# REPORT ON SITE SERVICES STUDY

For

## TORONTO ZOO

Prepared for:

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Prepared by:

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Project No: 850

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## EXECUTIVE SUMMARY

Paradigm Engineering Group Inc. reviewed five systems, which service the site. These are the water, gas, sewer, electrical and communication systems. An overview of each system is found in Section 2 of the Report. This summary is broken down into three components as follows: Terms of Reference, Study Findings and Summary Report.

A. *Terms of Reference*

Subsequent to a proposal dated November 16, 1998, Paradigm Engineering Group Inc. was retained to conduct a Condition Survey of the Toronto Zoo site services located on the Zoo property in Scarborough, Ontario. Authorization to proceed was notified by Mr. Eric Morris, Manager of Facilities and Services on behalf of the Toronto Zoo.

B. *Study Findings*

*Water:* The physical condition of the water supply and distribution system was found to be generally in good condition. For the most part, the flow rates and water pressures were found to be adequate with the exception of approximately three hydrants where water pressures were found to be low. The findings also revealed that adequate water is available to service the current needs of the Zoo. Any proposed addition or expansion to the Zoo requiring water supply must address the above low-pressure problem.

There are two key areas of concern with the water supply system namely;

1. The entire site is currently supplied from a single line connected to the City. Should a major line break requiring the shut down of the water system occur on a day when the Zoo is very busy with visitors needing access to water, there will be a significant negative consequence, hence we have recommended that consideration be given to the installation of a second linefeed to the Zoo from another City main. For the short term, the sections of water mains that have leaked in the past should be replaced. The cost of this immediate repair is shown in the Appendices.

2. The existing water mains hydrant connections contain some dead ends without a loop. The above feature is not in conformance with the requirements of the City of Scarborough, which required that all lines leading to the fire hydrant be looped.

The long term solution to the first problem is to install a second line fee at an approximate budget cost of $1,000,000. The solution to the second concern is to install loops at all hydrants without loops. Detailed discussion of these concerns and their corrective measures are given in the Appendices.

*Gas:* The physical condition of the Gas supply and distribution system was found to be generally in good condition. For the most part, the gas flow rates and pressures were found to be adequate. The findings also revealed that adequate gas is available to service the current needs. The adequacy of proposed expansions, including extension of gas facilities to the Eurasia exhibits area will be determined after design loads are known.

*Sewers*: The audit of the sewer system revealed that the sewer system has adequate capacity to service current needs and proposed expansions, however the entire storm and sanitary sewers contains a significant level of debris. We have recommended a complete flushing of the system to enhance its functional capacity.

*Electrical*: The audit of the electrical system indicates that there is adequate electrical capacity to service current needs, but any further expansion or addition to electrical energy loads must contemplate and include upgrading the electrical service. The electrical systems and equipment are in fair condition, despite the high incidence of failures. Given the age of the system and the reported frequency of disruption of operation resulting from power failures, we will recommend a phased replacement of all underground cables and submersible transformers.

*Communication*: The audit of the communication system indicates that there is adequate capacity to service current needs and proposed expansions. The communication equipment and systems are in good condition.

## C. *Summary Cost Report*

The attached Portfolio Summary Report details the projected cost requirements for Capital Improvements, Required Repairs and Preventive Maintenance.

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## 1.0 INTRODUCTION

### 1.1 Terms of Reference

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### 1.2 Scope of Work

In general, the scope of work consists of a Condition Survey of the water, gas, electrical and communication/data services and storm/sanitary sewer systems on the site to determine if any deficiencies exist. The study was broken down into 2 phases:

| | |
|---|---|
| Phase I | Facility Audit |
| Phase II | Development of Life Cycle Repair/Replacement and Maintenance Program |

Details of the complete scope of work are contained in the Request for Proposal Document and the Proposal.

### 1.3 Study Goals

The objective of this assignment is to evaluate the existing functional and physical adequacy and capacity of the existing site services at the Toronto Zoo (Zoo) complex and identify retrofit / replacement / repair / maintenance / expansion needs. This survey will address the needs of the Zoo by ensuring that the existing facilities are adequate to meet both the existing demand and reasonably foreseeable future expansion to Zoo facilities.

The Site Services Study is a comprehensive study of the condition of the utility systems and their components. The audit includes a complete inventory of the current use and capacity of the services. A summary of the goals of this project is:

1. Identify and quantify current deficiencies in all components of the services.
2. Develop an understanding of the future needs of the Zoo complex so that the Zoo can predict the funding necessary to maintain the services in an appropriate condition after the reduction or elimination of the current required repairs liability.
3. Provide an inventory of the existing use of the services including renewal cost allocation.
4. Use the study as the basis of a dynamic management tool which will continue to provide an accurate record of the state of the physical plant. The system should be capable of predicting the funding required to maintain desired conditions and will foster the creation of multi-year comprehensive capital implementation plans.

## 1.4 Study Methodology

Each utility system and site component is inspected and measured. The costs associated with each component are grouped into 3 distinct categories as follows:

Type 1: *Required Repairs Costs*

This category includes costs to rectify actual component deficiencies. All components of the systems, which exhibit or suffer from actual deficiencies at the time of this audit, are referred to as " Required Repairs". These deficiencies will require to be rectified in order to ensure that the components continue to serve their intended functions. All costs associated with required repairs are Required Repairs costs.

Type 2: *Preventive Maintenance Costs*

This category will affect all the components of the systems requiring periodic inspections/servicing and maintenance. For example, a sump pump requiring cleaning every year will be classified under preventive maintenance.

Type 3: *Capital Improvement Costs*

All site servicing systems/components are captured under this category. The repair and replacement of a component is a function of the natural wear/tear and the life expectancy of a component. Over the life of a project, components require periodic renewals in order to maintain the integrity of the facility. All costs associated with capital improvements are called capital improvement costs.

All visible deficiencies for the entire physical plant are identified. Each of the utility and site systems is examined and the remaining useful life of each component is estimated. Finally, the current replacement value of the utility systems and site components is calculated.

The Site Services Study includes deficiencies and anticipated requirements of the utility systems and site components. This comprehensive approach produces a total profile for the entire plant within a conceptual framework consistent with the standard approach for such service systems.

As a physical plant continues to age, additional components wear out. The analysis of life cycle maintenance costs is projected over a long period (25 years for the systems) in order to obtain reasonable average annual projections of the amount of money each component will require to maintain existing conditions.

The information gathered during this audit is analyzed and entered into PEG's Facility Renewal Planning software. The software generates the following three types of reports:

*Portfolio Summary Cost Report:* This report provides a highly condensed summary of the costs associated with each cost type. The cost columns over the 25-year planning horizon are divided into 10 groups. The costs for the first five years are given on a year by year basis. The costs for the remaining 20 years are put into five (5) year groups. All the future costs are inflated to reflect cost escalation and inflation. The last column gives the subtotal.

*Detailed Cost Report:* This report provides a condensed summary of the costs associated with each element of repair requirement. The cost columns over the 25-year planning horizon is divided into 10 groups and is similar to the Portfolio Summary Cost described above.

*Recommendation Report:* This report provides a detailed description of each repair requirements. The report is divided into 7 columns. Column 1 gives an identity number to each repair need. Column 2 describes the location of the repair need. Column 3 gives the priority of the work required relative to other work requirements. A description of the priorities is given below. Column 4 gives the category of the work required. Column 5 gives the description of the deficiency resulting in the need for repairs. Column 6 describes the correction needed to rectify the problem. Alternative solutions are also described. Column 7 gives the budget cost in today's dollar for rectifying the deficiency. The format of the recommendation report for Capital Improvement Costs is slightly different and self-explanatory, consisting of 14 columns.

*Priority Ranking Of Recommended Repairs*

Each observed required repair is assigned a number that defines the priority of the work relative to others.

| Priority No. | Description |
|---|---|
| 1 | Repairs of a safety nature where deficiencies have significant probability of harm to people and animals causing death and severe injury. |
| 2 | Repairs of a safety nature where deficiencies have significant probability of causing damage to health and minor injuries. |
| 3 | Repairs where deficiencies have a risk of consequential damage with high financial cost. |
| 4 | Repairs where deficiencies have risk of consequential damage with medium financial cost. |
| 5 | Repairs where deficiencies have a risk of consequential damage with low financial cost. |
| 6 | Repairs where deficiencies have no risk of consequential damage but are necessitated by the need for upgrades to improve or replace building components. |

*Categories Definition*

All building systems and components repair/retrofit costs are grouped into categories, which define their impact.

| Category Name: | Description |
|---|---|
| Regulatory: | These are costs, which arise as a result of regulatory requirements from all regulatory agencies. For example, costs incurred to upgrade existing access to achieve barrier free access for the handicapped will fall into this category. |
| Energy: | These are costs associated with energy conservation measures. For example, costs incurred to upgrade lighting fixtures from incandescent to florescent, etc. |
| Building Integrity: | There are costs, which are related to the overall integrity and soundness of a building, particularly the building envelope and structural systems. For example, rusting and delamination of concrete cladding, cracking of caulking. |
| Life Safety: | These are costs, which are associated with life and health safety concerns. For example, costs incurred to repair damaged of missing exit signs, dysfunctional heat detectors, etc. |
| Air Quality: | These are costs associated with health safety, primarily arising from air quality concern. For example, costs incurred to clean the ductwork to improve the quality and flow of air. |
| Functional: | These are costs, which are associated with upgrading systems to meet their functional requirements. For example, upgrading lighting to higher lux levels, repairing flashing to shed water away from joints, etc. |
| Appearance | These are cost that is associated mainly with integrity of interior finishes and a esthetic considerations. For example, missing acoustic ceiling tiles, soiled carpet, missing cover plates, etc. |
| Hazardous Material: | These are costs associated with the removal of hazardous materials. |
| Environmental: | These are costs associated with environmental concerns such as implementation of the BEPAC program, costs to implement the 3R program, etc. |

## 1.5 Description of the Complex

The Zoo property is a rolling, wooded area approximately 710 acres in extent, with approximately 300 developed acres of discrete, fenced areas for the maintenance and exhibit of wild life from around the world. Individual exhibits are provided with gas, water, electrical and sewage services for the care and comfort of the animals and the patrons, and given the area of the site and its combination of wooded hills and streams, there are several kilometres of underground services to be assessed. All distribution systems are underground. This presents both advantages, such as freedom from damage due to wind, snow, vehicles, animals, etc. and disadvantages such as difficulty of access, flooding, corrosion, etc. Construction of the Zoo complex started approximately 25 years ago and has been on-going since, with further changes and expansions proposed for the near future.

## 1.6 Acknowledgments and Assembly of the Report

Numerous consultants and specialists have assisted with the investigations and preparation of this document. In some instances, third and fourth opinions have been obtained. Those consulted, including texts, are noted in the appropriate sections.

Under the direction of Paradigm Engineering Group Inc., the following companies comprise the investigation team:

| | |
|---|---|
| Paradigm Engineering Group Inc. | Prime Consultant<br>Mechanical/Electrical Engineering |
| A-1 Fire Hydrant Services<br>(Hydrants, Water Valves) | Inspection/Testing Specialists |
| Trans Video Inspections<br>(Camera Survey) | Inspection/Testing Specialists |
| Trade Gas Services<br>(Gas Pressure) | Inspection/Testing Specialists |
| Civil Underground Limited<br>(Soil excavation) | Inspection/Testing Specialists |

The assembly of the information required to prepare this comprehensive Site Services Study was coordinated by Mr. Ernest Onyido, P.Eng of Paradigm Engineering Group Inc.

All files, notes, source data, test results and master files are retained in the offices of Paradigm Engineering Group Inc. and remain the property of the Consultant.

All opinions, conclusions and recommendations are those of the Consultant and represent their best judgement under the natural limitations imposed by the scope of work.

## 1.7 Life Cycle Costing Assumptions

The determination of the life expectancies and replacement costs is somewhat subjective. Every effort has been made to make the numbers as precise as possible, but the actual life of any component may differ substantially from the estimate made. For this reason, we recommend a dynamic approach to the planning and administration of this long term Retrofit/Replacement Program. This report provides a format. It should be reviewed annually as a part of the budget preparation process to reflect actual results and new information available.

The planning horizon for this project is 25 years, however, the projected costs beyond 5 years has limited accuracy and reliability. As a result, we urge that the schedule be revised and issued every five years. The costs for the first five years are given on a yearly basis. The costs for the remaining 20 years are grouped into 5-year increments. Every five years, all work completed should be entered into the system and the next 5 year period will be expanded into yearly costs.

Limitations

This report is limited in scope to only those service system components, which are specifically referenced in the text. Any components not included have not been reviewed.

This report is intended solely for the client named. It should not be distributed further without our knowledge.

All cost estimates are given in current dollars, and are provided for approximate budget purposes only. Accurate figures can only be obtained by preparing detailed specifications, tendering and receiving competitive quotes from suitable contractors. Lifespan projections are estimates only based upon visual evaluation of existing conditions.

As many of the activities covered by the report involve aesthetic qualities, there is an element of judgment in identifying costs and life cycles for certain elements, particularly finishes. While we endeavor to reflect our perception of the existing standards, adjustments to the life cycle cost may be necessary to comply with the expectation of the owners.

## 2.0 REPORT FINDINGS

### 2.1 Water System

#### 2.1.1 *General Description of the System*

The above site is supplied with a 14" diameter water main from the City of Scarborough. The water main consists of various pipe sizes and materials. The 14" and 12" mains are of cast iron pipes. The 10" and 8" are of ductile iron and the 4" and 6" mains are made of PVC pipes. There are 29 Fire Hydrants in the existing yards. The incoming pressure is 50 to 55 psi. However, the static pressure drops to about 30 psi in some areas such as the African Savanna exhibit.

The water system comprises of approximately12700 linear meters of piping, 29 fire hydrants, 148 Valves of various types, 1 Pumping Station and 1 Water Main Chamber. Detailed quantity take-off of the major system components of the underground plant are provided in Appendix 14.

#### 2.1.2 *Audit Procedure*

The audit of the water system comprised of a combination of a site walkthrough visual inspection, a review of existing documentation, interviews with maintenance personnel at the Zoo and testing.

a) Site Walkthrough Visual Inspection

The site was visited on several occasions to inspect representative samples of valve chambers, shut off valves, and back-flow-preventers and fire hydrants.

b) Documentation /History Review

We were provided with the site services layout drawings for the water system. In addition, we were provided with a copy of the Energy Report prepared by the City of Toronto Corporate Services, Energy Management Office for 1997.

All the above documentation was thoroughly reviewed prior to our site inspections.

c) Interviews with Zoo and City of Scarborough Personnel

Our inspection team interviewed Mr. Dean Evans and members of his staff during the inspection process to gather information on the types and locations of any known system failures. We also obtained information on the water supply parameters from the City of Scarborough and the Zoo personnel. The audit team also interviewed Mr.Paul Metteta of the City of Scarborough to discuss the requirement of the City of Scarborough for water supply for fire fighting. Mr.Metteta noted that the City of Scarborough requires that the water supply for fire fighting be constructed with a minimum of 8" mains and the mains be constructed in a looped system.

The team also held discussions with various other individuals including Andy Empringham, John Mayock and Steve Doran of the Scarborough Fire Department. The team spoke with Craig Rose of Marshall Macklin and Monagham. Through these discussions, it was revealed that the Scarborough Fire Prevention Department accepted the 1995 modifications to the water main for purposes of fire fighting (see Appendix 17).

A copy of this policy is attached as Appendix 15. The Zoo staff reported that there were two water leaks at the 14" main near the parking lot area. They also stated that the leak was repaired.

d) Testing

Testing was conducted on all fire hydrants to determine flow rates, residual GPM and static pressures. Excavation and examination of the buried water mains for reported leaks were completed in April, 1999.

2.1.3 *Audit Findings*

General Condition of the System

The inspection of a representative sampling of the water supply system and a review of test reports revealed that most of the fire hydrants had adequate water flow rates and pressures. The water flow rate and static/residual pressures were reported to be marginal (30 psi) at two fire hydrant locations, namely; African Pavilion/McDonalds restaurant and the Savana Pavilion/Restaurant. The criteria for minimum pressures needed for fire fighting for a given type of facility is established by the Ontario Building and Fire Codes. The Ontario Fire Marshall's Office has published the "Fire Protection Water Supply" guideline for Part 3 in the Ontario Building Code. See Appendix 18. Table 2 gives the minimum water supply flow rates. Except for the reported water leaks, it is our opinion that the water supply system (buried pipes) is in good condition.

Detailed discussion of our observations is given in Appendixes 1 to 3 under the following cost categories:

i) Required Repairs
ii) Preventive Maintenance
iii) Capital Improvement

2.1.4 *Comment on Existing Usage/Reserve Capacity and Future Requirements*

From our review of the energy report, the water consumption for 1997 was 330,480 cubic meters. In 1995 the consumption was 273,371 cubic meters. There was an increase in water consumption of 20.9% from 1995 to 1997. Our calculations indicate that there is considerable water available to the system, in the order of 5 – 6 times the existing consumption. Water pressure for fire fighting purposes was marginal in some areas. Although water volume is adequate, future expansions or additions to water usage must contemplate upgrading the water system. We have recommended the installation of a second water supply line. This solution will be designed and implemented to address the concern with marginal water pressures. Cost for implementing this system is estimated at approximately $1.0 M

## 2.2 Gas System

2.2.1 *General Description of the System*

The existing facility at the present time is serviced by a 4" diameter gas main. Distributed throughout the site by a combination of 1", 2", 3" and 4" mains. We understand from the Zoo that the design pressure is 50 psi. However, the actual pressure on-site is about 44 psi. The gas service presently supplies heating equipment such as boilers, make-up air-handling units, furnaces, domestic water heaters and rooftop hot water tanks, pool heaters, McDonald Restaurant kitchen equipment, emergency

generators for various Pavilions, etc. Quantity take-offs of the major system components and the underground plant are provided in Appendix 14.

2.2.2 *Audit Procedure*

The audit of the gas system comprised of a combination of a site walkthrough visual inspection, a review of existing documentation, interviews with Consumers Gas and maintenance personnel at the Zoo and testing.

a) Site Walkthrough Visual Inspection

The site was visited on several occasions to inspect representative samples of the gas regulators, valves, connections and the condition of exposed gas pipes. Selected sites for gas flow tests were chosen to permit inspection and examination of the gas distribution and control system.

b) Documentation /History Review

We were provided with the site services drawings showing the gas mains and branches. In addition, we were provided with a list of all the gas-fired equipment for various areas and pavilions. We were also provided with the following report:

1. Energy Report prepared by the City of Toronto Corporate Services, Energy Management Office for 1997.

All the above documentation was thoroughly reviewed prior to our site inspections.

c) Interviews with Zoo Maintenance Personnel and Consumers Gas

Our inspection team interviewed Mr. Dean Evans, Mr. Gary Bowerman and other members of the Zoo staff during the inspection process to gather information on the types and locations of any known system failures. No system deficiency was reported by Zoo staff, although it was reported by Zoo staff that a gas software survey based on the supply pressure, pipes sizes and lengths, indicated that there is a possible insufficiency in gas supply. The Zoo also reported that the existing Eurasia exhibit presently has no gas supply and heating is currently electric. The Zoo staff stated that it is proposed to supply gas to this area, hence the need to conduct an analysis of the feasibility and cost of this proposal. Mr.Brian Black of Consumers Gas was interviewed and he provided the following information.

a) Ten years ago, there were gas leaks at the Monorail line and the monkey exhibit area. He stated that significant portions of the gas pipes were replaced.
b) The Consumers Gas Company does conduct an annual gas leaks survey at the Zoo covering all underground pipes. He stated that the 1999 survey revealed no leaks.
c) The Consumers Gas Company does not conduct an annual corrosion survey unless leak detection failed.
d) He stated that all the pipes are protected anodes which slows down the corrosion of steel pipes. He recommended that a corrosion survey be completed to assure the integrity of the gas line system.

d) Testing

Gas pressure tests were performed at the main incoming supply and at several other locations including the Indo-Malayan Pavilion and the North Main Service building.

