps. New materials only.
Sprayer: Garden type portable manual sprayer or water hose with spray attachment if suitable.

Tape: Duct tape or tape suitable for sealing polyethylene to surfaces under both dry and wet conditions in the presence of Amended Water.

Wetting Agent: Non-sudsing surfactant added to water to reduce surface tension and increase wetting ability.

2.2 Signage

 Work Area Signs: Post signs in both official languages at access points to the Asbestos Work Area as follows:

.1 CAUTION.
.2 Asbestos Dust Hazard Area.
.3 Unauthorized Entry Prohibited.
.4 Wear Assigned Protective Equipment.
.5 Breathing Asbestos Dust May Cause Serious Bodily Harm.

Vehicles, Bins and Asbestos Waste Containers: Post signs on both sides of every vehicle used for the transportation of asbestos waste and on every asbestos waste container. Signs must display thereon in large, easily legible letters that contrast in colour with the background the word “CAUTION” in letters not less than ten centimetres in height and the words:

.1 CONTAINS ASBESTOS FIBRES
.2 Avoid Creating Dust and Spillage
.3 Asbestos May be Harmful To Your Health
.4 Wear Approved Protective Equipment.

Place placards in accordance with Transportation of Dangerous Goods Act.

PART 3 EXECUTION

3.1 Site Preparation - General

.1 Perform pre-removal damage survey and submit to Asbestos Abatement Consultant.
.2 Moving of equipment, tools, supplies, and stored materials that can be performed without disturbing ACM will be performed by others.
.3 Remove visible dust and friable material from all surfaces in the work area including those to be worked on, using HEPA Vacuums or wet wiping using Type 2 Procedures as required by O. Reg. 278/05.
.4 Maintain emergency and fire exits from Asbestos Work Area, or establish alternative exits satisfactory to Provincial Fire Marshall and local authorities having jurisdiction. Maintain extra routes from occupied areas. Place emergency exit signs at locations to clearly mark exit route. Seal emergency exit doors so as not to impede use of door during emergency evacuation.
.5 Isolate, at panel, and disconnect existing power supply to Asbestos Work Area. Power supply to remaining areas of building must not be disrupted during work of this section.
.1 Lock-out/tag-out power at electrical panels.
.2 Mark/tag any items within or passing through the Asbestos Work Area that are to remain live including but not limited to cable, conduit, wire, fixtures, equipment panels, etc.
.6 Provide amended water for wetting ACM, and adequate method of wetting (garden sprayers, airless sprayers, etc).
.1 All electrical equipment used during work shall be supplied power from a Ground Fault Panel.

3.2 Site Preparation – No Enclosure Required

.1 Cover floors, finishes, millwork, equipment and furnishings remaining in the Asbestos Work Area with rip-proof polyethylene drop sheets to control the spread of dust. Polyethylene should extend a minimum of 20 feet from wall where work is taking place.
.2 Install one layer of rip proof polyethylene sheeting at exterior of wall. Polyethylene should extend a minimum of 20 feet from wall where work is taking place.
.3 Install asbestos warning caution tape around work area both inside and outside of building at edge of polyethylene.
.4 Install Signage in clearly visible locations and in sufficient numbers to adequately warn of an asbestos dust hazard.
.5 Place HEPA vacuum(s) in Asbestos Work Area.
.6 Place HEPA equipped power tools in Asbestos Work Area.
.7 Place required tools to complete the abatement with the Asbestos Work Area.
.8 Designate an area for handling of Asbestos Waste. Area must have rip-proof polyethylene on ground, and be used for double bagging waste.
.9 Designate an area for worker decontamination. This area should contain all materials used by workers for cleaning themselves, and have waste bags for discarded suits, respirator cartridges, etc.

3.3 Maintenance of Asbestos Work Area

.1 Inspect polyethylene sheeting and ensure it is free of holes or damage. Repair damage and remedy defects immediately.
.2 Inspect electrical panels and ensure locks and tags are on panels prior to entering the Asbestos Work Area.
.3 Maintain Asbestos Work Area in tidy condition.
.4 Remove standing water on polyethylene drop sheets at the end of every shift.
.5 Turn off water supply to any hoses and reduce pressure in hose, prior to leaving the Asbestos Work Area at end of shift.
3.4 **Asbestos Removal - General**

1. Do not use compressed air to clean or remove dust or debris.
2. Frequently and at regular intervals during the work, clean up dust and waste using HEPA vacuums and/or wet sweeping or mopping.
3. Frequently and at regular intervals, place all waste in asbestos waste containers.
4. Immediately upon completion of work, clean area with HEPA vacuum and/or wet sweeping or mopping.

3.5 **Asbestos Removal - Non-Friable Tar and Transite Sheeting Behind Steel Cladding with HEPA Filtered Power Tools**

1. Wet all material to be disturbed.
2. Undo fasteners holding cladding and sheeting in place. Power tools must be equipped with a HEPA filtered dust collection device.
3. Scrape to remove any remaining material adhered to substrate or supporting structure.
4. Place removed ACM directly into an asbestos waste container.
5. Wet clean or HEPA vacuum the entire Asbestos Work Area, including surfaces not covered with polyethylene sheeting. Any materials or equipment removed to access ACM that are to be reused, must be wet cleaned or vacuumed prior to reinstatement.
6. Wet clean and wipe down lifts and scaffolding prior to removing from the work area.

3.6 **Waste and Material Handling**

1. Waste bins must be placed on grade or in receiving.
2. All bins must be covered and locked when waste transfer is not being performed.
3. Ensure redundant non-ACM, rubble, debris, etc. removed during contaminated work are treated, packaged, transported and disposed of as asbestos waste.
4. Clean, wash and apply Post Removal Sealant to metal waste prior to removal from Asbestos Work Area. Recycle metals or dispose of metals as clean waste.
5. Clean, wash and apply Post Removal Sealant to non-porous materials prior to disposal as clean waste. Obtain prior written approval from the Asbestos Abatement Consultant for each individual type of material.
6. Clean and wash equipment prior to removal from Asbestos Work Area if removed prior to completion.
7. Place all equipment, tools and unused materials that cannot be cleaned in Asbestos Waste Containers.
8. As work progresses, and at regular intervals, transport the sealed and labelled asbestos waste containers from the Asbestos Work Area to waste bin.
9. Place items in bins according to waste classification. Place asbestos waste, metals, non-asbestos waste, etc. in separate bins.
Removal of waste containers and decontaminated tools and materials from the Asbestos Work Area shall be performed as follows:

1. Remove any visible contamination from the surface of non-porous or cleanable waste being removed from the Asbestos Work Area. If the item can be cleaned, remove it from the site as clean waste.

2. Place waste or item in Asbestos Waste Container and seal closed.


4. Transfer to designated waste handling area and place in second Asbestos Waste Container. Seal closed.

5. Remove the item from the Asbestos Work Area.

Dispose of asbestos-contaminated waste that could tear a 6 mil (0.15 mm) polyethylene bag in sealed rigid Asbestos Waste Container.

Transport waste and materials via the predetermined routes and exits. Arrange waste transfer route with Owner. Use a closed, covered cart to transport through Occupied Areas.

Limit transportation of waste and materials through Occupied Areas of the building to Quiet Hours.

Provide workers transporting waste with means to access full personal protective equipment and all tools required to properly clean up spilled ACM in the case of a rupture of an Asbestos Waste Container.

Pick-up and drop off of garbage bin shall be at pre-approved times, and must not interfere with the Owner’s operations.

Transport asbestos contaminated waste to landfill licensed by Ontario Ministry of the Environment.