2.2.3 *Audit Findings*

General Condition of the System

An inspection of a representative sampling of gas lines and accessories and a review of the test reports indicated that there is a discrepancy between the design pressure and the actual pressure. The design pressure of 50 psi is higher than the actual test pressure of 44 psi.

Detailed discussion of our observations is given in Appendixes 1 to 3 under the following categories.

i) Required Repairs
ii) Preventive Maintenance
iii) Capital Improvement

2.2.4 *Comment on Existing Usage/Reserve Capacity and Future Requirements*

From our review of the energy report, the gas consumption for 1997 was 2,011,432 cubic meters. In 1995 the consumption was 1,802,733 cubic meters. There was an increase in gas consumption of 11.6% from 1995 to 1997. Discussion with Consumer's Gas indicate that the available capacity of the existing service in the order of 3 times the existing consumption, hence there is adequate capacity for the expansions proposed for the North America area and Eurasia area. Given that the size of the loadings and point of connection on the gas service for the proposed North American area and Eurasia areas are not known, a definite conclusion cannot be made. If the proposed design load is within the existing supply capacity, no upgrade will be required, otherwise the service will have to be upgraded to deliver higher pressure. Consumers Gas has confirmed that the existing supply pressure can be boosted to deliver up to 60 psi to the Zoo system.

## 2.3 Sewer System

2.3.1 *General Description of the System*

The above site has a 14" Class 2400 A.C. sanitary main which connects to the City main. The 12", 10", 8" and 6" diameter branches serve areas and Pavilions.

The storm main is 42" concrete, class IV, which connects from the site through 27", 24", 18", etc. pipes and storm water is dumped into creeks and the Rouge River. Quantity take-offs of the major system components and the underground plant are provided in Appendix 14.

2.3.2 *Audit Procedure*

The audit of the sewer system comprised of a combination of a site walkthrough visual inspection, a review of existing documentation, interviews with maintenance personnel at the Zoo and testing.

a) Site Walkthrough Visual Inspection

The site was visited on several occasions to inspect representative samples of manholes, catch basins, drains and piping.

b) Documentation /History Review

We were provided with the sanitary and storm sewer site services drawings. All the above drawings thoroughly reviewed prior to our site inspections.

c) Interviews with Zoo Maintenance Personnel

Our inspection team interviewed Mr. Dean Evans and members of his staff during the inspection process to gather information on the types and locations of any known system failures. We were informed of a situation in the African Savannah area where 2 – 8" lines come together into 1 – 12" line. Sewer backup has been experienced in this area.

d) Testing

Based on information from interviews and drawing review, camera surveys of the sewer systems was conducted.

2.3.3 *Audit Findings*

General Condition of the System

A camera survey of a representative sampling of sanitary and storm sewers was done. Deposits of debris and some calcite formation were observed in the sanitary system. Considering then extensive nature of the sanitary system, together with its age and the environmental condition to which it is subject, the system is in overall good condition.

The storm sewer system had considerably heavier debris deposits, to the point where camera access was blocked in numerous runs. The variety and amount of debris is to be expected considering the uncontrolled nature of materials entering the system. Considering the extensive nature of the storm system, together with its age and environmental and loading conditions to which it is subject, the system is considered to be in good condition. The complete flushing of the system is recommended to bring it up to functional adequacy.

Detailed discussion of our observations is given in Appendixes 1 to 3 under the following categories

i) Required Repairs
ii) Preventive Maintenance
iii) Capital Improvement for the sewer system are given in Appendices 1 - 3.

2.3.4 *Comment On Existing Usage/Reserve Capacity and Future Requirements*

Our inspection and review of the videotapes revealed that the existing demand or flow is approximately 20-40% of the available capacity of the sewers. It is our opinion that under the circumstances there is sufficient reserve capacity to accommodate the proposed expansions of Zoo facilities, namely:

- Relocation of the Canadian area to the North American area;

Unlike the electrical and water systems, the actual demand/loading of the storm and sanitary sewer system cannot be precisely quantified. One approach to the determination of existing demand and reserve capacity is to conduct an analysis of storm water run-off and waste water discharge into the system based on the current location of the buildings and facilities and the spatial distribution of the landscaped areas. Results would be compared with information gathered from the original design. The

second approach is to examine and estimate the actual loading in the sewers from a camera survey of selected locations. The latter approach is more realistic and it has been adopted in this study.

## 2.4 Electrical System

### 2.4.1 *General Description of the System*

The Zoo property is served by a 3-ph, 27.6kV line fed from a Scarborough Public Utilities Commission pole line on Old Finch Avenue. The service comes in to outdoor 27.6kV, 600A main switchgear on Zoo property and is distributed at 27.6kV through 28kV, single conductor cables running to a number of buried transformer vaults throughout the grounds. Cables are direct buried in sand-filled trenches between transformers, except where the cables pass under roadways where they are installed in concrete duct banks.

Cables are run as often as possible directly between transformers and from transformers to buildings, but there are some instances where splicing for taps has been done directly in the trench. Exterior transformers are submersible type, ranging from 300kVA to 750kVA, 27.6kV input, 208V/120V output to the utilization equipment inside the buildings. There are 49 exterior transformers in 27 underground vaults and approximately 9 miscellaneous outlets throughout the grounds. The parking lots have 33 lighting standards. Quantity take-offs of the major system components and the underground plant are provided in Appendix 14.

### 2.4.2 *Audit Procedure*

The audit of the electrical system comprised of a combination of a site walkthrough visual inspection, a review of existing test documentation and interviews with maintenance personnel at the Zoo

a) Site Walkthrough Visual Inspection

The site was visited on several occasions to inspect representative samples of manholes, transformer vaults and exterior switchgear. Selected transformer vaults were de-energized to permit inspection of the transformers and the condition of the cabling and vaults. Twenty-five percent of the vaults were inspected.

b) Documentation /History Review

We were provided with the electrical service drawings. In addition, we were provided with two reports on the electrical system, namely:

1. G.T. Wood test report on transformers and switchgear dated December, 1994, reference No. 9951.
2. Black & McDonald -- High Voltage Maintenance Reports dated August 1999, Reference No. 6621
3. Black & McDonald – Submersible Transformer Failure/Replacement Report dated August 1999, Reference No.6638
4. Energy Report prepared by the City of Toronto Corporate Services, Energy Management Office for 1997.

All the above documentation was thoroughly reviewed prior to our site inspections.

c) Interviews with Zoo Maintenance Personnel

Our inspection team interviewed Mr. Dean Evans and members of his staff during the inspection process to gather information on the types and locations of any known system failures. We were informed of approximately 7 cable failures and 2 transformer breakdowns.

d) Testing

Based on information from interviews and document review, testing of the electrical system was not deemed necessary and was not conducted.

2.4.3 *Audit Findings*

General Condition of the System

An inspection of a representative sampling of vaults and cable chambers and a review of repair records was done. Considering the extensive nature of the electrical system, together with its age and the environmental conditions to which it is subject, the overall system is in average condition.

Detailed discussion of our observations is given in Appendixes 1 to 3 under the following categories

i) Deferred Maintenance
ii) Preventive Maintenance
iii) Capital Improvement

2.4.4 *Comment on Existing Usage/Reserve Capacity and Future Requirements*

From our review of the energy report, the electrical energy consumption for 1997 was 10,171,317 kWh. In 1995 the consumption was 10,206,299 kWh. There was a decrease in electrical energy consumption of 0.3% from 1995 to 1997. The Electrical Code requires that the sizing of electrical power services be designed so that the load is no more than 80% of the service capacity. The 1997 demand was reported to be 19031 KW and the available capacity is 22919 KW. This translates to 83% of available capacity. The demand has marginally exceeded the Code prescribed limit. As a result, any further expansion or addition to electrical energy loads must contemplate and include upgrading the electrical service.

Ontario Hydro and the local utilities have been examining their vulnerability to potential Y2K problems and have initiated measures to ensure the continuity of electrical supply.

## 2.5 Communications/Data

2.5.1 *General Condition of the System*

Bell Telephone service is provided from the pole line along Old Finch Avenue. The service is routed underground to the Administration Building. Bell Telephone Service is located around Pavilions and restaurant areas to supply public telephones but is not extended to the Paddock areas. The system is serviced by a 50-pair underground cable system. The Zoo provides an internal telephone system (PAX), Mitel No. SX-2000SG, fire detection in each building, computer service and security monitoring. We understand that the Zoo purchased (not leased) the Mitel system in 1994 and installed and service it themselves. The Mitel communication system is serviced by 2-200 pair underground cables run to all buildings and areas of the Zoo. Data and power cables may be routed in the same

trench, duly segregated, and use separate cable chambers. Take-offs of the major system components and the underground plant are provided in Appendix 15.

2.5.2 *Audit Procedure*

The audit of the communications/data system comprised of a combination of a site walkthrough visual inspection, a review of existing documentation and interviews with Mitel Corporation and maintenance personnel at the Zoo.

a) Site Walkthrough Visual Inspection

The site was visited on several occasions to inspect representative samples of connections and cables.

b) Documentation /History Review

We were provided with the site services drawings showing the communication line routing.

All the above drawings were thoroughly reviewed prior to our site inspections.

c) Interviews with Zoo Maintenance Personnel

Our inspection team interviewed Mr. Dean Evans and other members of his staff during the inspection process to gather information on the types and locations of any known system failures. It was reported by the Zoo that several pairs in the Bell cable between the old Administration building and the Indo-Malayan Pavilion are inoperative.

2.5.3 *Audit Findings*

General Condition of the System

There have been no reports of dissatisfaction with the Zoo's internal PAX system and all exposed cable and connections which were examined appeared to be in good condition.

2.5.4 *Comment on Existing Usage/Reserve Capacity and Future Requirements*

From our discussions with the supplier, we understand that this system is expandable to provide several thousand lines. We conclude that the existing system is suitable to service any anticipated expansion of the Zoo's facilities with respect to voice communication.

The system is not specifically protected against possible Y2K problems, but if it is being used for communication purposes only, with no business or data transfer applications, date problems will not affect this system and equipment, except as incoming power for the system power supply may be adversely affected.

# APPENDIX 1

# PORTFOLIO SUMMARY REPORT

| Building Name | Replacement | 2000 | 2001 | 2002 | 2003 | 2004 | 2005- 2009 | 2010- 2014 | 2015- 2019 | 2020- 2024 | SubTotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Capital Improvement** | | | | | | | | | | | |
| Toronto Zoo | $1,150,000.00 | $85,000 | $118,450 | $108,212 | $79,223 | $187,960 | $266,009 | $571,292 | $406,648 | $392,535 | $2,215,329 |
| **Capital Improvement** | **$1,150,000** | **$85,000** | **$118,450** | **$108,212** | **$79,223** | **$187,960** | **$266,009** | **$571,292** | **$406,648** | **$392,535** | **$2,215,329** |
| **Preventive Maintenance** | | | | | | | | | | | |
| Toronto Zoo | $1,150,000.00 | $55,600 | $57,268 | $58,986 | $60,756 | $62,578 | $342,204 | $396,708 | $459,893 | $533,142 | $2,027,135 |
| **Preventive Maintenance** | **$1,150,000** | **$55,600** | **$57,268** | **$58,986** | **$60,756** | **$62,578** | **$342,204** | **$396,708** | **$459,893** | **$533,142** | **$2,027,135** |
| **Required Repairs** | | | | | | | | | | | |
| Toronto Zoo | $1,150,000.00 | $338,150 | | | | | | | | | $338,150 |
| **Required Repairs** | **$1,150,000** | **$338,150** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$338,150** |
| **Total** | | **$478,750** | **$175,718** | **$167,198** | **$139,978** | **$250,538** | **$608,212** | **$968,000** | **$866,541** | **$925,678** | **$4,580,614** |

# APPENDIX 2

# DETAILED COST REPORT

***REQUIRED REPAIRS***

***CAPITAL IMPROVEMENT***

***PREVENTIVE MAINTENANCE***

# Detailed Cost Report

## Toronto Zoo

Required Repairs



| ID | Recommendation | 2000 | 2001 | 2002 | 2003 | 2004 | 2005- 2009 | 2010- 2014 | 2015- 2019 | 2020- 2024 | SubTotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ELECTRICAL** | | | | | | | | | | | |
| ELRR-001 | Primary and Secondary Cables | $20,000 | | | | | | | | | $20,000 |
| ELRR-002 | Flooding of Cables | | | | | | | | | | $0 |
| ELRR-003 | Main Outdoor Switchgear | $10,000 | | | | | | | | | $10,000 |
| ELRR-004 | Outdoor Switchgear | | | | | | | | | | $0 |
| ELRR-005 | Vaults | $3,000 | | | | | | | | | $3,000 |
| ELRR-006 | Power Cables | | | | | | | | | | $0 |
| ELRR-007 | Transformers | | | | | | | | | | $0 |
| ELRR-008 | Black & McDonald Report | $45,000 | | | | | | | | | $45,000 |
| ELECTRICAL | **Sub Total** | **$78,000** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$78,000** |
| **WATER SYSTEM** | | | | | | | | | | | |
| WSRR-001 | Main | $100,000 | | | | | | | | | $100,000 |
| WSRR-002 | Hydrant | $500 | | | | | | | | | $500 |
| WSRR-003 | Hydrant | $500 | | | | | | | | | $500 |
| WSRR-004 | Hydrant | $2,000 | | | | | | | | | $2,000 |
| WSRR-005 | Hydrant | $600 | | | | | | | | | $600 |
| WSRR-006 | Hydrant | $400 | | | | | | | | | $400 |
| WSRR-007 | Hydrant | $150 | | | | | | | | | $150 |
| WSRR-008 | Hydrant | $600 | | | | | | | | | $600 |
| WSRR-009 | Hydrant | $500 | | | | | | | | | $500 |
| WSRR-010 | Hydrant | $2,000 | | | | | | | | | $2,000 |
| WSRR-011 | General | $40,000 | | | | | | | | | $40,000 |
| WATER SYSTEM | **Sub Total** | **$147,250** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$147,250** |
| **STORM/SANITARY SEWER** | | | | | | | | | | | |
| SSRR-001 | | $30,000 | | | | | | | | | $30,000 |
| SSRR-002 | | $300 | | | | | | | | | $300 |
| SSRR-003 | | | | | | | | | | | $0 |
| SSRR-004 | | | | | | | | | | | $0 |
| SSRR-005 | | | | | | | | | | | $0 |
| SSRR-006 | | $10,000 | | | | | | | | | $10,000 |
| SSRR-007 | | $2,000 | | | | | | | | | $2,000 |
| SSRR-008 | None | $65,000 | | | | | | | | | $65,000 |
| SSRR-009 | General | $600 | | | | | | | | | $600 |
| STORM/SANITARY SEWER | **Sub Total** | **$107,900** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$107,900** |

| ID | Recommendation | | 2000 | 2001 | 2002 | 2003 | 2004 | 2005- 2009 | 2010- 2014 | 2015- 2019 | 2020- 2024 | SubTotal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GAS SYSTEM** | | | | | | | | | | | | |
| GSRR-003 | General | | $5,000 | | | | | | | | | $5,000 |
| GAS SYSTEM | | Sub Total | $5,000 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $5,000 |
| Required Repairs | | Sub Total | $338,150 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $338,150 |
| Toronto Zoo | | Sub Total | $338,150 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $338,150 |
| | | Total | $338,150 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $338,150 |

SITE SERVICES ASSESSMENT FOR LONG TERM FACILITY RENEWAL PLANNING,
TORONTO ZOO 361A Old Finch Road,
Scarborough

# Detailed Cost Report

## Toronto Zoo

Capital Improvement

Project Number 98820
*26-Oct-99*

METROPOLITAN TORONTO ZOO

| ID | Recommendation | 2000 | 2001 | 2002 | 2003 | 2004 | 2005- 2009 | 2010- 2014 | 2015- 2019 | 2020- 2024 | SubTotal |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ELECTRICAL** | | | | | | | | | | | |
| ELCA-004 | Replace underground cable between North | $50,000 | | | | | | | | | $50,000 |
| ELCA-005 | Replace Light Standards - 6% every 5 years. | | | $6,365 | | | $7,829 | | $9,628 | $11,842 | $35,664 |
| ELCA-006 | Repair Transformer Vault -20% every 10 yea | | | | | | | $20,159 | | | $20,159 |
| ELCA-007 | Replace 30% of elec. Panels every 5 years. | | | $5,305 | | | $6,524 | | $8,024 | $9,868 | $29,720 |
| ELCA-008 | Replace transf. 4 every 2 years | $25,000 | | $26,523 | | $28,138 | $61,521 | $107,057 | $82,678 | $143,875 | $474,791 |
| ELCA-009 | Replace underground power cables between | | $103,000 | | | | | | | | $103,000 |
| ELCA-010 | Replace underground power cable between | | | $39,784 | | | | | | | $39,784 |
| ELCA-011 | Replace underground power cables between | | | | $68,295 | | | | | | $68,295 |
| ELCA-012 | Replace underground power cables between | | | | | $56,275 | | | | | $56,275 |
| ELCA-013 | Replace underground power cables between | | | | | | $86,946 | | | | $86,946 |
| ELECTRICAL | **Sub Total** | **$75,000** | **$103,000** | **$77,976** | **$68,295** | **$84,413** | **$162,819** | **$127,215** | **$100,330** | **$165,585** | **$964,634** |
| **WATER SYSTEM** | | | | | | | | | | | |
| WSCA-002 | Replace 20% of water valves every 4 years. | | | | | $90,041 | | $114,061 | | $144,489 | $348,590 |
| WSCA-003 | Replace 20%. Of druinking fountains every 5 | | | | | | $1,391 | | $1,870 | | $3,261 |
| WSCA-004 | Replace 30%. Of manholes in 15 years | | | | | | | | $37,391 | | $37,391 |
| WSCA-005 | Replace pumping station in 5 years | | | | | | $34,778 | | | | $34,778 |
| WSCA-006 | Repairs to 20% water main chamber in 15 yr | | | | | | | | $15,580 | | $15,580 |
| WSCA-007 | Replace 100 feet of water mains every 2 yrs. | | | $21,218 | | | $23,881 | $57,130 | $34,049 | $38,322 | $174,600 |
| WATER SYSTEM | **Sub Total** | **$0** | **$0** | **$21,218** | **$0** | **$90,041** | **$60,050** | **$171,191** | **$88,889** | **$182,811** | **$614,200** |
| **STORM/SANITARY SEWER** | | | | | | | | | | | |
| SSCA-001 | Replace pipes - 6 m every 5 yrs. | | | | | | $11,593 | | $15,580 | | $27,172 |
| SSCA-002 | Replace pumping station in 10 yrs. | | | | | | | $107,513 | | | $107,513 |
| SSCA-003 | Repair 50% of manholes in 15 yrs. | | | | | | | | $77,898 | | $77,898 |
| SSCA-005 | Replace 100% of area drains in 13 yrs | | | | | | | $10,280 | | | $10,280 |
| SSCA-007 | Replace in 10 years. | | | | | | | $107,513 | | | $107,513 |
| SSCA-008 | Replace 50%. Of manholes in 15 yrs | | | | | | | | $46,739 | | $46,739 |
| SSCA-010 | Replace 50%. Of Catch Basins in 15 yrs | | | | | | | | $46,739 | | $46,739 |
| STORM/SANITARY SEWER | **Sub Total** | **$0** | **$0** | **$0** | **$0** | **$0** | **$11,593** | **$225,306** | **$186,956** | **$0** | **$423,855** |
| **COMMUNICATION SYSTEM** | | | | | | | | | | | |
| CSCA-002 | Allowance for equip. technology unpgrade | | | | | | | $20,159 | | | $20,159 |
| CSCA-004 | Underground communication cables betwee | $10,000 | | | | | | | | | $10,000 |
| CSCA-005 | Underground communication cables betwee | | $12,360 | | | | | | | | $12,360 |
| CSCA-006 | Underground communication cables betwee | | | $7,957 | | | | | | | $7,957 |

| ID | Recommendation | | 2000 | 2001 | 2002 | 2003 | 2004 | 2005- 2009 | 2010- 2014 | 2015- 2019 | 2020- 2024 | SubTotal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CSCA-007 | Underground communication cables betwee | | | | | $10,927 | | | | | | $10,927 |
| CSCA-008 | Underground communication cables betwee | | | | | | $10,130 | | | | | $10,130 |
| CSCA-009 | Underground communication cables betwee | | | | | | | $12,752 | | | | $12,752 |
| COMMUNICATION SYSTEM | | **Sub Total** | **$10,000** | **$12,360** | **$7,957** | **$10,927** | **$10,130** | **$12,752** | **$20,159** | **$0** | **$0** | **$84,284** |
| **GAS SYSTEM** | | | | | | | | | | | | |
| GSCA-001 | Repair Gas system valves - 20% every 2 ye | | | | $1,061 | | | $1,194 | $2,857 | $1,702 | $1,916 | $8,730 |
| GSCA-002 | Repair gas/fittings - 6 m every two year | | | $3,090 | | | $3,377 | $3,690 | $8,437 | $10,075 | $5,748 | $34,416 |
| GSCA-003 | Repair regulators/memters - 20% every 5 ye | | | | | | | $13,911 | $16,127 | $18,696 | $21,673 | $70,407 |
| GAS SYSTEM | | **Sub Total** | **$0** | **$3,090** | **$1,061** | **$0** | **$3,377** | **$18,795** | **$27,421** | **$30,473** | **$29,338** | **$113,554** |
| Capital Improvement | | **Sub Total** | **$85,000** | **$118,450** | **$108,212** | **$79,223** | **$187,960** | **$266,009** | **$571,292** | **$406,648** | **$377,733** | **$2,200,527** |
| Toronto Zoo | | **Sub Total** | **$85,000** | **$118,450** | **$108,212** | **$79,223** | **$187,960** | **$266,009** | **$571,292** | **$406,648** | **$377,733** | **$2,200,527** |
| | | **Total** | **$85,000** | **$118,450** | **$108,212** | **$79,223** | **$187,960** | **$266,009** | **$571,292** | **$406,648** | **$377,733** | **$2,200,527** |

SITE SERVICES ASSESSMENT FOR LONG TERM FACILITY RENEWAL PLANNING,
TORONTO ZOO 361A Old Finch Road,
Scarborough

# Detailed Cost Report

## Toronto Zoo

Preventive Maintenance

Project Number 98820

*26-Oct-99*



METROPOLITAN TORONTO ZOO

| ID | Recommendation | | 2000 | 2001 | 2002 | 2003 | 2004 | 2005- 2009 | 2010- 2014 | 2015- 2019 | 2020- 2024 | SubTotal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WATER SYSTEM** | | | | | | | | | | | | |
| WSPM-001 | Fire Hydrants -Water System | | $5,500 | $5,665 | $5,835 | $6,010 | $6,190 | $33,851 | $39,243 | $45,493 | $52,739 | $200,526 |
| WSPM-002 | Fire Hydrants | | $5,800 | $5,974 | $6,153 | $6,338 | $6,528 | $35,698 | $41,383 | $47,974 | $55,616 | $211,464 |
| WSPM-003 | Fire Hydrants | | $5,800 | $5,974 | $6,153 | $6,338 | $6,528 | $35,698 | $41,383 | $47,974 | $55,616 | $211,464 |
| WSPM-004 | General | | $4,000 | $4,120 | $4,244 | $4,371 | $4,502 | $24,619 | $28,540 | $33,086 | $38,356 | $145,837 |
| WATER SYSTEM | | **Sub Total** | **$21,100** | **$21,733** | **$22,385** | **$23,057** | **$23,748** | **$129,865** | **$150,549** | **$174,528** | **$202,326** | **$769,290** |
| **STORM/SANITARY SEWER** | | | | | | | | | | | | |
| SSPM-001 | Catch Basins, Manholes and Drains | | $12,000 | $12,360 | $12,731 | $13,113 | $13,506 | $73,857 | $85,620 | $99,258 | $115,067 | $437,511 |
| SSPM-002 | Storm/Sanitary sewers | | $10,000 | $10,300 | $10,609 | $10,927 | $11,255 | $61,547 | $71,350 | $82,715 | $95,889 | $364,593 |
| SSPM-003 | Buried Pipes | | $1,000 | $1,030 | $1,061 | $1,093 | $1,126 | $6,155 | $7,135 | $8,271 | $9,589 | $36,459 |
| SSPM-004 | Buried Pipes | | $1,500 | $1,545 | $1,591 | $1,639 | $1,688 | $9,232 | $10,703 | $12,407 | $14,383 | $54,689 |
| STORM/SANITARY SEWER | | **Sub Total** | **$24,500** | **$25,235** | **$25,992** | **$26,772** | **$27,575** | **$150,791** | **$174,808** | **$202,651** | **$234,928** | **$893,252** |
| **GAS SYSTEM** | | | | | | | | | | | | |
| GSPM-001 | Gas Lines and Valves | | $10,000 | $10,300 | $10,609 | $10,927 | $11,255 | $61,547 | $71,350 | $82,715 | $95,889 | $364,593 |
| GAS SYSTEM | | **Sub Total** | **$10,000** | **$10,300** | **$10,609** | **$10,927** | **$11,255** | **$61,547** | **$71,350** | **$82,715** | **$95,889** | **$364,593** |
| Preventive Maintenance | | **Sub Total** | **$55,600** | **$57,268** | **$58,986** | **$60,756** | **$62,578** | **$342,204** | **$396,708** | **$459,893** | **$533,142** | **$2,027,135** |
| Toronto Zoo | | **Sub Total** | **$55,600** | **$57,268** | **$58,986** | **$60,756** | **$62,578** | **$342,204** | **$396,708** | **$459,893** | **$533,142** | **$2,027,135** |
| | | **Total** | **$55,600** | **$57,268** | **$58,986** | **$60,756** | **$62,578** | **$342,204** | **$396,708** | **$459,893** | **$533,142** | **$2,027,135** |

# APPENDIX 3

# RECOMMMENDATION REPORT

***REQUIRED REPAIRS***

***CAPITAL IMPROVEMENT***

***PREVENTIVE MAINTENANCE***

| ID | Location | Pty | Category | Description | Correction | Base Year Budget Cost |
|---|---|---|---|---|---|---|
| ELRR-001 | General<br>General | 6 | Functional | Primary and secondary cables are haphazardly arranged in the vaults, often buried in the mud on the vault floor. | *To avoid damage from the gravel and from workers stepping on the cables, and to lessen tripping hazards in the confined space, it is recommended that cable racks be installed and used in the transformer vaults.* | $20,000.00 |
| ELRR-002 | General<br>General | 4 | Functional | On occasion, vaults and cable chambers are flooded by runoff or temporarily rising water tables. We understand that the drains or weeping tiles have been installed at locations where this is a continuing problem. | *We recommend that these vaults be monitored frequently during the spring and after heavy rain. We understand that many cables are up to 25 years old. Althought this age is much lower than the expected life of the cables, it would be prudent to expose them to as little abuse as possible and the use of cable racks is recommended for this purpose. The cost of this item is included in item ELRR-001 above.* | $0.00 |
| ELRR-003 | General<br>General | 3 | Functional | The main outdoor switchgear was observed to suffer from rust and metal damage. | *It is recommended that the entire assembly be examined, repainted and recaulked.* | $10,000.00 |
| ELRR-004 | General<br>General | 3 | Functional | It was noted that ice formed inside all windows on the main outdoor switchgear. This indicates the presence of high humidity and condensation which can lead to insulation failure and reduction of electrical spacings. | *It is recommended that condensation prevention measures be undertaken such as the installation of heaters or forced ventilation. The cost of this is included in item ELRR-003 above.* | $0.00 |
| ELRR-005 | General<br>General | 6 | Functional | Some vaults were not numbered in the field. Vaults were not always numbered on the drawings. | *It is recommended that all vaults be consicuously numbered in the field to match the numbering system on the drawings. Un-numbered vaults on the drawings should be assigned numbers.* | $3,000.00 |

| ID | Location | Pty | Category | Description | Correction | Base Year Budget Cost |
|---|---|---|---|---|---|---|
| ELRR-006 | General General | 6 | Functional | Over the last 5 years, Toronto Zoo reported approximately seven breakdowns related to the 27.6 KV cable. For the most part, the breakdowns were rectified by simply removing and replacing the defective sections of the cable. From our review of the history of these problems and their correction, augmented with our site inspection, the most plausible cause of the cable failures appears to be manufacturing defects. | *This problem could be caused by a combination of several factors such as age, environmental condition, loading and manufacturing defects. We did not find any evidence pointing to either environmental conditions or loading as causes of the reported cable failures. Cables are suitable for direct burial and there was no evidence of excessive heat or humidity or corrosive soil conditions. The most plausible cause of this problem is age and manufacturing defects. Given the length of the run of the service cables it is not unexpected to experience some cable failures. From theoretical considerations, it can be expected that up to 10 feet per 1000 feet of cable will fail and be replaced every 12 years. Based on this, there are two remedial options available. The first one is to replace the entire buried cable system with new cable. This option is not feasible because of cost considerations. The second option is to set aside an annual budget to repair and replace sections of the cable. This option appears to be the most viable under the circumstances and this has been recommended. The cost of this option is given in the section on Capital Improvement. It is further recommened that all occurences of cable failure be properly documented, describing the cost of repair, nature and location of the problem and the type of repair conducted.* | $0.00 |
| ELRR-007 | General General | 6 | Functional | One transformer blow out was reported at the Lion House in 1996. One transformer blow out was reported at the African pad in 1996. Both occurences were repaired. It was reported that repair workmen determined that these failures were the result of faulty installation by the contractor who installed the units. | *This rate of failure can be anticipated. The theoretical life of a transformer is 30 years, however, repair of up to 10% is anticipated to a transformer every 10 years. Given the above facts, and the history of the transformers, it can be resonably concluded that the transformers have performed within expectation. There is no required repair. Allowance for periodic replacements has been made in the section on Capital improvement. We have allowed for replacing 4 transformers every two tears. In addition, we recommend that all accurences of transformer failures be documented, including repair cost and the nature and location of repair.* | $0.00 |
| ELRR-008 | General General | 2 | Functional | The High Voltage Maintenance Report completed by Black & McDonald dated August 1999, Reference Number 6621 contained 23 deficiencies. These deficiencies should be rectified. | *It is recommeded that all the deficiencies listed in the Black & McDonald Report be rectified. The cost indicated here does not include the cost of replacing the transformers which have been included in the Capital Improvement Schedule.* | $45,000.00 |

| ID | Location | Pty | Category | Description | Correction | Base Year Budget Cost |
|---|---|---|---|---|---|---|
| WSRR-001 | General General | 6 | Functional | It was reported that on the 14" diameter main there were two leaks which were repaired to remedy the problem temporarily. Three sections of pipe were excavated and exposed for inspection. Approximately 7 feet of the pipes were exposed and at two locations the joints were also exposed. Our inspection of the exposed water mains revealed that the mains were made of ductile iron and that the original protective coatings are still on the pipes. The incidences reported appear to be isolated. There was no evidence of pipe deterioration. | *There are two possible solutions to this immediate problem (1) Replace approximately 200 LM of the 14" Main at the vicinity of the leaks. This can be perform at a cost of approximately $ 40,000.00 (2) Design and install an alternative incoming main adjacent to the existing main of approximately 8 inches PVC to be brought from the city main and tied to the 14" main upstream. The new adjacent line should be designed to have a valve at the point where it joins the existing main. We estimate that this line will be approximately 600 LM long and tied at a point sufficiently far away from the sections currently exhibiting leakage problems. In the event of a leak at the section of main between the city main and the point of intersection of the 8 inch line, the 14 inch main can be shut off and repaired while the 8 inch main continue to supply the Zoo's minimum water flow requirements. This is an outline specification which must be properly designed by a registered engineer. The budget for this work is (600 x $175/lm) $100,000. We recommend the second option because replacing any of the section of the 14" does not guarantee that there will not be any further leakage.* | $100,000.00 |
| WSRR-002 | General General | 4 | Life Safety | Hydrant: The Hydrant near the South end of the Indo-Malayan Pavilion has a minor leak at the ground flange. | *Service and repair the hydrant to stop the leak.* | $500.00 |
| WSRR-003 | General General | 4 | Life Safety | Hydrant: The Hydrant outside the Gorilla exhibit doors, at the inside/outside holding area leaked when fully charged. | *Service and repair the hydrant to stop the leak.* | $500.00 |
| WSRR-004 | General General | 4 | Life Safety | Hydrant: The Hydrant near the inside/outside holding reported marginal test pressure. | *Retain a serviceman to service this hydrant.* | $2,000.00 |
| WSRR-005 | General General | 4 | Life Safety | Hydrant: The secondary valve of the Hydrant North of the North American Pavilion (Century make), seized when in the open position. | *Service and repair valve on hydrant.* | $600.00 |
| WSRR-006 | General General | 3 | Functional | Hydrant: Leaks were noted at the operating nut packing on the Hydrant North of the Australasia McDonald's restaurant. | *Service and repair. Replace packing.* | $400.00 |

| ID | Location | Pty | Category | Description | Correction | Base Year Budget Cost |
|---|---|---|---|---|---|---|
| WSRR-007 | General General | 5 | Life Safety | Hydrant: The left 2-1/2" port cap is missing on the Hydrant South of the Greenhouse. | *Replace missing 2-1/2" port cap.* | $150.00 |
| WSRR-008 | General General | 5 | Life Safety | Hydrant: The secondary valve box is broken and the lid is missing from the Hydrant at the East side of the garage. Although still operble, the box has mud in it and needs repair/replacement. | *Replace the broken secondary valve box and the lid.* | $600.00 |
| WSRR-009 | General General | 4 | Life Safety | Hydrant: The Hydrant East of Society was flushed, but a flow test could not be done because of the existing site condition (walk ways) and the secondary valve was inoperable since the valve box was full of dirt. | *Service and repair valve box.* | $500.00 |
| WSRR-010 | General General | 6 | Life Safety | Hydrant: Most of the Hydrants are not identifiable by number or area in the field. It is recommended that the Hydrants be conspicuously numbered in the field to match the numbering system on the drawings. | *Provide and install identifying number tags to match the numbering system on the drawings. Complete the numbering system on the drawings.* | $2,000.00 |

| ID | Location | Pty | Category | Description | Correction | Base Year Budget Cost |
|---|---|---|---|---|---|---|
| WSRR-011 | General<br>General | 4 | Life Safety | The flow and pressure tests on the hydrants revealed that the static and residual pressures ranged from 35 psi upto 65 psi. All fire hydrants tested in excess of 600 gpm at 20 psi. the Ontario Fire Marshal's office design guideline for water supply specifies the minimum water supply flow rate to be 1800L/min for buildings that one storey in building height and does not exceed 600 cubic meter in building area. This recorded flow rates and pressures exceed this minimum requirepment. The Ontario Building Code and Ontario Fire Code require that all existing and new fire protection systems meet the approval of local Fire chief i.e., the requirements of the Scarborough Fire Department. The City of Scarborough Fire Department require that fire hydrants be connected to the water main through a looped system. In addition, they require that the water main be 8" but that smaller sizes may be used if hydraulic calculations supporting required water supply were conducted. From our review of the drawings, there are two dead ends in the water system, mainly at the recently developed African Savannah complex. Based on the above observations, the existing water system is not in conformance with the City of Scarborough Fire Department requirement with respect to the lack of a complete looped system. As a result, the requirements of the City of Scarborough Fire Department, must be addressed. | *Preliminary consultation with city official reveal that they require as a solution to this problem, that all dead ends be removed from the system and a loop be installed at all fire hydrants. The installation of the loop at each hydrant increases the reliability of water supply. The cost of design and construction of a loop at each hydrant increases the reliability of water supply. The cost of design and construction of a loop to each of the two hydrants will be approximately $20000 per hydrant at a total cost of $40,000. This cost is very high and the effectiveness is limited. Hence, we recommend that the Toronto Zoo meet with and negotiate appropriate variance from the city because of the cost prohibitive nature of the remedy. Consideration should be given to the cost of the remedy, the effectiveness of the remedies and the overall impact of the system.* | $40,000.00 |

| ID | Location | Pty | Category | Description | Correction | Base Year Budget Cost |
|---|---|---|---|---|---|---|
| SSRR-001 | General<br>General | 4 | Functional | Storm Sewer: A camera inspection of the storm sewers was conducted at a representative sample of the storm sewer system. The camera inspection revealed various deficiencies in the sewer as listed below. Piping North of Indo pavilion has light debris 7m away from manhole 2. | *conduct a complete flushing of the entire storm system piping, clean all manhole in the entire complex.* | $30,000.00 |
| SSRR-002 | General<br>General | 5 | Functional | One extra manhole is not shown on the drawing. | *Update the existing drawing to show one extra existing manhole.* | $300.00 |
| SSRR-003 | General<br>General | 4 | Functional | Piping East of old elephant house had calcite at service connection. Calcite was also noted at othe rlocations. Given that only 5% of the entire storm sewer system was inspected with the camera, it is suspected that these deficiencies do occur at other locations. | *Conduct scrubbing an reaming of the sewer system at locations were calcite is identified. In order to determine the locations where calcite formation has occurred, a complete camera inspection of the entire storm sewer should be conducted. Scrubbing, reaming and possibly grouting techniques should be employed to rectify the calcite problem. This budget include the price of completing a 100% camera survey of the storm sewer and conducting necessary remedies as described above. The budget for this deficiency is included in the cost of item SSRR-008 shown below.* | $0.00 |
| SSRR-004 | General<br>General | 4 | Functional | Storm Sewer: Piping east of Rouge River has light debris under the flow. | *Conduct flushing of the system piping. The cost of this is included in item SSRR-001.* | $0.00 |
| SSRR-005 | General<br>General | 4 | Functional | Storm Sewer: Piping under Rouge River has light debris under the flow. | *Conduct flushing of the system piping. The cost of this is included in item SSRR-001.* | $0.00 |
| SSRR-006 | General<br>General | 4 | Functional | Sewer backup has been experienced in the African Savannah area where 2 - 8" sanitary lines come together in 1 - 12". | *Since camera inspection showed no blockage and only light deposits of debris, it is concluded that the problem arises from a system design deficiency. Retain the services of a qualified engineer to design corrective measures. The solution will involve excavation and replacement of the joints with new pipes to meet current design standard. The budget includes cost of design and construction.* | $10,000.00 |
| SSRR-007 | General<br>General | 5 | Functional | Manholes were not clearly identified in the field. | *Identity manholes in the field to match numbers on drawings. Add numbering to drawings.* | $2,000.00 |