Co-operate with Ministry of the Environment inspectors and immediately carry out instructions for remedial work at dump to maintain environment, at no additional cost to the Owner.

### 3.7 Clean-Up and Dismantling

1. Wash or HEPA vacuum equipment used in Asbestos Work Area including all scaffolding and lifts.

2. Wash remaining equipment and tools used in contaminated Asbestos Work Area to remove all asbestos contamination, or place in Asbestos Waste Containers prior to being removed from Asbestos Work Area.

3. Clean polyethylene sheeting and drop sheets with HEPA vacuum or wet cleaning methods at completion of work.

4. Wet drop sheets and polyethylene sheeting.

5. Carefully roll polyethylene sheeting on floors and ground. As polyethylene is rolled away, immediately remove visible debris beneath with a HEPA vacuum.

6. Remove and dispose of polyethylene sheeting as asbestos waste.
.7 Remove remaining site isolation, seals, tape, etc.
.8 Seal openings in HEPA vacuums.
.9 Remove ground fault panels.
.10 Place contaminated materials including polyethylene sheeting, drop sheets, seals, tape, disposable coveralls, and other contaminated waste in asbestos waste containers.

3.8 Re-Establishment of Items

.1 Upon completion of work:
   .1 Remove tags and locks from electrical panels and re-energize equipment and items.
   .2 Clean and vacuum Asbestos Work Area.

END OF SECTION
PART 1  GENERAL

1.1  General and Related Work

.1 Perform the following work practices for the handling, packaging, and transfer of materials containing polychlorinated biphenyls (PCB).

.2 Unless otherwise shown or specified it is the intent that work performed as per this section will result in the removal and disposal or decontamination of all PCB-containing materials and all materials which have been contaminated by PCBs either during or prior to work of this section.

1.2  Recommended Bidders

.1 The following is a list of recommended bidders by The Corporation of the City of London in conjunction with Pinchin Environmental Ltd. to complete the Division 13 hazardous materials abatement work as outlined in the contract documents:

   .1 JoBi Construction Ltd. (519)485–6181
   .2 JMX Environmental Inc. (905)426-8315
   .3 Quantum Murray 1-800-251-7773
   .4 Biggs and Narciso (519)433-9998

1.3  Site Conditions

.1 Assume one barrel of PCB Waste based on the following:

   .1 Fluorescent and HID light ballasts in the building are assumed to contain PCBs.

   .2 Underground cable has not been sampled for PCB content. Collect, submit and have analyzed, minimum 3 samples (at middle and ends) of any PCB-suspect cable prior to disposal as required by renovation scope of work. Packaging and disposal of any PCB cable is not included in lump sum bid.

1.4  Outline of Work

.1 Remove lamps, lenses, light fixtures, heat shields and ballasts throughout the project area.

.2 Remove bx cable back to junction box.

.3 Recycle metal from light fixtures, heat shields.

.4 Remove and dispose of lenses.

.5 Remove and recycle lamps.

.6 Identify ballasts as either non-PCB or PCB containing.

.7 Remove and dispose of non-PCB ballasts, or recycle.

.8 Remove and package PCB-containing ballasts.

.9 Transport packaged PCB waste to a MOE (Ministry of the Environment) approved incineration facility and destroy. Contractor to assume all costs incurred including destruction, transport, permits, approvals and record keeping.

1.5  Schedule
.1 Start work on:
  .1 To be determined, refer to project schedule

.2 Complete work by:
  .1 To be determined, refer to project schedule

.3 Quiet hours are defined as Weekends and 6:00 PM to 6:00 AM, Monday to Friday.

1.6 Definitions

.1 Competent Worker: A worker who is qualified because of knowledge, training and experience to perform the work, is familiar with the Occupational Health and Safety Act and Environmental Protection Act, has knowledge of the potential or actual danger to health and safety in the work.

.2 Polyethylene: Either polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide a continuous polyethylene membrane to protect underlying surfaces from damage.

.3 PCBs: Monochlorinated or Polychlorinated Biphenyls (or any mixture of both).

.4 PCB Equipment: Equipment designed or manufactured to operate with PCB liquid or to which PCB liquid was added or drums and other containers used for the storage of PCB liquid.

.5 PCB Liquid: means liquid containing PCBs at a concentration of more than fifty milligrams per kilogram, or 50 parts per million.

.6 PCB Material: means material containing PCBs at a concentration of more than fifty milligrams per kilogram or 50 parts per million, whether the material is liquid or not.

.7 PCB Waste: PCB Equipment, PCB Material, PCB Liquids and materials or items contaminated with PCBs.

.8 Personnel: All contractors’ employees, sub-contractors’ employees, supervisors.

.9 Work Area: Area of building from which PCB-containing items are being removed.

1.7 Submittals

.1 Prior to starting work, the Contractor performing work of this section shall submit:
  .1 Workplace Safety and Insurance Board Clearance Certificate.
  .2 Insurance certificates.
  .3 Company Health and Safety Policy.
  .4 Certificate of Approval for transportation of PCB waste and location of destruction facility.

.2 Prior to starting work, submit the following information regarding personnel:
  .1 WHMIS training certificates for all personnel.
  .2 Material Safety Data Sheets for chemicals or material used in the course of the Asbestos Abatement Project.

.3 Submit the following upon completion of the work.
.1 Manifests, waybills, certificate of destruction/recycling etc. as applicable for each type of waste.

1.8 Regulations

.1 Perform work in accordance with current applicable environmental and occupational health regulations and codes including but not limited to:

.1 Chlorobiphenyls Regulations (SOR/91-152; Amended SOR/2000-102).
.2 Regulations Respecting Mobile System for the Destruction and Treatment of Chlorobiphenyls that are Operated by or under Contract with Federal Institutions (SOR/90-5; amended SOR/93-231 and SOR/2000-105).
.3 Regulations Respecting the Storage of Material Containing Chlorobiphenyls (PCBs) (SOR/92-507, Amended SOR/2000-102).
.4 Regulations Respecting the Import and Export of Hazardous Wastes (SOR/92-637; Amended 94-459; SOR 94-684; SOR/2000-103).
.5 Waste Management – PCBs, R.R.O. Regulation 362/90.
.6 Mobile PCB Destruction Facilities, R.R.O. Regulation 352/90.
.7 Regulation 347, General Waste, as amended.

1.9 Supervision

.1 Provide on site, a supervisor, with authority to oversee aspects of the work, including but not limited to, health and safety, methods, scheduling, labour and equipment requirements.
.2 A minimum of one supervisor for every 10 workers is required.
.3 Replace supervisory personnel, with approved replacements, within 3 working days of a written request.

1.10 Quality Assurance

.1 Ensure the removal and handling of PCBs is performed by persons experienced in the methods, procedures and industry practices.
.2 Complete work so that at no time do PCBs contaminate the building or environment.

1.11 Instruction and Training

.1 Instruction and training must be provided to all workers and supervisors. Instruction and training includes the following:

.1 Hazards of PCBs.
.2 Use, care and disposal of protective equipment (including but not limited to respirators and filters) and clothing that would be used and worn during work, including:
.1 Limitations of equipment.
.2 Inspection and maintenance of equipment.
.3 Proper fitting of equipment.
.4 Disinfecting and cleaning of equipment.
.3 Personal hygiene to be observed when performing the work.
.4 The measures and procedures prescribed by this section.
.5 Instruction and training must be provided by a competent, qualified person.

1.12 Personal Protection

.1 During work involving PCBs, personnel are to wear the following personal protective equipment:
   .1 Gloves.
   .2 Aprons.
   .3 Protective coveralls.
   .4 Protective eyewear.

.2 During work involving PCB Liquid, personnel are to wear the following additional personal protective equipment:
   .1 Face Shields.

.3 Protective clothing shall be replaced or repaired if torn or ripped.

.4 Prior to leaving the Work Area, personnel shall decontaminate their clothing or protective clothing by using a HEPA Vacuum, or by damp wiping.

.5 Dispose of protective clothing not to be reused as PCB waste.

.6 Provide soap, towels and facilities for washing of hands and face, which shall be used by all personnel when leaving the Work Area.

.7 Prohibit smoking, eating, drinking, chewing in the Work Area.

.8 Use hard hats, safety shoes and other personal protective equipment required by applicable construction safety regulations.

.9 PCB liquids do not constitute an inhalation hazard when handled at room temperature. In the event of a fire or other heating of PCB Equipment, Material, Waste or Liquid, immediately vacate the area. Air purifying filter respirators DO NOT provide protection against PCB vapours.

.10 In the event of PCB ingestion, obtain medical assistance immediately.

.11 Respiratory protection shall be:
   .1 Non-powered half-face respirators with Combination P100 high efficiency (HEPA)/chemical cartridges.
   .2 Respiratory protection shall be certified by the National Institute of Occupational Safety and Health (NIOSH) or other testing agency acceptable to the Ministry of Labour.
   .3 Fitted so that there is an effective seal between the respirator and the worker’s face. Ensure that no person required to enter an Asbestos Work Area has facial hair which affects the seal between respirator and face.
   .4 Assigned to a worker for his exclusive use.
   .5 Maintained in accordance with manufacturer’s specifications.
.6 Cleaned, disinfected and inspected by a competent person after use on each shift, or more often if required.
.7 Repaired or have damaged or deteriorated parts replaced.
.8 Stored in a clean and sanitary location.
.9 Test and replace used filters as necessary according to manufacturer's specifications or the following minimum requirements:
   .1 Replace cartridge filters for negative pressure respirator every 16 hours of wear unless tested on site.
   .2 Mark filters for rotation and regular replacement.
.10 Personnel must have respirators fit checked by qualitative or quantitative fit-testing. Instruction must be provided by a competent person as defined by the Occupational Health and Safety Act.

PART 2  PRODUCTS

2.1 Materials
   .1 Apron: Full body neoprene apron.
   .2 Containment Drums: new, not used double bung 45 gallon No. 16 gauge cold rolled steel drums with removable steel lid, PCB resistant gasket, and 12 gauge compression type ring closure with 5/8" bolt and forged lug. Drums shall be newly painted inside and out with bright white rust-resistant enamel.
   .3 Drum liners: clear polyethylene bag, 36" x 60", 6 mil thick. Open one 36" end.
   .4 Face Shield: Full face shield to attach to hard hat to prevent splashes from Askarel Type Liquid from hitting skin.
   .5 Gloves: Elbow length, of PCB resistant material (neoprene) and in good condition.
   .6 Label: Number 4 Severe Hazard Label, completed as Health 3, Fire 1, Environment 4, and Reactivity 1. Available from Environment Canada Environmental Protection Service, 7th Floor, 25 St. Clair East, Toronto (966-5840).
   .7 Polyethylene Sheeting: 6 mil (0.15 mm) minimum thickness unless otherwise specified, in sheet size to minimize joints. New materials only.
   .8 Protective Coveralls: Disposable full body coveralls to prevent splashes to clothing, complete with hoods. Coveralls to fit snugly at ankles, wrists and neck. Acceptable materials: Tyvek. Tyvek material does not provide protection against PCB liquid if it soaks through.
   .9 Vermiculite: pre-packed, Industrial grade 3, containing no asbestos.

PART 3  EXECUTION

3.1 PCB Packaging
   .1 Wear personal protection at all times when disturbing PCB Equipment, Liquids, Material and Waste.
   .2 Do not contaminate building surfaces with PCB-containing oil, tar etc.
.3 Install polyethylene sheeting to protect surfaces and finishes.

.4 Notify Owner’s Representative of any PCB spills immediately.

.1 Any spills of PCBs are to be cleaned to the satisfaction of the Owner’s Representative at the contractors cost. This includes removal and replacement of building materials as required.

.5 Place PCB ballasts, and equipment on polyethylene sheeting immediately after removal.

.6 Do not drop PCB Equipment, Waste or Materials.

.7 Avoid rough handling of PCB Equipment and Materials. Do not throw into drum.

.8 Isolate, at panel, and disconnect existing power supply to electrical equipment. Power supply to remaining areas of building must not be disrupted during work of this section.

.1 Lock-out/tag-out power at electrical panels.

.2 Mark/tag any items within or passing through the Work Area that are to remain live including but not limited to cable, conduit, wire, fixtures, equipment panels, etc. as required.

.9 Remove ballasts, cables as specified.

.1 Remove bx cable for lights back to junction box.

.2 Remove wire and cable for capacitors and transformers back to electrical panel.

.3 Pour 2" layer of vermiculite or absorbent in Containment Drum. Place polyethylene liner into Containment Drum. No further fill is required.

.4 Place ballasts on end in Containment Drum.

.10 When full:

.1 Seal liner bag with duct tape.

.2 Seal drum with lid, gasket and compression ring.

.3 Affix specified and completed label.

.4 Do not leave liner bags or drums open overnight.

.11 As filled drums accumulate, transfer to temporary storage area.

.12 Temporary storage facility to be a fully enclosed block wall room within the building complete with appropriate warning signs.

.13 Remove contaminated material, including gloves, aprons, rags, hoses, solvents, protective coveralls, polyethylene, etc. and package as per the above.

3.2 Transportation and Reporting

.1 Transport materials following Transportation of Dangerous Goods Act.

.1 Transport PCBs to approved incineration site for destruction and ensure materials are destroyed.

.2 The facility used to process the PCBs shall be approved by the Ministry of the Environment, and shall have valid Certificates of Approval to carry out the work outlined herein.
.1 The facility must issue a Certificate of Destruction identifying types and quantities of PCBs generated from the project.

.3 A typed and signed transfer document for each transfer of PCBs, is to be submitted to Owner's representative, giving following:

.1 Number of drums.
.2 Contents including ballast type, capacitor type, oil type, transformer type and approximate quantities.
.3 Approximate net weight of contents.
.4 Dates removal begun and completed (for each lot).
.5 Date drums transferred.

.4 Submit certificate(s) of destruction, certificate of recycling (as applicable) and waste manifests from all transfer points. Submit the above for waste regardless of single transport or as blended waste.

3.3 Fire and Explosion Response

.1 PCB liquids are relatively non-flammable. However, if exposed to flame or hot surfaces, a higher vapour concentration will result. At high temperatures PCBs may decompose and chemically rearrange to produce highly toxic gases, vapours, and soot.

.2 In the event of a fire involving PCBs, immediately stop work and report to the local Fire Marshall and Fire Department. Report specifically the presence of PCBs. The necessity to rapidly report the fire overrides any decontamination procedures.

.3 Cause all workers to evacuate the site. When leaving, shut down all water in use. Only personnel trained in use of, and wearing SCUBA apparatus, will be allowed to re-enter site.

.4 Do not return to site until Owner's Representative and Ontario Ministry of the Environment representatives have declared the area for re-entry.

3.4 Re-Establishment of Items

.1 Upon completion of work:

.1 Remove tags and locks from electrical panels and re-energize equipment and items.

.2 Clean, mop and vacuum the Work Area.