| ID | Location | Pty | Category | Description | Correction | Base Year Budget Cost |
|---|---|---|---|---|---|---|
| SSRR-008 | General General | 4 | Functional | A camera survey of the sanitary sewers was conducted covering approximately 5% of the sewer lines. The survey revealed a significant level of deficiencies including ponding, debris buildup. At one location, the camera was blocked as result of the debris. The following are specific observations as they are listed (a) The sewer lines between North of Gate D to South of Gate D - ponding and debris was observed in the line. Heavy calcite was also observed below a service connection. (b) The sewer lines between South of Gate D to 2nd Manhole South of Gate D - light ponding was noted in the lines. (c) Between 2nd Manhole South of Gate D to 3rd. Manhole South of Gate D - A manhole lid was noted in the manhole. Light ponding was noted. (d) Between 1st manhole west of Eurasia pavilion and north of North American Pavilion - light debris and moerate ponding was noted in the line. (e) Between 1 st manhole west of Eurasia Pavilion and ending at Eurasia Pavilion - light ponding and moderate debris in the line. (f) Between south of the Savana Rest. And north east of manhole 10 -- the camera was blocked by heavy gravel. (g) Between south of the VAS Rest. And west of manhole 10 -- the camera was blocked by debris. Light ponding was also noted. (h) Between south east of the Africa Pav. And east entrace of Africa Pav. - camera was blocked by debris. (I) Between south eastcorner of the elephant house and south west corner of the African Pav. - camera was blocked by debris. (j) Between south west corner of the Africa Pavilion and south west corner of the Elephant House - debris and moderate ponding was noted in the line. (k) Between south west corner of the Africa Pav. And 1st manhole of the north manhole 16, the camera was blocked by debris (l) Between 1st manhole west of the Camel Pen. And 2nd manhole west of the Camel Pen. - Moderate debris in the line. | *The deficiencies noted above revealed three major types of problems namely; heavy to moderate debris in the lines, ponding and calcite formation. Out of the 18 runs observed, only in 4 of the runs were the lines found to be in good condition. Fourteen of the eighteen runs indicated some form of deficiency. Given that only approximately 5% of the entire sanitary sewer lines were inspected, it can be resonably concluded that the other lines which were not viewed will suffer from similar deficiencies to the same degree. In order to rectify these deficiencies, it is recommended that the camera survey be conducted throughout the sanitary lines at a cost of $15000. Following the survey, all areas usffering from light, moderate to heavy debris should be flushed. We estimate the cost of flusing the entire system to be approximately $30,000. The problem of ponding will partly be addressed after flushing where the ponding is the result of debris blockage. However, in some cases, the ponding may be the result of settlement of the pipe. The most appropriate solution to such deficiency will be to excavate the section suffering fromt his problem, raise the pipe and restore the subsoil structure. This solution is very costly and is of limited merit. For the most part, flusing is adequate to ensure proper flow. The third major deficiency was the formation of calcite in the lines. The solution to this problem is to conduct scrubbing, reaming and grouting the joints which are most prone to calcite. All locations where this problem occur will be shown in the camera survey. We estimate a cost of approximately $20,000 for this solution.* | $65,000.00 |
| SSRR-009 | General General | 5 | Functional | A camera survey of the sanitary sewers was conducted covering approximately 5% of the sewer lines. The survey revealed a significant level of deficiencies including ponding, debris buildup. At one location, the camera was blocked as result of the debris. The following are specific observations as they are listed (a) The sewer lines between 3rd manhole west of the Camel Pen and 4th manhole west of the Camel Pen - The drawing of the Sewer run is not correct. Sewer run does not run to manhole number 8 as shown. | *Determine sewer run and termination and record on the drawings.* | $600.00 |

| ID | Location | Pty | Category | Description | Correction | Base Year Budget Cost |
|---|---|---|---|---|---|---|
| CSRR-001 | General<br>General | **0** | Functional | At the time of this inspection and audit, no failure of either equipment or service cables were observed or reported. | *No action required.* | $0.00 |

| ID | Location | Pty | Category | Description | Correction | Base Year Budget Cost |
|---|---|---|---|---|---|---|
| GSRR-003 | General<br>General | 5 | Functional | Random sampling of the gas regulators and valves revealed that they are not providing adequate pressure. It is concluded that the majority of the gas regulators will suffer similar deficiencies. | *Retain a serviceman to check all the regulators, valves and accessories and adjust these components as required.* | $5,000.00 |

**$338,150.00**

| ID | Location | Pty | Category | Description | Action | Units | Quantity | Budget Cost | Norm Life | Age | Rem. Life | First Occ | Succ Occ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ELCA-004 | General General | 3 | Functional | Underground Service Cable | Replace underground cable between North Service to Americas | LM | 4000 | $50,000 | 50 | 27 | 0 | 2000 | 2050 |
| ELCA-005 | General General | 6 | Functional | Light Standards | Replace Light Standards - 6% every 5 years. | each | 33 | $6,000 | 30 | 27 | 2 | 2002 | 2007 |
| ELCA-006 | General General | 6 | Functional | Transformer Vault | Repair Transformer Vault -20% every 10 years | each | 27 | $15,000 | 75 | 27 | 10 | 2010 | 2020 |
| ELCA-007 | General General | 6 | Functional | Electrical Panels | Replace 30% of elec. Panels every 5 years. | each | 3 | $5,000 | 20 | 27 | 2 | 2002 | 2007 |
| ELCA-008 | General General | 6 | Functional | Transformers | Replace transf. 4 every 2 years | each | 49 | $25,000 | 30 | 27 | 0 | 2000 | 2002 |
| ELCA-009 | General General | 6 | Maintenance | Underground Power Cables | Replace underground power cables between Americas & Africa Pav. | LF | 4000 | $100,000 | 50 | 30 | 1 | 2001 | 2051 |
| ELCA-010 | General General | 6 | Functional | Underground power cable | Replace underground power cable between Africa and Indo Pav. | LF | 1500 | $37,500 | 50 | 30 | 2 | 2002 | 2052 |
| ELCA-011 | General General | 6 | Functional | Underground power cables | Replace underground power cables between Indo Pav. To Front Entrance | LF | 2500 | $62,500 | 50 | 30 | 3 | 2003 | 2053 |
| ELCA-012 | General General | 6 | Functional | Underground power cables | Replace underground power cables between Front Entrance & Australasia Pav. | LF | 2000 | $50,000 | 50 | 30 | 4 | 2004 | 2054 |
| ELCA-013 | General General | 6 | Functional | Underground power cables | Replace underground power cables between Australasia to North service Pav. | LF | 3000 | $75,000 | 50 | 30 | 5 | 2005 | 2055 |

| ID | Location | Pty | Category | Description | Action | Units | Quantity | Budget Cost | Norm Life | Age | Rem. Life | First Occ | Succ Occ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WSCA-002 | General General | 6 | Functional | Valves -Water System | Replace 20% of water valves every 4 years. | each | 199 | $80,000 | 10 | 27 | 4 | 2004 | 2008 |
| WSCA-003 | General General | 6 | Functional | Drinking Fountains-Water System | Replace 20%. Of druinking fountains every 5 years | each | 18 | $1,200 | 10 | 20 | 5 | 2005 | 2010 |
| WSCA-004 | General General | 6 | Functional | Manholes - Water System. | Replace 30%. Of manholes in 15 years | each | 5 | $24,000 | 50 | 27 | 15 | 2015 | 2030 |
| WSCA-005 | General General | 6 | Functional | Pumping Station | Replace pumping station in 5 years | each | 1 | $30,000 | 20 | 27 | 5 | 2005 | 2025 |
| WSCA-006 | General General | 6 | Functional | Water Main Chamber | Repairs to 20% water main chamber in 15 yrs | each | 1 | $10,000 | 50 | 27 | 15 | 2015 | 2035 |
| WSCA-007 | General General | 6 | Functional | Buried Water Pipe | Replace 100 feet of water mains every 2 yrs. | LM | 12750 | $20,000 | 50 | 27 | 2 | 2002 | 2004 |

| ID | Location | Pty | Category | Description | Action | Units | Quantity | Budget Cost | Norm Life | Age | Rem. Life | First Occ | Succ Occ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SSCA-001 | General General | 6 | Functional | Pipe & Fittings | Replace pipes - 6 m every 5 yrs. | LM | 19500 | $10,000 | 75 | 27 | 5 | 2005 | 2010 |
| SSCA-002 | General General | 6 | Functional | Pumping Station | Replace pumping station in 10 yrs. | Each | 329 | $80,000 | 20 | 27 | 10 | 2010 | 2030 |
| SSCA-003 | General General | 6 | Functional | Manholes - Sewer System | Repair 50% of manholes in 15 yrs. | Each | 329 | $50,000 | 50 | 27 | 15 | 2015 | 2065 |
| SSCA-005 | General General | 6 | Functional | General | Replace 100% of area drains in 13 yrs | Each | 7 | $7,000 | 40 | 27 | 13 | 2013 | 2000 |
| SSCA-007 | General General | 6 | Functional | Pumping Station | Replace in 10 years. | each | 329 | $80,000 | 20 | 27 | 10 | 2010 | 2020 |
| SSCA-008 | General General | 6 | Functional | Manholes - Storm System. | Replace 50%. Of manholes in 15 yrs | each | 329 | $30,000 | 50 | 27 | 15 | 2015 | 2030 |
| SSCA-010 | General General | 6 | Functional | Catch Basins - Storm System. | Replace 50%. Of Catch Basins in 15 yrs | each | 275 | $30,000 | 50 | 27 | 15 | 2015 | 2065 |

| ID | Location | Pty | Category | Description | Action | Units | Quantity | Budget Cost | Norm Life | Age | Rem. Life | First Occ | Succ Occ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CSCA-002 | General General | 6 | Functional | General | Allowance for equip. technology unpgrade | LM | 1 | $15,000 | 15 | 4 | 10 | 2010 | 2030 |
| CSCA-003 | General General | 6 | Functional | General | Replace undergrd cable | LM | 12000 | $7,500 | 50 | 27 | 23 | 2023 | 2050 |
| CSCA-004 | General General | 6 | Functional | Underground Cables | Underground communication cables between North Service to Americas Pavilions. | LF | 2000 | $10,000 | 50 | 30 | 0 | 2000 | 2050 |
| CSCA-005 | General General | 6 | Functional | Undergound Communication Cables | Underground communication cables between Americas to Africa Pavilions. | LF | 4000 | $12,000 | 50 | 30 | 1 | 2001 | 2051 |
| CSCA-006 | General General | 6 | Functional | Underground Communication Cables | Underground communication cables between Africa to Indo Pavilions. | LF | 1500 | $7,500 | 50 | 30 | 2 | 2002 | 2052 |
| CSCA-007 | General General | 6 | Functional | Underground Communication Cables | Underground communication cables between Indo Pavilion to Front Entrance. | LF | 2500 | $10,000 | 50 | 30 | 3 | 2003 | 2053 |
| CSCA-008 | General General | 6 | Functional | Underground Communication Cables | Underground communication cables between Front Entrance to Australisia Pavilions. | LF | 2000 | $9,000 | 50 | 30 | 4 | 2004 | 2054 |
| CSCA-009 | General General | 6 | Functional | Underground Communication Cables | Underground communication cables between Australasia to North Service Pavilions. | LF | 3000 | $11,000 | 50 | 30 | 5 | 2005 | 2055 |

| ID | Location | Pty | Category | Description | Action | Units | Quantity | Budget Cost | Norm Life | Age | Rem. Life | First Occ | Succ Occ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GSCA-001 | General General | 6 | Functional | Valves | Repair Gas system valves - 20% every 2 years | each | 4 | $1,000 | 20 | 20 | 2 | 2002 | 2004 |
| GSCA-002 | General General | 6 | Functional | Gas pipes and fittings | Repair gas/fittings - 6 m every two year | LM | 4150 | $3,000 | 75 | 27 | 1 | 2001 | 2003 |
| GSCA-003 | General General | 6 | Functional | Regulators and Meters | Repair regulators/memters - 20% every 5 years | each | 30 | $12,000 | 25 | 20 | 5 | 2005 | 2005 |

# Recommendation Report

**Preventive Maintenance** **Toronto Zoo**

## WATER SYSTEM



| ID | Location | Pty | Category | Description | Correction | Base Year Budget Cost |
|---|---|---|---|---|---|---|
| WSPM-001 | General<br>General | 4 | Life Safety | Fire Hydrants -Overhauling Servicing | *The fire hydrants require overhauling and servicing to maintain all operating parts. Allow for the servicing and overhauling of the fire hydrants once every 5 years at an annual cost of $ 1100.00* | $5,500.00 |
| WSPM-002 | General<br>General | 4 | Life Safety | Fire Hydrants: Fire Flow tests | *Conduct annual flow test to check the water pressure and performance of the hydrants on site. Allow an annual budget of $5800.* | $5,800.00 |
| WSPM-003 | General<br>General | 4 | Life Safety | Fire Hydrants: Leak Detection Tests | *The fire hydrants on site require a leak detection test to be performed on them to determine if there are any defective parts in its assembly. Allow an annual budget of $5800.* | $5,800.00 |
| WSPM-004 | General<br>General | 6 | Maintenance | Manholes, valve and meter chambers. All site services including manholes, vlave chambers and meters require annual cleaning and inspection. | *Conduct annual inspection and cleaning of all these components on site. Allow an annual budget of $4000.* | $4,000.00 |

| ID | Location | Pty | Category | Description | Correction | Base Year Budget Cost |
|---|---|---|---|---|---|---|
| SSPM-001 | General<br>General | 6 | Maintenance | Catch Basins, Manholes and Area Drains. These site services components require annual cleaning to clear them of dirt and debrits. | *Flush these services components once every year. Allow annual budget of $12000.* | $12,000.00 |
| SSPM-002 | General<br>General | 6 | Maintenance | Manholes. Thses site services components require annual cleaning to clear them of dirt and debrits. | *Flush these services components once every year. Allow annual budget of $10000.* | $10,000.00 |
| SSPM-003 | General<br>General | 6 | Maintenance | Buried Pipes. A camera survey is required in order to check the integrity of the underground pipes. This survey is recommended to be performed every 10 years. | *Conduct a camera survey of the storm sewer lines every 10 years. Allow an annual budget of $ 1000.00* | $1,000.00 |
| SSPM-004 | General<br>General | 6 | Maintenance | Buried Pipes. A camera survey is required in order to check the integrity of the underground pipes. This survey is recommended to be performed every 10 years. | *Conduct a camera survey of the sanitary sewer lines every 10 years. Allow an annual budget of $ 1500.00* | $1,500.00 |

| ID | Location | Pty | Category | Description | Correction | Base Year Budget Cost |
|---|---|---|---|---|---|---|
| GSPM-001 | General General | 6 | Maintenance | Gas Lines and Valves. Gas lines, meters, and valves require to be inspected periodically to check for signs of leaks, corrosion etc. | *Retain the services of Consumer Gas or its approved contractor to inspect the gas lines and associated components annually. All equipment on site using gas should be included in this annual inspection. All such appliances should be cleaned to ensure proper gas supply. Allow an annual budget of $ 1000.00.* | $10,000.00 |

**$55,600.00**

# APPENDIX 4

# 1997 ENERGY REPORT

TORONTO

# 1997 Energy Report

## Toronto Zoo

## All Facilities

Corporate Services
Energy Management Office, 392-8954

CITY OF TORONTO

# 1997 Energy Report

## TORONTO ZOO

## CONTENTS

CITY OF TORONTO
TORONTO ZOO

# ALL FACILITIES

## *1997 Actual Energy CONSUMPTION & COST vs Adjusted Baseline*

# EXECUTIVE SUMMARY

| ENERGY TYPE | | ENERGY CONSUMPTION | | | | ENERGY COST | | | |
|---|---|---|---|---|---|---|---|---|---|
| Name & Unit | | Adj.Base 1995 | Actual 1997 | Energy Change | Percent Change | Adj.Base 1995 | Actual 1997 | Cost Change | Percent Change |
| Electricity | kWh | 10,206,299 | 10,171,317 | (34,982) | -0.3% | $732,724 | $727,829 | ($4,895) | -0.7% |
| Natural Gas | $m^3$ | 1,802,733 | 2,011,432 | 208,699 | 11.6% | $263,690 | $296,334 | $32,644 | 12.4% |
| Heating Oil | litre | 13,458 | 9,228 | (4,230) | -31.4% | $4,433 | $3,058 | ($1,376) | -31.0% |
| Gasoline | litre | 61,427 | 59,577 | (1,850) | -3.0% | $34,107 | $33,120 | ($988) | -2.9% |
| Diesel | litre | 22,362 | 28,759 | 6,397 | 28.6% | $10,132 | $13,077 | $2,946 | 29.1% |
| Propane | litre | 50,973 | 61,645 | 10,671 | 20.9% | $17,988 | $21,650 | $3,663 | 20.4% |
| Water | $m^3$ | 28,849,623 | 30,972,943 | 2,123,321 | 7.4% | $220,768 | $260,329 | $39,561 | 17.9% |
| **Total** | ekWh | 30,208,091 | 32,417,110 | 2,209,019 | **7.3%** | $1,283,842 | $1,355,396 | **$71,554** | **5.6%** |

NOTE:

1) Adj.Base - The 1995 energy consumption and cost are adjusted to the 1997 billing periods, weather conditions and energy costs.

2) Actual - The current year (1997) actual energy consumption and cost.

3) ekWh - equivalent kilowatt-hour; water consumption is not included in total energy.

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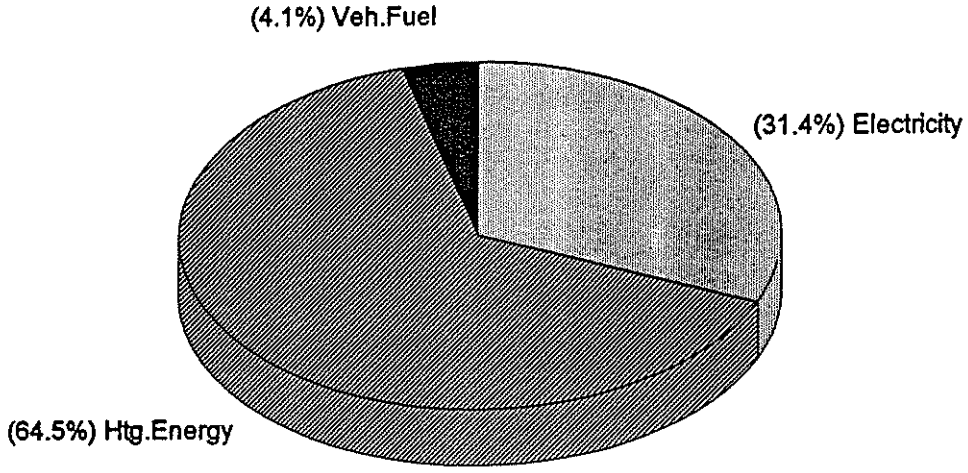
CITY OF TORONTO
TORONTO ZOO

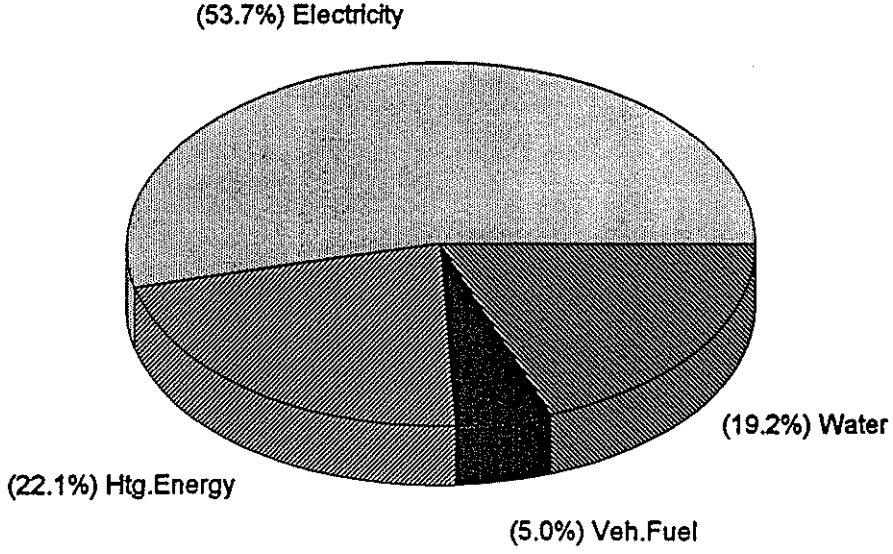
# ALL FACILITIES
## *1997 Actual ENERGY CONSUMPTION & COST*

## Energy Consumption




**Total 32,417.1 equivalent megawatt hours**
**Total 7,375 tonnes CO2**

## Energy Cost




**Total $1,355.4 millions**

NOTE: Htg Energy includes natural gas & heating oil; Veh.Fuel includes gasoline, diesel and propane.