END OF SECTION
PART 1  GENERAL

1.1  General and Related Work

.1 Perform the following work practices for the handling, packaging, and transfer of Mercury Materials and Waste.

.2 Unless otherwise shown or specified it is the intent that work performed as per this section will result in the removal and disposal or decontamination of all mercury-containing materials and all materials which have been contaminated by mercury either during or prior to work of this section.

1.2  Recommended Bidders

.1 The following is a list of recommended bidders by The Corporation of the City of London in conjunction with Pinchin Environmental Ltd. to complete the Division 13 hazardous materials abatement work as outlined in the contract documents:

   .1 JoBi Construction Ltd. (519)485–6181
   .2 JMX Environmental Inc. (905)426-8315
   .3 Quantum Murray 1-800-251-7773
   .4 Biggs and Narciso (519)433-9998

1.3  Site Conditions

.1 Mercury vapour is present in fluorescent lamps throughout the building.

.2 Mercury vapour is present in all mercury vapour lamps, metal halide lamps, high pressure sodium lamps and neon lamps throughout the building.

1.4  Outline of Work

.1 Remove fluorescent, HID and sod lamps.

.2 Package and recycle all mercury, mercury contaminated materials and mercury waste.

1.5  Schedule

.1 Start work on:

   .1 To be determined, refer to project schedule

.2 Complete work by:

   .1 To be determined, refer to project schedule

1.6  Definitions

.1 Competent Worker: A worker who is qualified because of knowledge, training and experience to perform the work, is familiar with the Occupational Health and Safety Act and Environmental Protection Act, has knowledge of the potential or actual danger to health and safety in the work.

.2 Mercury Waste: Equipment, materials or items containing mercury or contaminated with mercury.
.3 **Polyethylene:** Either polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required providing a continuous polyethylene membrane to protect underlying surfaces from damage.

.4 **Personnel:** All contractors’ employees, sub-contractors employees, supervisors.

.5 **Work Area:** Area of building from which mercury containing items are being removed.

1.7 **Submittals**

.1 Prior to starting work, the Contractor performing work of this section shall submit:

.1 Workplace Safety and Insurance Board Clearance Certificate.
.2 Insurance certificates.
.3 Company Health and Safety Policy.
.4 Certificate of Approval for transportation of mercury waste and location of recycling facility.

.2 Prior to starting work, submit the following information regarding personnel:

.1 WHMIS training certificates for all personnel.
.2 Material Safety Data Sheets for chemicals or material used in the course of the Asbestos Abatement Project.

.3 Submit the following upon completion of the work.

.1 Manifests, waybills, certificate of destruction/recycling etc. as applicable for each type of waste.

1.8 **Regulations**

.1 Perform work in accordance with current applicable environmental and occupational health regulations and codes including but not limited to:

.1 Regulation 347, General Waste, as amended.

1.9 **Supervision**

.1 Provide on site, a supervisor, with authority to oversee aspects of the work, including but not limited to, health and safety, methods, scheduling, labour and equipment requirements.

.2 A minimum of one supervisor for every 10 workers is required.

.3 Replace supervisory personnel, with approved replacements, within 3 working days of a written request.

1.10 **Quality Assurance**

.1 Ensure the removal and handling of Mercury is performed by persons experienced in the methods, procedures and industry practices.

.2 Complete work so that at no time does mercury contaminate the building or environment.

1.11 **Instruction and Training**
.1 Instruction and training must be provided to all workers and supervisors. Instruction and training includes the following:

.1 Hazards of Mercury.

.2 Use, care and disposal of protective equipment (including but not limited to respirators and filters) and clothing that would be used and worn during work, including:

.1 Limitations of equipment.

.2 Inspection and maintenance of equipment.

.3 Proper fitting of equipment.

.4 Disinfecting and cleaning of equipment.

.3 Personal hygiene to be observed when performing the work.

.4 The measures and procedures prescribed by this section.

.5 Instruction and training must be provided by a competent, qualified person.

1.12 Personal Protection

.1 During work involving mercury, personnel are to wear the following additional personal protective equipment:

.1 Non-powered half-face respirators with mercury vapour cartridges with life span indicators in the cartridge.

.2 Protective coveralls.

.3 Protective eyewear/face shield.

.4 Chemical resistant gloves and apron.

.2 Respiratory protection shall be certified by the National Institute of Occupational Safety and Health (NIOSH) or other testing agency acceptable to the Ministry of Labour.

.3 Respirators shall be:

.1 Fitted so that there is an effective seal between the respirator and the worker’s face. Ensure that no person required to enter the Work Area has facial hair which affects the seal between respirator and face.

.2 Assigned to a worker for his exclusive use.

.3 Maintained in accordance with manufacturer’s specifications.

.4 Cleaned, disinfected and inspected by a competent person after use on each shift, or more often if required.

.5 Repaired or have damaged or deteriorated parts replaced.

.6 Stored in a clean and sanitary location.

.4 Replace filters as necessary.

.5 Personnel must have respirators fit checked by qualitative or quantitative fit-testing. Instruction must be provided by a competent person as defined by the Occupational Health and Safety Act.

.6 Personnel shall wear and use the respirator provided.
.7 Protective clothing shall be replaced or repaired if torn or ripped.
.8 Prior to leaving the Work Area, personnel shall decontaminate their clothing or protective clothing by using a HEPA Vacuum, or by damp wiping.
.9 Dispose of protective clothing not to be reused as Mercury waste.
.10 Provide soap, towels and facilities for washing of hands and face, which shall be used by all personnel when leaving the Asbestos Work Area.
.11 Prohibit smoking, eating, drinking, chewing in the Work Area.
.12 Use hard hats, safety shoes and other personal protective equipment required by applicable construction safety regulations.

PART 2 PRODUCTS

2.1 Materials

.1 Containment Drums: new, not used double bung 45 gallon No. 16 gauge cold rolled steel drums with removable steel lid, chemical resistant gasket, and 12 gauge compression type ring closure with 5/8" bolt and forged lug. Drums shall be newly painted inside and out with bright white rust-resistant enamel.

.2 Drum liners: clear polyethylene bag, 36" x 60", 6 mils thick. Open one 36" end.

.3 Mercury Sponge: A plated metal-wool pad for the pick-up of mercury spills.

.4 Mercury Vacuum: Nilfisk VT Mercury Vacuum or equal. Vacuum used to collect liquid mercury and granular mercury compounds with an internal HEPA filter and an activated carbon adsorbent filter to purify exhaust air of mercury vapours.

.5 Neutralizing Agent: Mercon X or similar. Mercury neutralizing solution such as 20% sodium sulphide or sodium thiosulphate.

.6 Pipe and Drain Neutralizing Agent: MerconGel or similar solution that is designed to prevent the release of mercury vapour from traps, collection systems, pipes, drains and stand pipes.

.7 Polyethylene Sheeting: 6 mil (0.15 mm) minimum thickness unless otherwise specified, in sheet size to minimize joints. New materials only.

.8 Protective Coveralls: Disposable full body coveralls to prevent splashes to clothing, complete with hoods. Coveralls to fit snugly at ankles, wrists and neck. Acceptable materials: Tyvek.

.9 Vermiculite: pre-packed, Industrial grade 3, containing no asbestos.

PART 3 EXECUTION

3.1 Mercury Packaging

.1 Wear personal protection at all times when disturbing lamps, equipment and items that contain mercury.

.2 Do not drop mercury-containing materials.

.3 Do not contaminate building surfaces with mercury.
4. Protect work area by installing polyethylene drop sheets or sealed polyethylene sheeting below, and at surrounding work area.