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CITY OF TORONTO
TORONTO ZOO

# MASTER METERS

## *1997 Actual ENERGY CONSUMPTION VS Adjusted Baseline*

| FACILITIES | | ELECTRICITY (kWh) | | | NATURAL GAS (m³) | | | WATER (m³) | | | TOTAL (ekWh) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Facility ID | and Name | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change |
| DR | Domain Ride & Garage Bldg | 188,060 | 152,460 | -18.9% | — | — | — | — | — | — | 188,060 | 152,460 | -18.9% |
| FB | Finch Barn | 52,079 | 9,120 | -82.5% | — | — | — | — | — | — | 52,079 | 9,120 | -82.5% |
| GHS | Gate House | 14,867 | 9,068 | -39.0% | — | — | — | — | — | — | 14,867 | 9,068 | -39.0% |
| MB | Main Barn | 227,027 | 207,600 | -8.6% | — | — | — | — | — | — | 227,027 | 207,600 | -8.6% |
| ZMM | Zoo Main Meter | 9,664,589 | 9,730,005 | 0.7% | 1,802,733 | 2,011,432 | 11.6% | 273,371 | 330,480 | 20.9% | 28,307,913 | 30,531,631 | 7.9% |
| VH | Valley Halla | 25,828 | 19,096 | -26.1% | — | — | — | — | — | — | 25,828 | 19,096 | -26.1% |
| ZPS | Zoo Police Stable | 33,849 | 43,968 | 29.9% | — | — | — | — | — | — | 33,849 | 43,968 | 29.9% |
| Total | | 10,206,299 | 10,171,317 | -0.3% | 1,802,733 | 2,011,432 | 11.6% | 273,371 | 330,480 | 20.9% | 28,849,623 | 30,972,943 | 7.4% |

# MASTER METERS

## *1997 Actual ENERGY COST VS Adjusted Baseline*

| FACILITIES | | ELECTRICITY COST | | | NATURAL GAS COST | | | WATER COST | | | TOTAL COST | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Facility ID | and Name | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change |
| DR | Domain Ride & Garage Bldg | $15,094 | $12,342 | -18.2% | — | — | — | — | — | — | $15,094 | $12,342 | -18.2% |
| FB | Finch Barn | $4,965 | $833 | -83.2% | — | — | — | — | — | — | $4,965 | $833 | -83.2% |
| GHS | Gate House | $1,387 | $850 | -38.8% | — | — | — | — | — | — | $1,387 | $850 | -38.8% |
| MB | Main Barn | $18,617 | $16,130 | -13.4% | — | — | — | — | — | — | $18,617 | $16,130 | -13.4% |
| ZMM | Zoo Main Meter | $687,572 | $692,323 | 0.7% | $263,690 | $296,334 | 12.4% | $220,768 | $260,329 | 17.9% | $1,172,030 | $1,248,986 | 6.6% |
| VH | Valley Halla | $2,245 | $1,684 | -25.0% | — | — | — | — | — | — | $2,245 | $1,684 | -25.0% |
| ZPS | Zoo Police Stable | $2,844 | $3,667 | 28.9% | — | — | — | — | — | — | $2,844 | $3,667 | 28.9% |
| Total | | $732,724 | $727,829 | -0.7% | $263,690 | $296,334 | 12.4% | $220,768 | $260,329 | 17.9% | $1,217,182 | $1,284,492 | 5.5% |

NOTE: Adj.Base - The 1995 energy consumption and cost are adjusted to the 1997 billing periods, weather conditions and energy costs.
Actual - The current year (1997) actual energy consumption and cost.
ekWh - Equivalent kilowatt-hour (1 cubic metre of Natural Gas = 10.3417 ekWh).

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CITY OF TORONTO
TORONTO ZOO

# McDONALD RESTAURANTS

## *1997 Actual ENERGY CONSUMPTION VS Adjusted Baseline*

| FACILITIES | ELECTRICITY (kWh) | | | NATURAL GAS (m³) | | | WATER (m³) | | | TOTAL (ekWh) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Facility ID and Name | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change |
| AR Africa Restaurant | 517,885 | 529,200 | 2.2% | 82,097 | 73,153 | -10.9% | 6,979 | 5,008 | -28.2% | 1,366,905 | 1,285,723 | -5.9% |
| ESB Eurasia Snack Bar | 28,586 | 45,360 | 58.7% | — | — | — | 899 | 469 | -47.8% | 28,586 | 45,360 | 58.7% |
| MGSB Main Gate Snack Bar | — | 2,800 | — | — | — | — | 1,152 | 1,269 | 10.2% | — | 2,800 | — |
| MSB Madagascar Snack Bar | 72,275 | 73,440 | 1.6% | — | — | — | 928 | 700 | -24.6% | 72,275 | 73,440 | 1.6% |
| NAR North America Restaurant | 290,282 | 321,200 | 10.7% | 32,612 | 43,743 | 34.1% | 7,917 | 7,649 | -3.4% | 627,548 | 773,579 | 23.3% |
| **Total** | | 972,000 | | | 116,896 | | | 15,095 | | | 2,180,902 | |
| **Total (excl. energy added after 1995)** | 909,028 | 969,200 | **6.6%** | 114,709 | 116,896 | **1.9%** | 17,875 | 15,095 | **-15.6%** | 2,095,314 | 2,178,102 | **4.0%** |

# McDONALD RESTAURANTS

## *1997 Actual ENERGY COST VS Adjusted Baseline*

| FACILITIES | ELECTRICITY COST | | | NATURAL GAS COST | | | WATER COST | | | TOTAL COST | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Facility ID and Name | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change |
| AR Africa Restaurant | $37,661 | $37,911 | 0.7% | $11,967 | $10,570 | -11.7% | $5,400 | $3,888 | -28.0% | $55,028 | $52,370 | -4.8% |
| ESB Eurasia Snack Bar | $1,839 | $3,222 | 75.2% | — | — | — | $707 | $368 | -48.0% | $2,546 | $3,590 | 41.0% |
| MGSB Main Gate Snack Bar | — | $213 | — | — | — | — | $896 | $987 | 10.2% | — | $1,201 | — |
| MSB Madagascar Snack Bar | $5,049 | $5,169 | 2.4% | — | — | — | $721 | $553 | -23.3% | $5,770 | $5,722 | -0.8% |
| NAR North America Restaurant | $21,021 | $22,863 | 8.8% | $4,648 | $6,395 | 37.6% | $6,148 | $5,899 | -4.0% | $31,817 | $35,157 | 10.5% |
| **Total** | | $69,379 | | | $16,965 | | | $11,695 | | | $98,039 | |
| **Total (excl. energy added after 1995)** | $65,570 | $69,166 | **5.5%** | $16,615 | $16,965 | **2.1%** | $13,871 | $11,695 | **-15.7%** | $95,161 | $96,839 | **1.8%** |

NOTE: **Adj.Base** - The 1995 energy consumption and cost are adjusted to the 1997 billing periods, weather conditions and energy costs.
**Actual** - The current year (1997) actual energy consumption and cost.
**ekWh** - Equivalent kilowatt-hour (1 cubic metre of Natural Gas = 10.3417 ekWh).

CITY OF TORONTO
TORONTO ZOO

# SUBMETERS

## *1997 Actual ENERGY CONSUMPTION VS Adjusted Baseline*

| FACILITIES | | ELECTRICITY (kWh) | | | NATURAL GAS (m³) | | | WATER (m³) | | | TOTAL (ekWh) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Facility ID | and Name | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change |
| AFP | African Pavilion | — | 1,225,207 | — | 434,394 | 487,994 | 12.3% | — | — | — | — | 6,271,892 | — |
| AFR | Africa Rhino / Mixed Hoofstock | — | — | — | — | 3,038 | — | — | — | — | — | 31,418 | — |
| AMP | Americas Pavilion | — | 519,028 | — | 112,177 | 130,520 | 16.4% | — | — | — | — | 1,868,824 | — |
| APN | Australasian Pavilion Nocturnal | — | — | — | 2,601 | 2,355 | -9.5% | — | — | — | 26,898 | 24,351 | -9.5% |
| AUP | Australasian Pavilion | — | 395,717 | — | 122,204 | 143,968 | 17.8% | — | — | — | — | 1,884,589 | — |
| BBH | Baboon House | — | — | — | — | 2,029 | — | — | — | — | — | 20,983 | — |
| CHH | Cheetah House | — | — | — | — | 1,011 | — | — | — | — | — | 10,455 | — |
| CL | Caracal Lynx | — | — | — | — | 2,207 | — | — | — | — | — | 22,824 | — |
| DR | Domain Ride & Garage Bldg | — | — | — | 43,209 | 34,753 | -19.6% | — | — | — | 446,849 | 359,400 | -19.6% |
| EH | Elephants House | — | — | — | 17,159 | 33,737 | 96.6% | — | — | — | 177,456 | 348,902 | 96.6% |
| FC | Family Centre | — | — | — | 4,778 | 4,568 | -4.4% | — | — | — | 49,410 | 47,237 | -4.4% |
| GGS | Greenhouse Gift Shop | — | — | — | — | 16,507 | — | — | — | — | — | 170,710 | — |
| GH | Giraffe House | — | — | — | 9,789 | 10,876 | 11.1% | — | — | — | 101,234 | 112,473 | 11.1% |
| GHG | Gorilla Holding | — | — | — | 14,984 | 9,219 | -38.5% | — | — | — | 154,958 | 95,340 | -38.5% |
| GKB | Groundskeeping Building | — | — | — | 52,521 | 68,884 | 31.2% | — | 813 | — | 543,151 | 712,374 | 31.2% |
| HPH | Hippo House | — | — | — | 58,434 | 74,902 | 28.2% | — | — | — | 604,305 | 774,610 | 28.2% |
| IMP | Indo-Malayan Pavilion | — | 643,067 | — | 242,524 | 253,206 | 4.4% | — | — | — | — | 3,261,644 | — |
| IRB | Indian Rhino Building | — | — | — | 67,270 | 50,214 | -25.4% | — | — | — | 695,691 | 519,293 | -25.4% |
| LH | Lion House | — | — | — | — | 1,055 | — | — | — | — | — | 10,910 | — |
| LHH | Lion House (Hyena) | — | — | — | — | 7,836 | — | — | — | — | — | 81,038 | — |
| MHS | Mixed Hoofstock | — | — | — | — | 10,720 | — | — | — | — | — | 110,863 | — |
| MT | Mayan Temple | — | — | — | — | 17,938 | — | — | — | — | — | 185,509 | — |
| MW | Malayan Wood (Village Edge) | — | — | — | 39,680 | 40,334 | 1.6% | — | — | — | 410,364 | 417,119 | 1.6% |
| NSB | North Services Building | — | — | — | 386,110 | 410,429 | 6.3% | — | 9,330 | — | — | 4,244,537 | — |
| OAB | Old Administrative Building | — | 258,174 | — | 24,578 | 27,474 | 11.8% | — | — | — | — | 542,298 | — |
| OH | Orangutan Holding | — | — | — | 15,911 | 17,874 | 12.3% | — | — | — | 164,551 | 184,851 | 12.3% |
| PBH | Polar Bear Holding | — | — | — | — | 4,696 | — | — | — | — | — | 48,565 | — |
| ZSB | Zoological Society Building | 275,229 | 279,597 | 1.6% | 7,280 | 4,912 | -32.5% | 2,225 | 1,459 | -34.5% | 350,516 | 330,397 | -5.7% |
| **Total** | | | 3,320,790 | | | 1,873,253 | | | 11,602 | | | 22,693,406 | |
| **Total (excl. energy added after 1995)** | | 275,229 | 279,597 | **1.6%** | 1,655,603 | 1,806,216 | **9.1%** | 2,225 | 1,459 | **-34.5%** | 3,725,384 | 3,926,346 | **5.4%** |

NOTE: Adj.Base - The 1995 energy consumption and cost are adjusted to the 1997 billing periods, weather conditions and energy costs.
Actual - The current year (1997) actual energy consumption and cost.
ekWh - Equivalent kilowatt-hour (1 cubic metre of Natural Gas = 10.3417 ekWh).

Prepared By: City of Toronto, Corporate Services, Energy Management Office .....Date: 98/2/27 .....File: g:\energy\mz\sva97mz.wk4, SubMtrUse

CITY OF TORONTO
TORONTO ZOO

# SUBMETERS

## *1997 Actual ENERGY COST VS Adjusted Baseline*

| FACILITIES | | ELECTRICITY COST | | | NATURAL GAS COST | | | WATER COST | | | TOTAL COST | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Facility ID | and Name | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change | Adj.Base 1995 | Actual 1997 | Percent Change |
| AFP | African Pavilion | — | $87,411 | — | $64,607 | $72,869 | 12.8% | — | — | — | — | $160,280 | — |
| AFR | Africa Rhino / Mixed Hoofstock | — | — | — | — | $439 | — | — | — | — | — | $439 | — |
| AMP | Americas Pavilion | — | $36,876 | — | $16,748 | $19,526 | 16.6% | — | — | — | — | $56,401 | — |
| APN | Australasian Pavilion Nocturnal | — | — | — | $390 | $356 | -8.6% | — | — | — | $390 | $356 | -8.6% |
| AUP | Australasian Pavilion | — | $28,071 | — | $18,244 | $21,676 | 18.8% | — | — | — | — | $49,747 | — |
| BBH | Baboon House | — | — | — | — | $313 | — | — | — | — | — | $313 | — |
| CHH | Cheetah House | — | — | — | — | $146 | — | — | — | — | — | $146 | — |
| CL | Caracal Lynx | — | — | — | — | $329 | — | — | — | — | — | $329 | — |
| DR | Domain Ride & Garage Bldg | — | — | — | $6,496 | $5,221 | -19.6% | — | — | — | $6,496 | $5,221 | -19.6% |
| EH | Elephants House | — | — | — | $2,552 | $5,057 | 98.2% | — | — | — | $2,552 | $5,057 | 98.2% |
| FC | Family Centre | — | — | — | $713 | $684 | -4.1% | — | — | — | $713 | $684 | -4.1% |
| GGS | Greenhouse Gift Shop | — | — | — | — | $2,481 | — | — | — | — | — | $2,481 | — |
| GH | Giraffe House | — | — | — | $1,469 | $1,639 | 11.6% | — | — | — | $1,469 | $1,639 | 11.6% |
| GHG | Gorilla Holding | — | — | — | $2,205 | $1,346 | -39.0% | — | — | — | $2,205 | $1,346 | -39.0% |
| GKB | Groundskeeping Building | — | — | — | $7,882 | $10,297 | 30.6% | — | $662 | — | $7,882 | $10,297 | 30.6% |
| HPH | Hippo House | — | — | — | $8,740 | $11,246 | 28.7% | — | — | — | $8,740 | $11,246 | 28.7% |
| IMP | Indo-Malayan Pavilion | — | $45,721 | — | $36,171 | $37,955 | 4.9% | — | — | — | — | $83,676 | — |
| IRB | Indian Rhino Building | — | — | — | $10,062 | $7,539 | -25.1% | — | — | — | $10,062 | $7,539 | -25.1% |
| LH | Lion House | — | — | — | — | $155 | — | — | — | — | — | $155 | — |
| LHH | Lion House (Hyena) | — | — | — | — | $1,166 | — | — | — | — | — | $1,166 | — |
| MHS | Mixed Hoofstock | — | — | — | — | $1,594 | — | — | — | — | — | $1,594 | — |
| MT | Mayan Temple | — | — | — | — | $2,669 | — | — | — | — | — | $2,669 | — |
| MW | Malayan Wood (Village Edge) | — | — | — | $5,915 | $6,021 | 1.8% | — | — | — | $5,915 | $6,021 | 1.8% |
| NSB | North Services Building | — | — | — | $57,653 | $61,302 | 6.3% | — | $7,383 | — | — | $61,302 | — |
| OAB | Old Administrative Building | — | $18,448 | — | $3,682 | $4,114 | 11.7% | — | — | — | — | $22,563 | — |
| OH | Orangutan Holding | — | — | — | $2,358 | $2,676 | 13.5% | — | — | — | $2,358 | $2,676 | 13.5% |
| PBH | Polar Bear Holding | — | — | — | — | $707 | — | — | — | — | — | $707 | — |
| ZSB | Zoological Society Building | $19,506 | $19,935 | 2.2% | $1,105 | $744 | -32.7% | $1,811 | $1,186 | -34.5% | $22,423 | $22,491 | 0.3% |
| **Total** | | | $236,462 | | | $280,269 | | | $9,231 | | | $518,543 | |
| **Total (excl. energy added after 1995)** | | $19,506 | $19,935 | **2.2%** | $246,993 | $270,269 | **9.4%** | $1,811 | $1,186 | **-34.5%** | $71,206 | $74,574 | **4.7%** |

NOTE: Adj.Base - The 1995 energy consumption and cost are adjusted to the 1997 billing periods, weather conditions and energy costs.
Actual - The current year (1997) actual energy consumption and cost.
ekWh - Equivalent kilowatt-hour (1 cubic metre of Natural Gas = 10.3417 ekWh).

Prepared By: City of Toro... Corporate Services, Energy Management Office .....Date: 98/2/27 .....File: g:\energy\mz\ava97mz.wk4, SubMtrCost

## II. MULTI-YEAR ENERGY

QUARTERLY Energy Consumption

ANNUAL Energy Consumption & Cost

CITY OF TORONTO
**TORONTO ZOO**

# MULTI-YEAR QUARTERLY ENERGY CONSUMPTION

(Excluding McDonalds)

| ENERGY TYPE | | 1st QTR | 2nd QTR | 3rd QTR | 4th QTR | TOTAL | Tonnes CO2 |
|---|---|---|---|---|---|---|---|
| **1997 ACTUAL CONSUMPTION** | | | | | | | |
| Electricity | kWh | 2,690,350 | 2,109,088 | 1,929,473 | 2,470,406 | 9,199,317 | 2,451 |
| Natural Gas | $m^3$ | 878,934 | 332,633 | 99,944 | 583,025 | 1,894,536 | 4,038 |
| Heating Oil | Litre | 6,263 | 1,186 | — | 1,780 | 9,229 | 29 |
| Gasoline | Litre | 10,323 | 21,799 | 15,442 | 12,013 | 59,577 | 158 |
| Diesel Oil | Litre | 6,195 | — | 10,976 | 11,588 | 28,759 | 84 |
| Propane | Litre | 13,520 | 14,065 | 23,846 | 10,213 | 61,644 | 88 |
| Water | $m^3$ | 31,001 | 71,204 | 62,328 | 150,851 | 315,384 | — |
| **Total** | **ekWh** | **12,114,729** | **5,877,212** | **3,408,673** | **8,835,589** | **30,236,204** | **6,848** |
| **Tonnes of CO2** | | **2,674** | **1,353** | **834** | **1,987** | **6,848** | **6,848** |
| **1996 ACTUAL CONSUMPTION** | | | | | | | |
| Electricity | kWh | 3,067,791 | 2,054,795 | 1,755,495 | 2,267,879 | 9,145,960 | 2,436 |
| Natural Gas | $m^3$ | 838,667 | 340,400 | 81,583 | 545,239 | 1,805,889 | 3,849 |
| Heating Oil | Litre | 17,992 | 4,467 | — | 4,723 | 27,182 | 85 |
| Gasoline | Litre | 15,894 | 15,481 | 16,869 | 15,702 | 63,946 | 170 |
| Diesel Oil | Litre | 6,263 | 3,922 | 5,841 | 4,993 | 21,019 | 62 |
| Propane | Litre | 16,309 | 13,028 | 17,639 | 10,613 | 57,589 | 83 |
| Water | $m^3$ | 45,737 | 15,462 | 164,268 | 70,351 | 295,818 | — |
| **Total** | **ekWh** | **12,277,030** | **5,912,019** | **2,956,743** | **8,241,665** | **29,387,456** | **6,684** |
| **Tonnes of CO2** | | **2,745** | **1,358** | **729** | **1,853** | **6,684** | **6,684** |
| **1995 ACTUAL CONSUMPTION** | | | | | | | |
| Electricity | kWh | 2,780,268 | 2,103,835 | 2,004,690 | 2,394,446 | 9,283,239 | 2,473 |
| Natural Gas | $m^3$ | 706,538 | 325,526 | 92,599 | 496,452 | 1,621,115 | 3,455 |
| Heating Oil | Litre | 15,155 | 5,943 | — | — | 21,098 | 66 |
| Gasoline | Litre | 15,502 | 15,781 | 15,325 | 14,819 | 61,427 | 163 |
| Diesel Oil | Litre | 3,584 | 6,761 | 6,132 | 5,885 | 22,362 | 66 |
| Propane | Litre | 13,874 | 12,555 | 13,980 | 10,564 | 50,973 | 73 |
| Water | $m^3$ | 45,009 | 122,815 | 119,911 | 63,195 | 350,929 | — |
| **Total** | **ekWh** | **10,541,764** | **5,852,858** | **3,280,598** | **7,813,654** | **27,488,875** | **6,296** |
| **Tonnes of CO2** | | **2,365** | **1,353** | **810** | **1,768** | **6,296** | **6,296** |
| **1994 ACTUAL CONSUMPTION** | | | | | | | |
| Electricity | kWh | 2,635,799 | 1,751,056 | 1,552,095 | 2,173,911 | 8,112,861 | 2,161 |
| Natural Gas | $m^3$ | 676,728 | 243,540 | 87,864 | 418,476 | 1,426,608 | 3,040 |
| Heating Oil | Litre | 12,075 | 5,180 | 1,126 | 6,947 | 25,328 | 79 |
| Gasoline | Litre | — | 22,998 | 11,000 | 18,003 | 52,001 | 138 |
| Diesel Oil | Litre | — | 7,993 | — | 9,000 | 16,993 | 50 |
| Propane | Litre | 17,402 | 19,829 | 25,001 | 21,501 | 83,733 | 120 |
| Water | $m^3$ | 38,327 | 59,814 | 36,391 | 133,259 | 267,791 | — |
| **Total** | **ekWh** | **9,895,054** | **4,781,337** | **2,766,781** | **7,007,689** | **24,450,862** | **5,589** |
| **Tonnes of CO2** | | **2,207** | **1,115** | **669** | **1,598** | **5,589** | **5,589** |

**NOTE: Energy data has not been normalized to billing period nor weather conditions. Water is not included in total energy and CO2.**

**Prepared By: City of Toronto, Corporate Services, Energy Management Office .....Date: 98/2/27 .....File: g:\energy\mr\qtrmr.wk4**

02-26-1998

# FASER ENERGY ACCOUNTING SYSTEM
# CITY OF TORONTO

## TORONTO ZOO
## Cost Centre: ZOO FACILITIES
## Energy: ALL ENERGY TYPES
## Program: MULTIYEAR - ACTUAL ENERGY
## Report: COST CENTRE SUMMARY

| FACILITY ENERGY TYPE NAME | | 1995 USE | 1995 COST | 1996 USE | 1996 COST | 1997 USE | 1997 COST |
|---|---|---|---|---|---|---|---|
| ALL FACILITIES | | | | | | | |
| ELECTRICITY | (KWH ) | 10,256,879 | $769,549 | 10,109,360 | $750,680 | 10,171,317 | $727,829 |
| DEMAND | (KW ) | 20,183 | | 19,143 | | 19,031 | |
| NATURAL GAS | (M3 ) | 1,732,519 | $260,243 | 1,938,654 | $287,390 | 2,011,432 | $296,334 |
| HEATING OIL | (L ) | 21,099 | $4,947 | 27,182 | $7,208 | 9,228 | $3,058 |
| GASOLINE | (L ) | 61,427 | $31,758 | 63,946 | $33,060 | 59,577 | $33,120 |
| DIESEL OIL | (L ) | 22,362 | $9,750 | 21,018 | $9,164 | 28,759 | $13,07 |
| PROPANE | (L ) | 50,973 | $15,751 | 57,589 | $20,924 | 61,645 | $21,65 |
| WATER | (M3 ) | 368,635 | $274,177 | 306,823 | $245,629 | 330,480 | $260,32 |
| TOTAL | (EKWH ) | 29,614,634 | $1,366,175 | 31,723,864 | $1,354,054 | 32,417,110 | $1,355,39 |

NOTE: Energy data has not been normalized to billing period nor weather conditions.

02-26-1998

# FASER ENERGY ACCOUNTING SYSTEM
# CITY OF TORONTO

## TORONTO ZOO
## Cost Centre: MCDONALDS RESTAURANT
## Energy: ALL ENERGY TYPES
## Program: MULTIYEAR - ACTUAL ENERGY
## Report: COST CENTRE SUMMARY

| FACILITY<br>ENERGY TYPE NAME | | 1995<br>USE | 1995<br>COST | 1996<br>USE | 1996<br>COST | 1997<br>USE | 1997<br>COST |
|---|---|---|---|---|---|---|---|
| ALL FACILITIES | | | | | | | |
| ELECTRICITY | (KWH ) | 973,640 | $81,680 | 963,400 | $78,635 | 972,000 | $69,379 |
| DEMAND | (KW ) | 3,256 | | 2,952 | | 3,345 | |
| NATURAL GAS | (M3 ) | 111,404 | $16,795 | 134,331 | $19,703 | 116,896 | $16,965 |
| WATER | (M3 ) | 17,683 | $13,534 | 11,102 | $8,691 | 15,095 | $11,695 |
| TOTAL | (EKWH ) | 2,125,746 | $112,009 | 2,352,612 | $107,028 | 2,180,903 | $98,039 |

NOTE: Energy data has not been normalized to billing period nor weather conditions.

# APPENDIX 5

# GT WOOD – HIGH VOLTAGE MAINTENANCE REPORT DATED 1995

G.T. WOOD CO. LTD.

3354 Mavis Rd. Mississauga, Ont. L5C 1T8
TEL: (905) 272-1696 Fax: (905) 272-1425

February 28, 1995

METRO TORONTO ZOO
P.O. Box 280,
West Hill, Ontario,
M1E 4R5

ATTN: Mr. Dean Evans

**RE: Your PO #12124**
**Our Ref #9951**

Dear Sir;

In accordance with your request, we have completed the Inspection and Testing of the substation and associated electrical equipment at the above location.

Please find enclosed our test report for your reference.

Thank you for the favour of this business.

Yours very truly,
G.T. WOOD COMPANY LIMITED

L.A. Snow
LAS/jn

Encl.
RSCL/1

G.I. WOOD CO. LTD.

**METRO TORONTO ZOO**
**WEST HILL**
**ATTN: MR. DEAN EVANS**

**REFERENCE NO.: 9951**
**DECEMBER 1994**

## GENERAL SHEET

MAIN OUTDOOR SUBSTATION - SHEETS #1 - #3

- ~~The substation fence requires replacement.~~
- The primary switchgear is showing signs of rust. The entire enclosure requires repainting and recaulking.
- The insulation resistance of the lighting arrestors on the entrance pole was found as follows:

  Red Phase - 32 Megohms
  Yellow Phase - 45 Megohms
  Blue Phase - 40 Megohms

  The above values show internal deterioration. Replacement units are required.

SHEET #1

- The interphase barriers are showing signs of deterioration. Replacements are required.
- Two (2) of three (3) interrupting units are defective. Replacements are required.
- ~~Two (2) potential indicators were found defective. Replacements were supplied and installed~~.

SHEET #2

- The arc blades are missing from this switch. New units are required.
- The interphase barriers are showing signs of deterioration. Replacements are required.
- One (1) potential indicator was found defective. A new unit was supplied and installed.
- ~~A new heater was installed.~~

SHEET #3

- The interphase barriers are showing signs of deterioration. Replacements are required.
- ~~A new heater was installed~~

continued

G.T. WOOD CO. LTD.

**METRO TORONTO ZOO**
**YOUR PO #12124**
**OUR REF #9951**

A B B
A BROWN BOBAY



SOCIETY BUILDING
- All equipment was found to be satisfactory.

INDO-MALAYA PAVILION - SHEETS #11 & #12
- The overload devices on both air circuit breakers are leaking fluid. We recommend replacing these liquid filled overload devices with solid state units.
- The base of the secondary switchboard is rusting. Repainting is required. ?

EURASIA PAVILION - SHEET #18
- The switch handle for this feeder is defective. Replacement is required.

AFRICA PAVILION - SHEETS #30 & #31
- The overload devices on both air circuit breakers are leaking fluid. We recommend replacing these liquid filled overload devices with solid state units.
- A draw-out handle is required for the breakers

NORTH AMERICA PAVILION
- All electrical equipment was found to be satisfactory.

ENT. FACILITIES - SHEET #43
- The interrupter units for this switch require replacement.

VAULT TYPE TRANSFORMERS
- All transformers and vaults were serviced and left in satisfactory condition. The liquid from each transformer was analyzed for 4 part standard test. Please see the attached test report for results.

G.I. WOOD CO. LTD.

# STANDARD OIL TEST SHEET

**CUSTOMER:** TORONTO METRO ZOO **REF NO.:** 9951

**LOCATION:** WEST HILL, ONTARIO

**********

The following standards are applicable for transformer oil tests.

It is recommended a sample be tested every 12 months.

**DIELECTRIC:** (Kilo Volt breakdown A. S. T. M. Standard) For safe and satisfactory operation, this should not be below 25 Kilo Volts.

**ACID:** Neutralization Number mg. KOH/g. New oil has a Neutralization Number of approximately .03. As this value increases, oxidation and final sludging is progressively indicated.

**INTERFACIAL TENSION:** (I.F.T. Dynes/CM) New oil has an I.F.T. of 35 - 40 Dynes. This drops very rapidly in early stages of contamination, but serious contamination is not indicated until a value of approximately 14 - 17 dynes is reached.

**COLOUR:** New oil has a colour value of approximately No. 1. A change in colour indicates contamination and has value in final evaluation of oil condition.

**TEST RESULTS WERE AS FOLLOWS;**

| SERIAL NO. | NEUT NO. | COLOUR | IFT | DIELECTRIC |
|---|---|---|---|---|
| Vault #28 | | | | |
| 871934 | .02 | 1 | 42.7 | 46 |
| 871931 | .01 | 1 | 43.2 | 25 |
| Vault #1 | | | | |
| 871935 | .02 | 1 | 42.7 | 35 |
| Vault #26 | | | | |
| 861962 | .02 | 1 | 41.8 | 42 |
| Vault #33 | | | | |
| 861942 | .02 | 1 | 44.0 | 30 |
| Vault #29 | | | | |
| 861972 | .01 | 1 | 43.0 | 34 |
| 861964 | .01 | 1 | 40.2 | 38 |
| Vault #21 | | | | |
| 861981 | .02 | 1 | 39.1 | 25 |
| 871926 | .01 | 1 | 39.0 | 31 |
| Vault #20 | | | | |
| 861944 | .02 | 1 | 39.8 | 36 |
| 871937 | .01 | 1 | 39.0 | 33 |

//

G.I. WOOD CO. LTD.

# STANDARD OIL TEST SHEET

**CUSTOMER:** TORONTO METRO ZOO **REF NO.:** 9951

**LOCATION:** WEST HILL, ONTARIO

**********

The following standards are applicable for transformer oil tests.

It is recommended a sample be tested every 12 months.

**DIELECTRIC:** (Kilo Volt breakdown A. S. T. M. Standard) For safe and satisfactory operation, this should not be below 25 Kilo Volts.

**ACID:** Neutralization Number mg. KOH/g. New oil has a Neutralization Number of approximately .03. As this value increases, oxidation and final sludging is progressively indicated.

**INTERFACIAL TENSION:** (I.F.T. Dynes/CM) New oil has an I.F.T. of 35 - 40 Dynes. This drops very rapidly in early stages of contamination, but serious contamination is not indicated until a value of approximately 14 - 17 dynes is reached.

**COLOUR:** New oil has a colour value of approximately No. 1. A change in colour indicates contamination and has value in final evaluation of oil condition.

**TEST RESULTS WERE AS FOLLOWS;**

| SERIAL NO. | NEUT NO. | COLOUR | IFT | DIELECTRIC |
|---|---|---|---|---|
| Vault #22 | | | | |
| 861973 | .02 | 1 | 38.4 | 35 |
| 871933 | .02 | 1 | 38.2 | 28 |
| 861976 | .02 | 1 | 42.7 | 33 |
| 871932 | .01 | 1 | 41.9 | 31 |
| 861955 | .03 | 1 | 42.8 | 32 |
| 861949 | .02 | 1 | 40.0 | 35 |
| 861952 | .02 | 1 | 42.6 | 32 |
| 871930 | .02 | 1 | 41.6 | 33 |
| 861980 | .02 | 1 | 43.4 | 37 |
| 861975 | .01 | 1 | 40.7 | 33 |
| Vault #6 | | | | |
| 861979 | .01 | 1 | 43.6 | 37 |
| Vault #34 | | | | |
| 871936 | .01 | 1 | 43.0 | 37 |
| 861927 | .01 | 1 | 44.7 | 41 |
| 861971 | .01 | 1 | 43.0 | 50 |
| Vault #13 | | | | |
| 861951 | .02 | 1.75 | 42.7 | 35 |
| 861950 | .02 | 1 | 44.7 | 40 |
| 861954 | .02 | 1 | 44.0 | 46 |
| Vault #13A | | | | |
| LG37990 | .01 | 1 | 42.6 | 41 |

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G.T. WOOD CO. LTD.

# STANDARD OIL TEST SHEET

**CUSTOMER:** TORONTO METRO ZOO **REF NO.:** 9951

**LOCATION:** WEST HILL, ONTARIO

**********

The following standards are applicable for transformer oil tests.

It is recommended a sample be tested every 12 months.

**DIELECTRIC:** (Kilo Volt breakdown A. S. T. M. Standard) For safe and satisfactory operation, this should not be below 25 Kilo Volts.

**ACID:** Neutralization Number mg. KOH/g. New oil has a Neutralization Number of approximately .03. As this value increases, oxidation and final sludging is progressively indicated.

**INTERFACIAL TENSION:** (I.F.T. Dynes/CM) New oil has an I.F.T. of 35 - 40 Dynes. This drops very rapidly in early stages of contamination, but serious contamination is not indicated until a value of approximately 14 - 17 dynes is reached.

**COLOUR:** New oil has a colour value of approximately No. 1. A change in colour indicates contamination and has value in final evaluation of oil condition.

**TEST RESULTS WERE AS FOLLOWS;**

| SERIAL NO. | NEUT NO. | COLOUR | IFT | DIELECTRIC |
|---|---|---|---|---|
| Vault #12 | | | | |
| 861963 | .01 | 1 | 40.6 | 35 |
| 861967 | .01 | 1 | 43.8 | 40 |
| 861968 | .02 | 1 | 41.2 | 36 |
| Vault #35 | | | | |
| 871928 | .02 | 1 | 43.5 | 42 |
| 971929 | .01 | 1 | 43.9 | 40 |
| 971925 | .02 | 1 | 44.7 | 41 |
| Vault #11 | | | | |
| 861953 | .01 | 1 | 42.8 | 41 |
| Vault #8 | | | | |
| 871939 | .01 | 1 | 42.3 | 35 |
| Vault #10 | | | | |
| 861978 | .01 | 1 | 44.6 | 42 |
| 861977 | .01 | 1 | 44.0 | 44 |
| Vault N/A | | | | |
| 861974 | .01 | 1 | 44.8 | 41 |
| Vault N/A | | | | |
| LG37989 | .01 | 1 | 44.0 | 46 |
| Vault N/A | | | | |
| 861966 | .02 | 1 | 42.1 | 35 |

G.I. WOOD CO. LTD.

# STANDARD OIL TEST SHEET

**CUSTOMER:** TORONTO METRO ZOO **REF NO.:** 9951

**LOCATION:** WEST HILL, ONTARIO

**********

The following standards are applicable for transformer oil tests.

It is recommended a sample be tested every 12 months.

**DIELECTRIC:** (Kilo Volt breakdown A. S. T. M. Standard) For safe and satisfactory operation, this should not be below 25 Kilo Volts.

**ACID:** Neutralization Number mg. KOH/g. New oil has a Neutralization Number of approximately .03. As this value increases, oxidation and final sludging is progressively indicated.

**INTERFACIAL TENSION:** (I.F.T. Dynes/CM) New oil has an I.F.T. of 35 - 40 Dynes. This drops very rapidly in early stages of contamination, but serious contamination is not indicated until a value of approximately 14 - 17 dynes is reached.

**COLOUR:** New oil has a colour value of approximately No. 1. A change in colour indicates contamination and has value in final evaluation of oil condition.

**TEST RESULTS WERE AS FOLLOWS;**

| SERIAL NO. | NEUT NO. | COLOUR | IFT | DIELECTRIC |
|---|---|---|---|---|
| Vault N/A LG37991 | .01 | 1 | 42.3 | 38 |
| Vault N/A 861965 | .01 | 1 | 44.0 | 44 |
| Vault N/A 861965 | .01 | 1 | 43.2 | 30 |
| Vault N/A | | | | |
| #1-861941 | .02 | 1 | 44.0 | 48 |
| #2-861940 | .02 | 1.25 | 44.4 | 45 |
| #3-861943 | .01 | 1 | 44.0 | 44 |
| No # | .01 | 1 | 43.2 | 42 |

METRO ZOO

Ref. # 9951 — 1995 — SHEET No. 1

**INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR**

MAIN OUTDOOR SUBSTATION

MAIN INCOMING
Interrupter Switch Specifications: Manuf. S & C ELECTRIC Amps 600

Cat. # 341C.E. K.V. 27.6

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☐ SATISFACTORY
- ☑ SEE GENERAL SHEET. NOTE #1
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. C.O.B Type DYNAGAP

Cat. # 46615-3061 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 200+ 2. 200+ 3. 200+ megohms
The above values are satisfactory.