5. Isolate, at panel, and disconnect existing power supply to electrical equipment. Power supply to remaining areas of building must not be disrupted during work of this section.
   1. Lock-out/tag-out power at electrical panels.
   2. Mark/tag any items within or passing through the Work Area that are to remain live including but not limited to cable, conduit, wire, fixtures, equipment panels, etc. as required.

6. Remove and package entire mercury containing components (i.e. boiler flow valve, thermostat etc.) for recycling. Do not drain mercury.

7. Package lamps in cardboard boxes designed for lamps of that size. Do not break lamps.

8. Place other mercury materials into containment drums. Insert drum liner. When full:
   1. Seal liner bag with duct tape.
   2. Seal drum with lid, gasket and compression ring.
   3. Affix label.
   4. Do not leave liner bags or drums open overnight.

9. As filled drums accumulate, transfer to temporary storage area.

3.2 Spill Containment

1. For large mercury spills:
   1. Evacuate area. Only personnel using the specified PPE are to be in spill area.
   2. Deactivate air handling systems.
   3. Open windows or provide ventilation to area.
   4. Deactivate heat systems if they are adjacent and may aid in vaporization of mercury.
   5. Contact Owner’s Representative immediately.
   6. If spill cannot be cleaned up immediately, apply neutralizing agent over mercury spill area.
   7. Collect mercury droplets together with a dust pan, squeegee or mercury vacuum.
   8. Clean-up bulk mercury using aspirator bulb or mercury vacuum. Clean remainder with a mercury sponge. Place mercury in closed container (plastic or glass).
   9. Porous surfaces are to be cleaned with Neutralizing Agent after clean-up of bulk mercury.
   10. If mercury spills into soil, carpet, through cracks, into drains etc. further removal of surface materials at contractor cost will be required. Do not proceed without approval from Owner’s Representative.
   11. Place all cleaning materials including drop sheets or polyethylene sheeting in containment drums.

3.3 Transportation and Reporting
.1 Transport materials following Transportation of Dangerous Goods Act.
.1 Transport Mercury Materials and Waste to approved site for recycling, including mercury vapour in lamps, and ensure materials are recycled.

.2 The facility used to process and recycle the mercury shall be approved by the Ministry of the Environment, or local jurisdictional authority, and shall have valid Certificates of Approval to carry out the work outlined herein.
.1 The facility must issue a Certificate of Recycling identifying types and quantities of materials generated from the project. The facility must also provide a Certificate of Recycling for the mercury generated from the project. Any mercury contaminated materials not recycled are to be identified by a manifest.

.3 A typed and signed transfer document for each transfer of mercury is to be submitted to Owner's representative, giving following:
.1 Number of drums or boxes.
.2 Contents and approximate quantities.
.3 Approximate net weight of contents.
.4 Dates removal begun and completed (for each lot).
.5 Date transferred.

.4 Submit certificate(s) of certificate of recycling and waste manifests from all transfer points. Submit the above for waste regardless of single transport or as blended waste.

3.4 Re-Establishment of Items
.1 Upon completion of work:
.1 Remove tags and locks from electrical panels and re-energize equipment and items.
.2 Clean, mop and vacuum the Work Area.

END OF SECTION
### 2.8 DETAILED VALVE SPECIFICATION SHEET

#### PLV

#### GENERAL

<table>
<thead>
<tr>
<th>TYPE OF VALVE</th>
<th>SYMBOL</th>
<th>TYPE OF COMMODITY</th>
<th>RATING PRESSURE (kPa)</th>
<th>TEMP. (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug Valve</td>
<td>PLV</td>
<td>Wastewater</td>
<td>1034 (Note 1)</td>
<td>0 - 40</td>
</tr>
</tbody>
</table>

#### TYPICAL SERVICE

**PTR, SCLR, PTS, RTN**

#### VALVE MATERIALS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MATERIAL</th>
<th>Reference Document</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>Cast Iron ASTM A-126, Class B.</td>
<td>Size Range 100mm to 750mm</td>
</tr>
<tr>
<td>Cover</td>
<td>Cast Iron ASTM A-126, Class B.</td>
<td>Style Full Port Eccentric Plug Valve.</td>
</tr>
<tr>
<td>Plug</td>
<td>Resilient</td>
<td>Actuator Note 3, Note 4.</td>
</tr>
<tr>
<td>Seat</td>
<td>Welded-in Nickel.</td>
<td></td>
</tr>
<tr>
<td>Bearing</td>
<td>Type 304SS.</td>
<td></td>
</tr>
</tbody>
</table>

#### NOTES

.1 CWP non-shock working pressure. Valve rating: drip tight shut-off for full pressure rating of 1050 kPa in either direction.
.2 Manual: Enclosed gear operator with handwheel.
.3 Motorized: Provide motorized actuators for valves, where shown on drawings, in accordance with requirements of this Section 15100, (Clause 2.0, 2.2) and as noted below.
.4 Refer to Division 16, Section 16 05 81.
.5 Lubrication: Alemite, buttonhead grease fittings for pressure lubrication of stem sealing area and lower trunnion.
.6 Tag numbers and description/service on all valves.

#### ACCEPTABLE PRODUCTS

| Dezurik, PEF | Valmatic, Cam-Centric, Series 5600R | Golden Anderson, Figure 517 |

#### PROVIDE FOLLOWING MOTORIZED VALVE ACTUATORS PER TABLE BELOW:

<table>
<thead>
<tr>
<th>Valve Tag #</th>
<th>Services</th>
<th>Valve Type</th>
<th>Valve Size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLV-214,-224,-314,-324</td>
<td>PTR</td>
<td>PLUG</td>
<td>200</td>
</tr>
<tr>
<td>PLV-211,-221,-311,-321</td>
<td>PTS</td>
<td>PLUG</td>
<td>150</td>
</tr>
</tbody>
</table>
## DETAILED VALVE SPECIFICATION SHEET
### CHV

### GENERAL

<table>
<thead>
<tr>
<th>TYPE OF VALVE</th>
<th>SYMBOL</th>
<th>TYPE OF COMMODITY</th>
<th>RATING PRESSURE (kPa)</th>
<th>TEMP. (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wafer Swing Check Valve</td>
<td>CHV</td>
<td>Wastewater</td>
<td>1034</td>
<td>-</td>
</tr>
</tbody>
</table>

### TYPICAL SERVICE

### PTR

### VALVE MATERIALS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MATERIAL</th>
<th>VALVE DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>Cast Iron or Carbon Steel, ASTM A216 Gr. WCB.</td>
<td>Size Range 50mm to 300mm</td>
</tr>
<tr>
<td>Disc</td>
<td>316SS</td>
<td>Style Wafer Swing Check</td>
</tr>
<tr>
<td>Shaft</td>
<td>316SS</td>
<td>Flange Type ANSI 150 (Flat Faced)</td>
</tr>
<tr>
<td>Seat Shaft</td>
<td>PTFE</td>
<td>Additional Items Note 1, 2, 3 and 4.</td>
</tr>
<tr>
<td>Seat Body</td>
<td>Nitrile or Viton</td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td>304SS</td>
<td></td>
</tr>
<tr>
<td>Bushing</td>
<td>316SS</td>
<td></td>
</tr>
<tr>
<td>Travel Stop</td>
<td>316SS</td>
<td></td>
</tr>
</tbody>
</table>

### NOTES

1. Shall have torsional a spring-assisted fast closure to minimize possibility of water hammer.
2. The valve disc/arm assembly shall be one piece design.
3. Tag numbers and description/service on all valves.
4. Valves installed in the vertical position shall have flow upward.