Fuse Specifications Manuf. NA

Mountings: Cat. # — K.V. — Amp — Type —

Holders: Cat. # — K.V. — Amp — Type —

Refills: Cat. # — K.V. — Amp — Type —

Resistance Test: 1. — 2. — 3. — microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951

SHEET No. 2

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

FEEDER TO EURASIA PAVILION

Interrupter Switch Specifications: Manuf. S & C ELECTRIC Amps 600

Cat. # 345634-T2 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE # 2.
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. C.O.B Type DYNAGAP

Cat. # 46615-2061 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 200+ 2. 200+ 3. 200+ megohms

The above values are satisfactory.

Fuse Specifications Manuf. S & C ELECTRIC

Mountings: Cat. # — K.V. — Amp — Type —

Holders: Cat. # 8644R-1 K.V. 34.5 Amp 300 Type SM-5

Refills: Cat. # 134250R4 K.V. 34.5 Amp 150 ~~Type~~ Tcc 153.4

Resistance Test: 1. 725 2. 790 3. 755 microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951 SHEET No. 3

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

FREDDIE'S SERVICE BUILDING

Interrupter Switch Specifications: Manuf. S & C ELECTRIC Amps 600

Cat. # 3456R4-72 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. G.E. Type DYNAGAP

Cat. # 866448R-1 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 200+ 2. 200+ 3. 200+ megohms

The above values are satisfactory.

Fuse Specifications Manuf. S & C ELECTRIC

Mountings: Cat. # - K.V. - Amp - Type -

Holders: Cat. # 866448R4 K.V. 34.5 Amp 300 Type SM-5

Refills: Cat. # 134250R-4 K.V. 34.5 Amp 150 ~~Type~~ TCC 153.4

Resistance Test: 1. 710 2. 760 3. 760 microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951 SHEET No. 4

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

SOCIETY BUILDING

Interrupter Switch Specifications: Manuf. S & C ELECTRIC Amps 600

Cat. # 2345-338C41-1 K.V. 29

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. G.E. Type I.V

Cat. # 217117 K.V. 19 M.C.O.V

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 200+ 2. 200+ 3. 200+ megohms

The above values are satisfactory.

Fuse Specifications Manuf. S & C ELECTRIC

Mountings: Cat. # - K.V. - Amp - Type -

Holders: Cat. # 8664R-2 K.V. 34.5 Amp 300 Type SM-5

Refills: Cat. # _____ K.V. 34.5 Amp 15 Type TCC 15R-4

Resistance Test: 1. 2270 2. 2200 3. 2275 microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

# TRANSFORMER INSPECTION & TEST SHEET No. 1

SOCIETY BUILDING

Manufacturer CARTE Serial No. N07090-1

Type ONAN H.V. 27.6/16.0 L.V. 208Y/120 Taps 4-2½%

Gal. Liquid 872 K.V.A. 300

% Impedance 4.58 VECTOR WYE/WYE

**Liquid Sample**

| Serial No. | Neut. No. | Colour | I.F.T. | Dielectric | Spec. Gravity |
|---|---|---|---|---|---|
| | | N.T | | | |

The above results are satisfactory.

**Insulation Resistance Test**

| | | Test Voltage D.C. |
|---|---|---|
| H.V. to Ground | 5/5 megohms | 1000 |
| L.V. to Ground | 200 megohms | |
| H.V. to L.V. | 200 megohms | |

The above results are satisfactory.

Station Grounding System: 2.50 Ohm

T. WOOD CO. LTD. 06/03

# TRANSFORMER INSPECTION & TEST SHEET No. 2

## GENERAL CONDITIONS

Serial No. NO 7090-1

**Bushings:** Insulation was intact and thoroughly cleaned. Cementing was free from deterioration.

**Gaskets:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Paint:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Liquid Level:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Thermometer:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

MAXIMUM TEMPERATURE WAS 48 °C

**Cooling System:**
- [x] CLEAR
- [ ] SEE GENERAL SHEET. NOTE

**Gas Detector Relay:**
- [ ] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE
- [x] NOT APPLICABLE

**Terminal Board and/or Tap Switch:** located in position C for 100 % - volts

Ref. # 9951 SHEET No. 5

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

INDO-MALAYA PAVILION

Interrupter Switch Specifications: Manuf. S&C ELECTRIC Amps 600

CELL #1 - FEEDER TO ENTRANCE TRANSFORMERS Cat. # 3403 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. OHIO BRASS Type GP

Cat. # 46157 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 200+ 2. 500+ 3. 500+ megohms

The above values are satisfactory.

Fuse Specifications Manuf. NA

Mountings: Cat. # - K.V. - Amp - Type -

Holders: Cat. # - K.V. - Amp - Type -

Refills: Cat. # - K.V. - Amp - Type -

Resistance Test: 1. - 2. - 3. - microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951 SHEET No. 6

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

FEEDER TO AFRICA PAVILION.

Interrupter Switch Specifications: Manuf. S & C ELECTRIC Amps 600

Cat. # 34062 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. OHIO BRASS Type G.P.

Cat. # 46159 K.V. 2.4

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 200+ 2. 200+ 3. 200+ megohms

The above values are satisfactory.

Fuse Specifications Manuf. NA

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # _____ K.V. _____ Amp _____ Type _____

Refills: Cat. # _____ K.V. _____ Amp _____ Type _____

Resistance Test: 1. _____ 2. _____ 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951 SHEET No. 7

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

FEEDER TO T2

Interrupter Switch Specifications: Manuf. S & C ELECTRIC Amps 600

Cat. # 345623R4-T2 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. G.E. Type G.P.

Cat. # 46159 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 200+ 2. 200+ 3. 200+ megohms

The above values are satisfactory.

Fuse Specifications Manuf. S & C ELECTRIC

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # 8664R1 K.V. 345 Amp 300E Type SM-5

Refills: Cat. # 134044R4 K.V. 345 Amp 25 ~~Type~~ TCC 153-4

Resistance Test: 1. 1980 2. 1980 3. 1980 microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951



## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

Interrupter Switch Specifications: Manuf. S & C ELECTRIC Amps 600
PADLOCK FEATURE
Cat. # 345624-T Series K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. OHIO BRASS Type GA
Cat. # 4616 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. _____ 2. 1900 M 3. _____ megohms
The above values are satisfactory.

Fuse Specifications Manuf. S & C ELECTRIC

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # 866461 K.V. 34.5 Amp 300 Type SM-5

Refills: Cat. # 134125CY K.V. 34.5 Amp 80 ~~Type~~ TCC 153-4

Resistance Test: 1. _____ 2. 1170 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

# TRANSFORMER INSPECTION & TEST SHEET No. 1

INDO- MALAYA PAVILION TRANSFORMER T2

Manufacturer WESTINGHOUSE Serial No. 795156

No. LWAN H.V. 27600Y/16000 L.V. 208 Y 1120 Taps 4 - 2½% ↑2

Gal. Liquid 200 K.V.A. 500/560

% Impedance 7.1 VECTOR WYE / WYE CSA

## Liquid Sample

| Serial No. | Neut. No. | Colour | I.F.T. | Dielectric | Spec. Gravity |
|---|---|---|---|---|---|

The above results are satisfactory.

## Insulation Resistance Test

| | | Test Voltage D.C. |
|---|---|---|
| H.V. to Ground | 5/9 megohms | 1000 |
| L.V. to Ground | 50 megohms | " |
| H.V. to L.V. | 50 megohms | " |

The above results are satisfactory.

Station Grounding System: 1.50 Ohm

# TRANSFORMER INSPECTION & TEST SHEET No. 2

## GENERAL CONDITIONS

Serial No. 795156

**Bushings:** Insulation was intact and thoroughly cleaned. Cementing was free from deterioration.

**Gaskets:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Paint:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Liquid Level:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Thermometer:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

MAXIMUM TEMPERATURE WAS 40 °C

**Cooling System:**
- [x] CLEAR
- [ ] SEE GENERAL SHEET. NOTE

**Gas Detector Relay:**
- [ ] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE
- [x] NOT APPLICABLE

**Terminal Board and/or Tap Switch:** located in position 3 for 27,600 volts

Ref. # 9951 Sheet # 11

LOW VOLTAGE BREAKER ✓ / DISCONNECT DEVICE _____ & ENCLOSURES

Designation: INDO-MALAYA TAV. - MAIN.

SPECIFICATION:

Manufacturer : F.P.E
Interrupt. Cap : 50KA
Frame Size : 1600 AMP
Elect. Operated: NA
Manul. Operated: ✓

Serial # : TH-4143-72
Volts : 600
Type : 50HZ
Poles : 3
Fixed: _____ / Draw Out: ✓

TRIPPING DEVICE:

Type: P.A.
Longtime P/U : 1600 amps
Shorttime P/U: 6400 amps
Grd Fault P/U: NA amps
Instant. P/U : NA amps
Fused Rating & Manufacturer: NA

Coil/C.T. Rating 1600 amps
Delay MIN T/B ~~seconds~~
Delay 15 CYCLE ~~seconds~~
Delay NA seconds

CONTACT RESISTANCE:

Phase I 32 Phase II 30 Phase III 32 microhms

INSULATION RESISTANCE:

Phase I 200+ Phase II 200+ Phase III 200+ megohms

| GENERAL: | | O.K. | NOTE# | | | O.K. | NOTE# |
|---|---|---|---|---|---|---|---|
| 1. | Exterior Enclosure Condition | ✓ | | 12. | Lubricated | ✓ | |
| 2. | Arcing Contacts | ✓ | | 13. | Breaker Cleaned | ✓ | |
| 3. | Main Contacts | ✓ | | 14. | Enclosure Cleaned | ✓ | |
| 4. | Exterior Breaker Condition | ✓ | | 15. | Bus Connections | ✓ | |
| 5. | Tripping Device Condition | | ✓ | 16. | Cable Connections | ✓ | |
| 6. | Manual Closing Operation | ✓ | | 17. | Voltmeter | ✓ | |
| 7. | Manual Tripping Operation | ✓ | | 18. | Ammeter | ✓ | |
| 8. | Electrical Closing Operation | | | 19. | Arc Chute Condition | ✓ | |
| 9. | Electrical Tripping Operation | | | 20. | Barrier Condition | ✓ | |
| 10. | Secondary Auxillary Contacts | ✓ | | 21. | Single Phase Indicators | | |
| 11. | Breaker Drawout Clusters | ✓ | | 22. | Others | | |

The secondary equipment was serviced and left in satisfactory condition and consisted of

_____ Moulded Case Breakers

20 Fused Switches

f. # 9951 Sheet # 12

LOW VOLTAGE BREAKER ✓ / DISCONNECT DEVICE _____ & ENCLOSURES

Designation: INDO-MALAYA TAV - DP-MB

PECIFICATION:

Manufacturer : T.P.E
Serial # : TH-4124/72
Interrupt. Cap : 50KA
Volts : 600
Frame Size : 1600AMP
Type : 50H-2
Elect. Operated: —
Poles : 3
Manul. Operated: ✓
Fixed: ✓ / Draw Out: _____

RIPPING DEVICE:

Type: TA
Coil/C.T. Rating 1000 amps
Longtime P/U : 1000 amps
Delay MIN T/B ~~seconds~~
Shorttime P/U: NA amps
Delay NA seconds
Grd Fault P/U: NA amps
Delay NA seconds
Instant. P/U : 4000 amps
Fused Rating & Manufacturer: NA

ONTACT RESISTANCE:

Phase I 41 Phase II 42 Phase III 45 microhms

NSULATION RESISTANCE:

Phase I 200↑ Phase II 200↑ Phase III 200↑ megohms

| GENERAL: | O.K. | NOTE# | | O.K. | NOTE# |
|---|---|---|---|---|---|
| 1. Exterior Enclosure Condition | ✓ | | 12. Lubricated | ✓ | |
| 2. Arcing Contacts | ✓ | | 13. Breaker Cleaned | ✓ | |
| 3. Main Contacts | ✓ | | 14. Enclosure Cleaned | ✓ | |
| 4. Exterior Breaker Condition | ✓ | | 15. Bus Connections | ✓ | |
| 5. Tripping Device Condition | | ✓ | 16. Cable Connections | ✓ | |
| 6. Manual Closing Operation | ✓ | | 17. Voltmeter | | |
| 7. Manual Tripping Operation | ✓ | | 18. Ammeter | | |
| 8. Electrical Closing Operation | | | 19. Arc Chute Condition | ✓ | |
| 9. Electrical Tripping Operation | | | 20. Barrier Condition | ✓ | |
| 10. Secondary Auxillary Contacts | | | 21. Single Phase Indicators | | |
| 11. Breaker Drawout Clusters | | | 22. Others | | |

The secondary equipment was serviced and left in satisfactory condition and consisted of

_____ Moulded Case Breakers

_____ Fused Switches

TH/11-92R

Ref. # 9951



## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

SERVICE BUILDING,
Interrupter Switch Specifications: Manuf. S & C ELECTRIC Amps 600
FEEDER TO MAIN OUTDOOR SWITCHGEAR Cat. # 34063 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. OHIO BRASS Type G.E.
Cat. # 466159 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 200+ 2. 200+ 3. 200+ megohms
The above values are satisfactory.

Fuse Specifications Manuf. N.A.

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # _____ K.V. _____ Amp _____ Type _____

Refills: Cat. # _____ K.V. _____ Amp _____ Type _____

Resistance Test: 1. _____ 2. _____ 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951



## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

SERVICE ENTR. LDG
Interrupter Switch Specifications: Manuf. SIC ELECTRIC Amps 600
PADDOCK TERRACE WEST
Cat. # 34563R4-75 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. OHIO BRASS Type G.P.
Cat. # 46159 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. _____ 2. 200[1] 3. _____ megohms
The above values are satisfactory.

Fuse Specifications Manuf. SIC ELECTRIC

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # 8664K1 K.V. 345 Amp 300 Type SMS

Refills: Cat. # 12412SR4 K.V. 5½ Amp 25 Type NEW

Resistance Test: 1. _____ 2. 1160 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9101



## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

SERVICE BUILDING
Interrupter Switch Specifications: Manuf. [illegible] Amps 600
PARKER FEED EAST
Cat. # 3430-R4-T Kv. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. [illegible] Type [illegible]
Cat. # [illegible] K.V. [illegible]

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. _____ 2. 200+ 3. _____ megohms
The above values are satisfactory.

Fuse Specifications Manuf. [illegible]

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # 2664HRI K.V. [illegible] Amp [illegible] Type [illegible]

Refills: Cat. # 2412SCF K.V. [illegible] Amp [illegible] Type [illegible]

Resistance Test: 1. _____ 2. 963 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951



## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

Service Building
Interrupter Switch Specifications: Manuf. S&C ELECTRIC Amps 600
For [illegible]
Cat. # 24062 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. [illegible] Type GE
Cat. # 46159 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 200+ 2. [illegible] 3. [illegible] megohms
The above values are satisfactory.

Fuse Specifications Manuf. S&C ELECTRIC

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # [illegible] K.V. [illegible] Amp [illegible] Type [illegible]

Refills: Cat. # [illegible] K.V. [illegible] Amp [illegible] Type [illegible]

Resistance Test: 1. 1170 2. [illegible] 3. [illegible] microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951



## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

Interrupter Switch Specifications: Manuf. [illegible] Amps [illegible]

Cat. # [illegible] K.V. [illegible]

**Insulation:** Intact and thoroughly cleaned.

**Alignement & Mechanism:** Operated normally. Lubricated where necessary.

**Contacts:** Cleaned, conditioned and sealed against oxidation.

**Interrupting Units:**
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

**Lightning Arrester Specification** Manuf. OHIO BRASS Type GP

Cat. # 46154 K.V. 24

**Insulation:** Intact and thoroughly cleaned.

**Cementing:** Free from deterioration.

**Insulation Resistance Test:** 1. 200+ 2. 200+ 3. 200+ megohms

The above values are satisfactory.

**Fuse Specifications** Manuf. NA

**Mountings:** Cat. # _____ K.V. _____ Amp _____ Type _____

**Holders:** Cat. # _____ K.V. _____ Amp _____ Type _____

**Refills:** Cat. # _____ K.V. _____ Amp _____ Type _____

**Resistance Test:** 1. _____ 2. _____ 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9401



## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

EUROPEAN TRANSFORMER
Interrupter Switch Specifications: Manuf. S+C ELECTRIC Amps 600
INTERRUPTER SWITCH
4 SOUTH Cat. # 3456B-TG K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary. SEE GENERAL

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. OHIO BRASS Type GE
Cat. # 46159 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. _____ 2. 200+ 3. 200+ megohms
The above values are satisfactory.

Fuse Specifications Manuf. S+C ELECTRIC

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # 8664011 K.V. 34.5 Amp 200 Type SMU-5

Refills: Cat. # 134125 K.V. 34.5 Amp 25 Type 13S-V

Resistance Test: 1. _____ 2. 1200 3. 1200 microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951 SHEET No. 19

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

EURASIA PAVILION
Interrupter Switch Specifications: Manuf. S&C ELECTRIC Amps 600
FEEDER TO OUTDOOR SUB
Cat. # 340L=C 3 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. OHIO BRASS Type GP.
Cat. # 46159 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 200+ 2. 200+ 3. 200+ megohms
The above values are satisfactory.

Fuse Specifications Manuf. NA

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # _____ K.V. _____ Amp _____ Type _____

Refills: Cat. # _____ K.V. _____ Amp _____ Type _____

Resistance Test: 1. _____ 2. _____ 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 995.1



## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

Interrupter Switch Specifications: Manuf. S&C ELECTRIC Amps 600

Cat. # 345-211-12 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. N A Type _____

Cat. # _____ K.V. _____

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. _____ 2. _____ 3. _____ megohms

The above values are satisfactory.

Fuse Specifications Manuf. S&C ELECTRIC

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # 816401R1 K.V. 34.5 Amp 300 Type SM-5

Refills: Cat. # 12425R1 K.V. 34.5 Amp 15 Type 15E-1

Resistance Test: 1. 2200 2. 2200 3. 2170 microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

# TRANSFORMER INSPECTION & TEST SHEET No. 1

MUSEIA PAVILLION TRANSFORMER T-1

Manufacturer WESTINGHOUSE Serial No. 249320

To LVAN H.V. 27600/11000 L.V. 208Y/120 Taps 4-2½% ±2

Gal. Liquid 200 K.V.A. 500/560

Impedance 5.9 VECTOR Wye/Wye ccn

Liquid Sample

| Gal No. | Neut. No. | Colour | I.F.T. | Dielectric | Spec. Gravity |
|---|---|---|---|---|---|

The above results are satisfactory.

Insulation Resistance Test — Test Voltage D.C.

H.V. to Ground >1G megohms 1000

L.V. to Ground 60 megohms "

H.V. to L.V. 60 megohms

The above results are satisfactory.