### ACCEPTABLE PRODUCTS

| Uni-Chek (Crane) | Cla-Val, Series 501A |
## 2.6 Pressure Transmitters [Addendum#5]

<table>
<thead>
<tr>
<th>Tag:</th>
<th>PIT-201</th>
<th>PIT-301</th>
<th>PIT-410</th>
<th>PIT-420</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Pilot Area A1 &amp; A2 Supply Piping</td>
<td>Pilot Area B1 &amp; B2 Supply Piping</td>
<td>Holding Tank 1</td>
<td>Holding Tank 2</td>
</tr>
<tr>
<td>Service:</td>
<td>Raw Sewage</td>
<td>Raw Sewage</td>
<td>Raw Sewage Tank Level</td>
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</tr>
<tr>
<td>P&amp;ID DWG Reference:</td>
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<td>PD103</td>
<td>PD104</td>
<td></td>
</tr>
<tr>
<td>Control DWG Reference:</td>
<td>GPCC-E672,E681</td>
<td>GPCC-E672,E681</td>
<td>GPCC-E672,E681</td>
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</tr>
<tr>
<td><strong>Primary Element (PE):</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement Type</td>
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<td>Gauge Pressure</td>
<td>Gauge Pressure</td>
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</tr>
<tr>
<td>Process Conn. Type:</td>
<td>Flange ½ - 14 FNPT</td>
<td>Flange ½ - 14 FNPT</td>
<td>Flange 100MM ½/1/4 FNPT</td>
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</tr>
<tr>
<td>Process Conn. Material:</td>
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<td>Teflon Coated Carbon Steel</td>
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<td>Flange Press. Rating:</td>
<td>ANSI B16.1 Class 125</td>
<td>ANSI B16.1 Class 125</td>
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</tr>
<tr>
<td>Diaphragm Material:</td>
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<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Sleeve Material:</td>
<td>Buna-N</td>
<td>Buna-N</td>
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<td></td>
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<tr>
<td>Fill Fluid Material:</td>
<td>Ethylene Glycol</td>
<td>Ethylene Glycol</td>
<td>Ethylene Glycol</td>
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<tr>
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<td>Liquid</td>
<td>Liquid</td>
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<td>Min/Norm/Max Press.:</td>
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<td>0 / 280 / 2068 kPa</td>
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<td>-20 / 80°C</td>
<td>-20 / 80°C</td>
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<tr>
<td>Enclosure:</td>
<td>Die-cast aluminium</td>
<td>Die-cast aluminium</td>
<td>Die-cast aluminium</td>
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</tr>
<tr>
<td>Mounting:</td>
<td>Pipe</td>
<td>Pipe</td>
<td>Pipe</td>
<td></td>
</tr>
<tr>
<td>Approval:</td>
<td>CSA</td>
<td>CSA</td>
<td>CSA</td>
<td></td>
</tr>
<tr>
<td>Area Classification:</td>
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<td>Class 1 Div 1</td>
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</tr>
<tr>
<td>Cable Length:</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

**Transmitter (PIT):**

<p>| Type:               | Integral                     | Integral                     | Integral                     |                              |
| Enclosure:          | Die-cast aluminium          | Die-cast aluminium          | Die-cast aluminium          |                              |
| No. of Transducer Inputs: | 1                      | 1                            | 1                            |                              |
| Temp min/max:       | -20 / 40°C                  | -20 / 40°C                  | -20 / 40°C                  |                              |
| Humidity min/max:   | 0 / 100%                    | 0 / 100%                    | 0 / 100%                    |                              |
| Area Classification: | nil                         | Class 1 Div 1               | nil                          |                              |
| Approval:           | CSA                          | CSA                          | CSA                          |                              |
| Display Type, Size: | backlit LCD                 | backlit LCD                 | backlit LCD                 |                              |
| Programming Unit:   | Yes                          | Yes                          | Yes                          |                              |
| Programming Software: | Yes                     | Yes                          | Yes                          |                              |
| Process Units, Range: | 0 - 400 kPa               | 0 - 400 kPa                 | 0 – 5 m                     |                              |
| Calibrated Range:   | TBD                          | TBD                          | TBD                          |                              |
| Accuracy:           | 0.1%                         | 0.1%                         | 0.1%                         |                              |
| Rangeability:       | 20:1                         | 20:1                         | 20:1                         |                              |
| Response Time:      | 0.5 sec                     | 0.5 sec                     | 0.5 sec                     |                              |
| Power Supply:       | Loop powered                | Loop powered                | Loop powered                |                              |</p>
<table>
<thead>
<tr>
<th>Tag</th>
<th>PIT-201</th>
<th>PIT-301</th>
<th>PIT-410</th>
<th>PIT-420</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Output</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td></td>
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<tr>
<td>Relay Outputs</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>Profibus PA</td>
<td>Profibus PA</td>
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<tr>
<td>Electrical Connections</td>
<td>½ - 14 NPT</td>
<td>½ - 14 NPT</td>
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<tr>
<td>Manufacturer</td>
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<td>Endress &amp; Hauser</td>
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<td>Primary Element</td>
<td>Red Valve Series 40</td>
<td>Red Valve Series 40</td>
<td>Red Valve Series 40</td>
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<tr>
<td>Transmitter</td>
<td>PMP71</td>
<td>PMP71</td>
<td>PMP71</td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td>Sensor and transmitter assembled and tested; all connections brass piped</td>
<td>Sensor and transmitter assembled and tested; all connections brass piped</td>
<td>Sensor and transmitter assembled and tested; all connections brass piped</td>
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2.7 Combustible Gas Analysers [Addendum#5]

<table>
<thead>
<tr>
<th>Tag:</th>
<th>AIT-201-AEA</th>
<th>AIT-201-AEB</th>
<th>AIT-201</th>
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</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Pilot Area A1</td>
<td>Pilot Area A1</td>
<td>Electrical Room</td>
</tr>
<tr>
<td>Service:</td>
<td>H2S Sensor</td>
<td>LEL Sensor</td>
<td>Controller</td>
</tr>
<tr>
<td>P&amp;ID DWG Reference:</td>
<td>PD102</td>
<td>PD102</td>
<td>PD102</td>
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**Primary Element:**

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<th>AE</th>
<th>AE</th>
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<tbody>
<tr>
<td>Measurement</td>
<td>H2S</td>
<td>Combustible gas</td>
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</tr>
<tr>
<td>Sensor Type</td>
<td>Diff./absorption MOS</td>
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<td>-</td>
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<tr>
<td>Material</td>
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<td>Aluminium</td>
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<tr>
<td>Mounting</td>
<td>Transmitter</td>
<td>Transmitter</td>
<td>-</td>
</tr>
<tr>
<td>Min/Norm/Max Range:</td>
<td>0 / 0 / 50 ppm</td>
<td>0 / 0 / 100 %</td>
<td>-</td>
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<td>Temperature min/max:</td>
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<td>-</td>
</tr>
<tr>
<td>Humidity min/max:</td>
<td>0 / 100%</td>
<td>0 / 100%</td>
<td>-</td>
</tr>
<tr>
<td>Response Time:</td>
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<td>30s</td>
<td>-</td>
</tr>
<tr>
<td>Repeatability:</td>
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<td>Accuracy:</td>
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**Transmitter:**

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<th>Description</th>
<th>AIT</th>
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<th>AIT</th>
</tr>
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<tbody>
<tr>
<td>Type:</td>
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<td>Remote</td>
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<tr>
<td>Enclosure:</td>
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<td>Die-cast aluminium</td>
<td>Non-metallic</td>
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<tr>
<td>No. of Transducer Inputs:</td>
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<td>1</td>
<td>3</td>
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<tr>
<td>Temp min/max:</td>
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<td>-40 / 60°C</td>
<td>-40 / 60°C</td>
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<tr>
<td>Humidity min/max:</td>
<td>0 / 100%</td>
<td>0 / 100%</td>
<td>0 / 100%</td>
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<td>Area Classification:</td>
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<tr>
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<td>CSA</td>
<td>CSA</td>
<td>CSA</td>
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<td>Display Type, Size:</td>
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<td>3-digit digital</td>
<td>Multi-line, LED</td>
</tr>
<tr>
<td>Calibration Unit:</td>
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<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Process Units, Range:</td>
<td>0-50 ppm</td>
<td>0-100 %</td>
<td>Per channel</td>
</tr>
<tr>
<td>Calibrated Range:</td>
<td>TBD</td>
<td>TBD</td>
<td>Per channel</td>
</tr>
<tr>
<td>Power Supply:</td>
<td>Loop</td>
<td>Loop</td>
<td>120 Vac, 60Hz</td>
</tr>
<tr>
<td>Analog Input:</td>
<td>4 - 20 mA (1)</td>
<td>4 - 20 mA (1)</td>
<td>4 - 20 mA (4)</td>
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<td>Analog Output:</td>
<td>4 - 20 mA (1)</td>
<td>4 - 20 mA (1)</td>
<td>4 - 20 mA (4)</td>
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<td>Relay Outputs:</td>
<td>Form C (3)</td>
<td>Form C (3)</td>
<td>Form C (2x4)</td>
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<tr>
<td>Communication:</td>
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<tr>
<td>Electrical Connections:</td>
<td>(3) ½ - 14 NPT</td>
<td>(3) ½ - 14 NPT</td>
<td>(6) ½ - 14 NPT</td>
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**Manufacturer:**

<table>
<thead>
<tr>
<th>Description</th>
<th>General Monitor</th>
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<tr>
<td>Primary Element Model:</td>
<td>50445-5</td>
<td>IR400</td>
<td>-</td>
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<td>Transmitter Model:</td>
<td>S40000TH</td>
<td>IR4000S</td>
<td>MC600</td>
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**Notes:**

Install sensor 600mm AFF. Provide splash guard.
Install sensor at 2.4m, transmitter at 1.5m, provide remote JBX.
2.7 Combustible Gas Analysers (cont's) [Addendum#5]

<table>
<thead>
<tr>
<th>Tag:</th>
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<tr>
<td>Location:</td>
<td>Pilot Area A2</td>
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<td>Service:</td>
<td>H2S Sensor</td>
<td>LEL Sensor</td>
<td>Controller</td>
</tr>
<tr>
<td>P&amp;ID DWG Reference:</td>
<td>PD102</td>
<td>PD102</td>
<td>PD102</td>
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<tr>
<td>Control DWG Reference:</td>
<td>GPCC-E634,E681</td>
<td>GPCC-E634,E681</td>
<td>GPCC-E634,E681</td>
</tr>
</tbody>
</table>

### Primary Element:
- AE

**Measurement:**
- H2S: Combustible gas

**Sensor Type:**
- Diff./absorption MOS
- Diff./catalytic

**Material:**
- Aluminium
- Aluminium

**Mounting:**
- Transmitter
- Transmitter

**Min/Norm/Max Range:**
- 0 / 0 / 50 ppm
- 0 / 0 / 100 %

**Temperature min/max:**
- -40 / 60°C
- -40 / 60°C

**Humidity min/max:**
- 0 / 100%
- 0 / 100%

**Response Time:**
- 60s
- 30s

**Repeatability:**
- 2%
- 2%

**Accuracy:**
- 2ppm
- 5%

**Approval:**
- CSA
- CSA

**Area Classification:**
- Nil
- Nil

**Cable Length:**
- As required
- As required

### Transmitter:
- AIT

**Type:**
- Integral
- Remote

**Enclosure:**
- Die-cast aluminium
- Die-cast aluminium
- Non-metallic

**No. of Transducer Inputs:**
- 1
- 1
- 3

**Temp min/max:**
- -40 / 60°C
- -40 / 60°C
- -40 / 60°C

**Humidity min/max:**
- 0 / 100%
- 0 / 100%
- 0 / 100%

**Area Classification:**
- nil
- nil
- nil

**Enclosure Rating:**
- CSA 4/NEMA 4X
- CSA 4/NEMA 4X
- CSA 4/NEMA 4X

**Approval:**
- CSA
- CSA
- CSA

**Display Type, Size:**
- 3-digit digital
- 3-digit digital
- Multi-line, LED

**Calibration Unit:**
- Yes
- Yes
- No

**Process Units, Range:**
- 0-50 ppm
- 0-100 %
- Per channel

**Calibrated Range:**
- TBD
- TBD
- Per channel

**Power Supply:**
- Loop
- Loop
- 120Vac, 60Hz

**Analog Input:**
- 4 - 20 mA (4)

**Analog Output:**
- 4 - 20 mA (1)
- 4 - 20 mA (1)
- 4 - 20 mA (4)

**Relay Outputs:**
- Form C (3)
- Form C (3)
- Form C (2x4)

**Communication:**
- nil
- nil
- nil

**Electrical Connections:**
- (3) ½ - 14 NPT
- (3) ½ - 14 NPT
- (6) ½ - 14 NPT

### Manufacturer:
- General Monitor
- General Monitor
- General Monitor

### Notes:
- Install sensor 600mm AFF. Provide splash guard.
- Install sensor at 2.4m, transmitter at 1.5m, provide remote JBX.
### Combustible Gas Analysers (cont’s) [Addendum#5]

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<td>Service:</td>
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<td>LEL Sensor</td>
<td>Controller</td>
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<tr>
<td>P&amp;ID DWG Reference:</td>
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<td>Measurement:</td>
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<td>Combustible gas</td>
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<td>Sensor Type:</td>
<td>Diff./absorption MOS</td>
<td>Diff./ catalytic</td>
<td>-</td>
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<tr>
<td>Material:</td>
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<tr>
<td>Mounting:</td>
<td>Transmitter</td>
<td>Transmitter</td>
<td>-</td>
</tr>
<tr>
<td>Min/Norm/Max Range:</td>
<td>0 / 0 / 50 ppm</td>
<td>0 / 0 / 100 %</td>
<td>-</td>
</tr>
<tr>
<td>Temperature min/max:</td>
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<tr>
<td>Humidity min/max:</td>
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<td>0 / 100%</td>
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<tr>
<td>Response Time:</td>
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<td>30s</td>
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<tr>
<td>Repeatability:</td>
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<td>Accuracy:</td>
<td>2ppm</td>
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<td>Approval:</td>
<td>CSA</td>
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<td>Area Classification:</td>
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<tr>
<td>Cable Length:</td>
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<td>AIT</td>
<td>AIT</td>
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<td>Remote</td>
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<td>Enclosure:</td>
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<td>Die-cast aluminium</td>
<td>Non-metallic</td>
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<tr>
<td>No. of Transducer Inputs:</td>
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<td>1</td>
<td>3</td>
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<td>-40 / 60°C</td>
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<tr>
<td>Approval:</td>
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<tr>
<td>Display Type, Size:</td>
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<td>Calibration Unit:</td>
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<td>Yes</td>
<td>No</td>
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<tr>
<td>Process Units, Range:</td>
<td>0-50 ppm</td>
<td>0-100 %</td>
<td>Per channel</td>
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<tr>
<td>Calibrated Range:</td>
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<td>TBD</td>
<td>Per channel</td>
</tr>
<tr>
<td>Power Supply:</td>
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<td>Loop</td>
<td>120Vac, 60Hz</td>
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<tr>
<td>Analog Input:</td>
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<td></td>
<td>4 - 20 mA (4)</td>
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<tr>
<td>Analog Output:</td>
<td>4 - 20 mA (1)</td>
<td>4 - 20 mA (1)</td>
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<td>Relay Outputs:</td>
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<td>Form C (3)</td>
<td>Form C (2x4)</td>
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<td>Electrical Connections:</td>
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<td>(3) ½ - 14 NPT</td>
<td>(6) ½ - 14 NPT</td>
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<td>General Monitor</td>
<td>General Monitor</td>
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<td>IR400</td>
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<tr>
<td>Transmitter Model:</td>
<td>S4000TH</td>
<td>IR4000S</td>
<td>MC600</td>
</tr>
<tr>
<td>Notes:</td>
<td>Install sensor 600mm AFF. Provide splash guard.</td>
<td>Install sensor at 2.4m, transmitter at 1.5m, provide remote JBX.</td>
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### Combustible Gas Analysers (cont’s) [Addendum#5]

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<th>Tag:</th>
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<td>Controller</td>
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</tr>
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<td>0 / 0 / 100 %</td>
<td>-</td>
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<tr>
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<tr>
<td>Humidity min/max:</td>
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<td>0 / 100%</td>
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<td>Response Time:</td>
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<td>30s</td>
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<td>Remote</td>
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<td>Enclosure:</td>
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<td>Die-cast aluminium</td>
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<td>1</td>
<td>3</td>
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<tr>
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<td>-40 / 60°C</td>
<td>-40 / 60°C</td>
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<tr>
<td>Approval:</td>
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<td>CSA</td>
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<tr>
<td>Display Type, Size:</td>
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<td>Multi-line, LED</td>
</tr>
<tr>
<td>Calibration Unit:</td>
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<td>Yes</td>
<td>No</td>
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<tr>
<td>Process Units, Range:</td>
<td>0-50 ppm</td>
<td>0-100 %</td>
<td>Per channel</td>
</tr>
<tr>
<td>Calibrated Range:</td>
<td>TBD</td>
<td>TBD</td>
<td>Per channel</td>
</tr>
<tr>
<td>Power Supply:</td>
<td>Loop</td>
<td>Loop</td>
<td>120Vac, 60Hz</td>
</tr>
<tr>
<td>Analog Input:</td>
<td>4 - 20 mA (1)</td>
<td></td>
<td>4 - 20 mA (4)</td>
</tr>
<tr>
<td>Analog Output:</td>
<td>4 - 20 mA (1)</td>
<td>4 - 20 mA (1)</td>
<td>4 - 20 mA (4)</td>
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<tr>
<td>Relay Outputs:</td>
<td>Form C (3)</td>
<td>Form C (3)</td>
<td>Form C (2x4)</td>
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<tr>
<td>Communication:</td>
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<td>nil</td>
<td>nil</td>
</tr>
<tr>
<td>Electrical Connections:</td>
<td>(3) ½ - 14 NPT</td>
<td>(3) ½ - 14 NPT</td>
<td>(6) ½ - 14 NPT</td>
</tr>
<tr>
<td>Manufacturer:</td>
<td>General Monitor</td>
<td>General Monitor</td>
<td>General Monitor</td>
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<tr>
<td>Primary Element Model:</td>
<td>50445-5</td>
<td>IR400</td>
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<tr>
<td>Transmitter Model:</td>
<td>S4000TH</td>
<td>IR4000S</td>
<td>MC600</td>
</tr>
<tr>
<td>Notes:</td>
<td>Install sensor 600mm AFF. Provide splash guard.</td>
<td>Install sensor at 2.4m, transmitter at 1.5m, provide remote JBX.</td>
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### Combustible Gas Analysers (cont's) [Addendum#5]

<table>
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<td>Service:</td>
<td>H2S Sensor</td>
<td>LEL Sensor</td>
<td>Controller</td>
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<tr>
<td>P&amp;ID DWG Reference:</td>
<td>PD103</td>
<td>PD103</td>
<td>PD103</td>
</tr>
<tr>
<td>Control DWG Reference:</td>
<td>GPCC-E634,E681</td>
<td>GPCC-E634,E681</td>
<td>GPCC-E634,E681</td>
</tr>
</tbody>
</table>

#### Primary Element:
- **Tag**: AE
- **Material**: Aluminium
- **Mounting**: Transmitter
- **Min/Norm/Max Range**: 0 / 0 / 50 ppm
- **Temperature min/max**: -40 / 60°C
- **Humidity min/max**: 0 / 100%
- **Response Time**: 60s
- **Accuracy**: 2 ppm
- **Approval**: CSA
- **Area Classification**: Nil
- **Cable Length**: As required

#### Transmitter:
- **Type**: Integral
- **Enclosure**: Die-cast aluminium
- **No. of Transducer Inputs**: 1
- **Temp min/max**: -40 / 60°C
- **Humidity min/max**: 0 / 100%
- **Area Classification**: nil
- **Enclosure Rating**: CSA 4/NEMA 4X
- **Approval**: CSA
- **Display Type, Size**: 3-digit digital
- **Calibration Unit**: Yes
- **Process Units, Range**: 0-50 ppm
- **Calibrated Range**: TBD
- **Power Supply**: Loop
- **Analog Input**: 4 - 20 mA (1)
- **Analog Output**: 4 - 20 mA (1)
- **Relay Outputs**: Form C (3)
- **Communication**: nil
- **Electrical Connections**: (3) ½ - 14 NPT

#### Notes:
- Install sensor 600mm AFF. Provide splash guard.
- Install sensor at 2.4m, transmitter at 1.5m, provide remote JBX.
### 2.8 Level Switches

<table>
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<th>LSH-310</th>
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<td>Pilot Plant Area B1 &amp; B2</td>
</tr>
<tr>
<td>Service</td>
<td>HI Level Switch</td>
<td>HI Level Switch</td>
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<td>PD103</td>
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<tr>
<td>Control DWG Reference</td>
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<td>GPCC-E681</td>
</tr>
</tbody>
</table>

#### Primary Element (LS):

| Type:               | Mechanical Switch | Mechanical Switch |
| Body Material:      | Buna 316SS        | 316SS             |
| Mounting:           | Wall bracket      | Wall bracket      |
| Fluid:              | Raw sewage        | Raw sewage        |
| Mounting height:    | AFF               | AFF               |
| Field Adjustable:   | Yes               | Yes               |
| Min/Max Temperature:| 5 / 24°C          | 5 / 24°C          |
| Min/Max Density:    | 0.65 / 1.5 g/cm³  | 0.65 / 1.5 g/cm³  |
| Submersible:        | Yes               | Yes               |
| Local JBX:          | Yes               | Yes               |
| IS Barrier:         | Yes               | Yes               |
| Approval:           | CSA               | CSA               |
| Area Classification:| nil               | Class 1 Div 1     |
| Cable:              | As required       | As required       |

#### Switch:

| Power Supply: | nil | nil |
| Contacts:     | Form C (1) | Form C (1) |

#### Manufacturer:

| Manufacturer/Supplier: | Gem Sensor | Gem Sensor |
| Model:                 | LS-1800    | LS-800     |

#### Notes:
OVERALL PLAN
CABLE TRAY & GROUNDING
NORTH