Station Grounding System: 2.50 Ohm

# TRANSFORMER INSPECTION & TEST SHEET No. 2

## GENERAL CONDITIONS

Serial No. 849380

**Bushings:** Insulation was intact and thoroughly cleaned. Cementing was free from deterioration.

**Gaskets:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Paint:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Liquid Level:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Thermometer:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

MAXIMUM TEMPERATURE WAS 28 ° C

**Cooling System:**
- [x] CLEAR
- [ ] SEE GENERAL SHEET. NOTE

**Gas Detector Relay:**
- [ ] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE
- [x] NOT APPLICABLE

**Terminal Board and/or Tap Switch:** located in position 3 for 27600 volts

:f. # 9951 Sheet # 23

LOW VOLTAGE BREAKER ✓ / DISCONNECT DEVICE _____ & ENCLOSURES

Designation: EURASIA "I" VILLA

CIFICATION:

Manufacturer : ITE
Serial # : 98013
Interrupt. Cap : 50KA
Volts : 600 (208/120)
Frame Size : 1600 AMP
Type : K-1600
Elect. Operated: —
Poles : 3
Manul. Operated: ✓
Fixed: _____ / Draw Out: ✓

TRIPPING DEVICE:

Type: [illegible]
Coil/C.T. Rating 800 amps
Longtime P/U : 800 amps
Delay MIN T/A seconds
Shorttime P/U: 3200 amps
Delay MIN T/B seconds
Grd Fault P/U: NA amps
Delay — seconds
Instant. P/U : NA amps
Fused Rating & Manufacturer: NA

NTACT RESISTANCE:

Phase I [illegible] Phase II [illegible] Phase III [illegible] microhms

ULATION RESISTANCE:

Phase I [illegible] Phase II [illegible] Phase III [illegible] megohms

| GENERAL: | | O.K. | NOTE# | | | O.K. | NOTE# |
|---|---|---|---|---|---|---|---|
| 1. | Exterior Enclosure Condition | ✓ | | 12. | Lubricated | ✓ | |
| 2. | Arcing Contacts | ✓ | | 13. | Breaker Cleaned | ✓ | |
| 3. | Main Contacts | ✓ | | 14. | Enclosure Cleaned | ✓ | |
| 4. | Exterior Breaker Condition | ✓ | | 15. | Bus Connections | ✓ | |
| 5. | Tripping Device Condition | ✓ | | 16. | Cable Connections | ✓ | |
| 6. | Manual Closing Operation | ✓ | | 17. | Voltmeter | ✓ | |
| 7. | Manual Tripping Operation | ✓ | | 18. | Ammeter | ✓ | |
| 8. | Electrical Closing Operation | | | 19. | Arc Chute Condition | ✓ | |
| 9. | Electrical Tripping Operation | | | 20. | Barrier Condition | ✓ | |
| 10. | Secondary Auxillary Contacts | ✓ | | 21. | Single Phase Indicators | | |
| 11. | Breaker Drawout Clusters | ✓ | | 22. | Others | | |

The secondary equipment was serviced and left in satisfactory condition and consisted of

_____ Moulded Case Breakers

2 Fused Switches

TH/11-92R

Ref. # 9951

SHEET No. 24

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

AFRICA PAVILION

Interrupter Switch Specifications: Manuf. S/C ELECTRIC Amps 600

TRANSFORMER T-6

Cat. # 345,244 -T2 K.V. 23

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. N/A Type —

Cat. # — K.V. —

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. _____ 2. _____ 3. _____ megohms

The above values are satisfactory.

Fuse Specifications Manuf. S/C ELECTRIC

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # 266V6K1 K.V. 34.5 Amp 200 Type SMU-5

Refills: Cat. # 1E40662Y K.V. 34.5 Amp 40 Type TCC 15E-40

Resistance Test: 1. 1010 2. 1025 3. 1020 microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951 SHEET No. 25

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

Interrupter Switch Specifications: Manuf. S&C ELECTRIC Amps 600
Cat. # 340[illegible] K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. OHIO BRASS Type DYNA-GAP
Cat. # [illegible] K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. >200 2. >200 3. >200 megohms
The above values are satisfactory.

Fuse Specifications Manuf. N/A

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # _____ K.V. _____ Amp _____ Type _____

Refills: Cat. # _____ K.V. _____ Amp _____ Type _____

Resistance Test: 1. _____ 2. _____ 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951

SHEET No. 26

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

Interrupter Switch Specifications: Manuf. S/E ELECTRIC Amps 600
ARRIVAL TRANSFORMER
FEEDER TO INDO-MALAYA TAV
Cat. # [illegible] K.V. 22

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. [illegible] Type DUAL-GAP.
Cat. # [illegible] K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 200+ 2. 200+ 3. 200+ megohms
The above values are satisfactory.

Fuse Specifications Manuf. N/A

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # _____ K.V. _____ Amp _____ Type _____

Refills: Cat. # _____ K.V. _____ Amp _____ Type _____

Resistance Test: 1. _____ 2. _____ 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951 SHEET No. 29

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

AFRICA PAVILION
PANDORA - THE WORLD

Interrupter Switch Specifications: Manuf. S/C ELECTRIC Amps 600

Cat. # 345604-12 K.V. 29

**Insulation:** Intact and thoroughly cleaned.

**Alignement & Mechanism:** Operated normally. Lubricated where necessary.

**Contacts:** Cleaned, conditioned and sealed against oxidation.

**Interrupting Units:**
- ☐ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

**Lightning Arrester Specification** Manuf. _____ Type _____

Cat. # _____ K.V. _____

**Insulation:** Intact and thoroughly cleaned.

**Cementing:** Free from deterioration.

**Insulation Resistance Test:** 1. _____ 2. _____ 3. _____ megohms
The above values are satisfactory.

**Fuse Specifications** Manuf. S/C ELECTRIC

**Mountings:** Cat. # _____ K.V. _____ Amp _____ Type _____

**Holders:** Cat. # 86640E1 K.V. 34.5 Amp 300 Type SM-5

**Refills:** Cat. # 13412-R1 K.V. 34.5 Amp 40 Type TCC 153-V

**Resistance Test:** 1. _____ 2. 1200 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

G. T. WOOD CO. LTD. 9/27/83

SHT-28

# TRANSFORMER INSPECTION & TEST SHEET No. 1

TRICITY PAVILION TRANSFORMER T-6

Manufacturer WESTINGHOUSE Serial No. 79-1511

No. 1-PHASE H.V. 27,600Y/16,000 L.V. 208Y/120 Taps 4-2½% F.C.

Wt. Liquid 350 K.V.A. 750/1000

Impedance 6.0 VECTOR WYE/WYE 60 CY

Liquid Sample

| Serial No. | Neut. No. | Colour | I.F.T. | Dielectric | Spec. Gravity |
|---|---|---|---|---|---|

The above results are satisfactory.

Insulation Resistance Test

| | | Test Voltage D.C. |
|---|---|---|
| H.V. to Ground | S/G megohms | 1000 |
| L.V. to Ground | 100 megohms | " |
| H.V. to L.V. | 100 megohms | " |

The above results are satisfactory.

Station Grounding System: 2.50 Ohm

G. T. WOOD CO. LTD. 06/03

# TRANSFORMER INSPECTION & TEST SHEET No. 2

## GENERAL CONDITIONS

Serial No. 795154

**Bushings:** Insulation was intact and thoroughly cleaned. Cementing was free from deterioration.

**Gaskets:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Paint:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Liquid Level:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Thermometer:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

MAXIMUM TEMPERATURE WAS 65 °C

**Cooling System:**
- [x] CLEAR
- [ ] SEE GENERAL SHEET. NOTE

**Gas Detector Relay:**
- [ ] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE
- [x] NOT APPLICABLE

**Terminal Board and/or Tap Switch:** located in position 3 for 27600 volts

Ref. # 9951 Sheet # 30

LOW VOLTAGE BREAKER / / DISCONNECT DEVICE _____ & ENCLOSURES

Designation: AFRICAN PAVILION - MAIN

SPECIFICATION:

Manufacturer : F.P.E
Interrupt. Cap : 75 KA
Frame Size : 2000 AMP
Elect. Operated: ✓
Manul. Operated: ✓

Serial # : TH 4136-92
Volts : 600 (120/208)
Type : 7-H-3
Poles : 3
Fixed: _____ / Draw Out: —

TRIPPING DEVICE:

Type: PA
Longtime P/U : 2000 amps
Shorttime P/U: 8000 amps
Grd Fault P/U: — amps
Instant. P/U : — amps
Fused Rating & Manufacturer: —

Coil/C.T. Rating 2000 amps
Delay MAX/A seconds
Delay 15 CYCLE seconds
Delay — seconds

CONTACT RESISTANCE:

Phase I 29 Phase II 30 Phase III 27 microhms

INSULATION RESISTANCE:

Phase I 200 Phase II 200 Phase III 200 megohms

| GENERAL: | O.K. | NOTE# | | O.K. | NOTE# |
|---|---|---|---|---|---|
| 1. Exterior Enclosure Condition | ✓ | | 12. Lubricated | ✓ | |
| 2. Arcing Contacts | ✓ | | 13. Breaker Cleaned | ✓ | |
| 3. Main Contacts | ✓ | | 14. Enclosure Cleaned | ✓ | |
| 4. Exterior Breaker Condition | ✓ | | 15. Bus Connections | ✓ | |
| 5. Tripping Device Condition | | ✓ | 16. Cable Connections | ✓ | |
| 6. Manual Closing Operation | ✓ | | 17. Voltmeter | ✓ | |
| 7. Manual Tripping Operation | ✓ | | 18. Ammeter | ✓ | |
| 8. Electrical Closing Operation | ✓ | | 19. Arc Chute Condition | ✓ | |
| 9. Electrical Tripping Operation | ✓ | | 20. Barrier Condition | ✓ | |
| 10. Secondary Auxillary Contacts | ✓ | | 21. Single Phase Indicators | | |
| 11. Breaker Drawout Clusters | ✓ | | 22. Others | | |

The secondary equipment was serviced and left in satisfactory condition and consisted of

_____ Moulded Case Breakers

_____ Fused Switches

TH/11-92R

# 9951 Sheet # 31

LOW VOLTAGE BREAKER ✓ / DISCONNECT DEVICE ____ & ENCLOSURES

Designation: AFRICIA PAVILION - MCC-A1

FICATION:

Manufacturer : FPE
Interrupt. Cap : 50kA
Frame Size : 1600 AMP
Elect. Operated: —
Manul. Operated: ✓

Serial # : TH 4125-92.
Volts : 600
Type : FOH-3
Poles : 3
Fixed: ✓ / Draw Out: ____

RIPPING DEVICE:

Type: PA
Longtime P/U : 1000 amps
Shorttime P/U: — amps
Grd Fault P/U: — amps
Instant. P/U : 4000 amps
Fused Rating & Manufacturer: NA

Coil/C.T. Rating 1000 amps
Delay MIN T/A seconds
Delay — seconds.
Delay — seconds

X ITACT RESISTANCE:

Phase I 35 Phase II 42 Phase III 45 microhms

I ATION RESISTANCE:

Phase I 200 Phase II 200 Phase III 200 megohms

| GENERAL: | O.K. | NOTE# | | O.K. | NOTE# |
|---|---|---|---|---|---|
| Exterior Enclosure Condition | ✓ | | 12. Lubricated | ✓ | |
| Arcing Contacts | ✓ | | 13. Breaker Cleaned | ✓ | |
| Main Contacts | ✓ | | 14. Enclosure Cleaned | ✓ | |
| Exterior Breaker Condition | ✓ | | 15. Bus Connections | ✓ | |
| 5. Tripping Device Condition | | ✓ | 16. Cable Connections | ✓ | |
| Manual Closing Operation | ✓ | | 17. Voltmeter | | |
| 7. Manual Tripping Operation | ✓ | | 18. Ammeter | | |
| Electrical Closing Operation | | | 19. Arc Chute Condition | ✓ | |
| 9. Electrical Tripping Operation | | | 20. Barrier Condition | ✓ | |
| 1. Secondary Auxillary Contacts | | | 21. Single Phase Indicators | | |
| 1. Breaker Drawout Clusters | | | 22. Others | | |

The secondary equipment was serviced and left in satisfactory condition and consisted of

____ Moulded Case Breakers

21 Fused Switches

TH/11-92R

Ref. # 995.1

SHEET No. 32

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

NORTH AMERICA PAVILION
Interrupter Switch Specifications: Manuf. S/C ELECTRIC Amps 600
FEEDER TO ARENA 1 & 2 Cat. # 3H6L-47 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. OHIO BRASS Type S.P
Cat. # 4659 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 200+ 2. 200+ 3. 200+ megohms
The above values are satisfactory.

Fuse Specifications Manuf. _____

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # _____ K.V. _____ Amp _____ Type _____

Refills: Cat. # _____ K.V. _____ Amp _____ Type _____

Resistance Test: 1. _____ 2. _____ 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951



## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

Interrupter Switch Specifications: Manuf. NORTH AMERICA INV. TRANSFORMER T-S Amps 600

Cat. # 34563R4-72 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. NA Type _____

Cat. # _____ K.V. _____

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. _____ 2. _____ 3. _____ megohms

The above values are satisfactory.

Fuse Specifications Manuf. S/C ELECTRIC

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # 86644R1 K.V. 34.5 Amp 300 Type SM 5

Refills: Cat. # 130025R4 K.V. 34.5 Amp 15 Type TCC 153.4

Resistance Test: 1. 2280 2. 2287 3. 2300 microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 1951

SHEET No. 34

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

NORTH AMERICA PAVILION
Interrupter Switch Specifications: Manuf. S/C ELECTRIC Amps 600
FEEDS TO SERVICE BLDG.
Cat. # 2101-C Kv. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. OHIO BRASS Type GP
Cat. # 4L-1-9 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 200+ 2. 200+ 3. 200+ megohms
The above values are satisfactory.

Fuse Specifications Manuf. _____

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # _____ K.V. _____ Amp _____ Type _____

Refills: Cat. # _____ K.V. _____ Amp _____ Type _____

Resistance Test: 1. _____ 2. _____ 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 1-11 SHEET No. 35

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

NORTH AMERICAN PHILLIPS
Interrupter Switch Specifications: Manuf. S&C ELECTRIC Amps 600
PADDOCK TEXTILE
Cat. # 345634R4-T2 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. OHIO Type GP
Cat. # 46159 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. _____ 2. 200 3. _____ megohms
The above values are satisfactory.

Fuse Specifications Manuf. _____

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # 866442 K.V. 34.5 Amp 300 Type JN5

Refills: Cat. # 2601252 K.V. 34.5 Amp 80 Type TCC 119-4

Resistance Test: 1. _____ 2. 1160 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

SNT-36

# TRANSFORMER INSPECTION & TEST SHEET No. 1

Nova Inverness

ufacturer Westinghouse Serial No.

o LNAN H.V. 24600Y/16000 L.V. 208Y/120 Taps 4-2½%

. Liquid 200 K.V.A. 500/560

Impedance 7.1 VECTOR Dyn / Yyn

uid Sample

| ial No. | Neut. No. | Colour | I.F.T. | Dielectric | Spec. Gravity |
|---|---|---|---|---|---|
| | | | | | |

The above results are satisfactory.

sulation Resistance Test

Test Voltage D.C.

| | | | |
|---|---|---|---|
| H.V. to Ground | 5/9 | megohms | 1000 |
| L.V. to Ground | 100 | megohms | " |
| H.V. to L.V. | 100 | megohms | " |

The above results are satisfactory.

Station Grounding System: 2.50 Ohm

G.T. WOOD CO. LTD. 06/03

SAT-37

# TRANSFORMER INSPECTION & TEST SHEET No. 2

## GENERAL CONDITIONS

Serial No. .....

**Bushings:** Insulation was intact and thoroughly cleaned. Cementing was free from deterioration.

**Gaskets:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Paint:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Liquid Level:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Thermometer:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

MAXIMUM TEMPERATURE WAS [52] °C

**Cooling System:**
- [x] CLEAR
- [ ] SEE GENERAL SHEET. NOTE

**Gas Detector Relay:**
- [ ] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE
- [x] NOT APPLICABLE

**Terminal Board and/or Tap Switch:** located in position 3 for 22600 volts

ef. # 7951 Sheet # 38

LOW VOLTAGE BREAKER ✓ / DISCONNECT DEVICE ____ & ENCLOSURES

Designation: NORTH AMERICAN PAN - MAIN

PECIFICATION:

Manufacturer : ITE
Serial # : 72017
Interrupt. Cap : 50KA
Volts : 600 - 120/208?
Frame Size : 1600 AMP
Type : K-1600
Elect. Operated: —
Poles : 3
Manul. Operated: ✓
Fixed: ____ / Draw Out: ✓

RIPPING DEVICE:

Type: 0214
Coil/C.T. Rating 1200 amps
Longtime P/U : 1100 amps
Delay MIN T/S seconds
Shorttime P/U: 4000 amps
Delay MIN T/S seconds
Grd Fault P/U: — amps
Delay — seconds
Instant. P/U : ____ amps
Fused Rating & Manufacturer: —

ONTACT RESISTANCE:

Phase I 32 Phase II 35 Phase III 29 microhms

NSULATION RESISTANCE:

Phase I 700 Phase II 700 Phase III 200 megohms

| GENERAL: | | O.K. | NOTE# | | | O.K. | NOTE# |
|---|---|---|---|---|---|---|---|
| 1. | Exterior Enclosure Condition | ✓ | | 12. | Lubricated | ✓ | |
| 2. | Arcing Contacts | ✓ | | 13. | Breaker Cleaned | ✓ | |
| 3. | Main Contacts | ✓ | | 14. | Enclosure Cleaned | ✓ | |
| 4. | Exterior Breaker Condition | ✓ | | 15. | Bus Connections | ✓ | |
| 5. | Tripping Device Condition | ✓ | | 16. | Cable Connections | ✓ | |
| 6. | Manual Closing Operation | ✓ | | 17. | Voltmeter | ✓ | |
| 7. | Manual Tripping Operation | ✓ | | 18. | Ammeter | ✓ | |
| 8. | Electrical Closing Operation | | | 19. | Arc Chute Condition | ✓ | |
| 9. | Electrical Tripping Operation | | | 20. | Barrier Condition | ✓ | |
| 0. | Secondary Auxillary Contacts | ✓ | | 21. | Single Phase Indicators | | |
| 1. | Breaker Drawout Clusters | ✓ | | 22. | Others | | |

The secondary equipment was serviced and left in satisfactory condition and consisted of

____ Moulded Case Breakers

____ Fused Switches

TH/11-92R

Ref. # 9951 SHEET No. 39

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

ENT. FACILITIES
Interrupter Switch Specifications: Manuf. S/C ELECTRIC Amps 600
TESTED TO JOHN MALYN PAV.
Cat. # 3416? K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. OHIO BRASS Type GAP
Cat. # 46159 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 200+ 2. 200+ 3. 200+ megohms
The above values are satisfactory.

Fuse Specifications Manuf. _____

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # _____ K.V. _____ Amp _____ Type _____

Refills: Cat. # _____ K.V. _____ Amp _____ Type _____

Resistance Test: 1. _____ 2. _____ 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951

SHEET No. 40

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

ENT. FACILITIES
Interrupter Switch Specifications: Manuf. S/C ELECTRIC Amps 600
FEEDER TO VILLAGE LIGHT SOUTH Cat. # 345624-7? K.V. 27

**Insulation:** Intact and thoroughly cleaned.

**Alignement & Mechanism:** Operated normally. Lubricated where necessary.

**Contacts:** Cleaned, conditioned and sealed against oxidation.

**Interrupting Units:**
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

**Lightning Arrester Specification** Manuf. OHIO [illegible] Type [illegible]
Cat. # [illegible] K.V. 24

**Insulation:** Intact and thoroughly cleaned.

**Cementing:** Free from deterioration.

**Insulation Resistance Test:** 1. _____ 2. 200+ 3. _____ megohms
The above values are satisfactory.

**Fuse Specifications** Manuf. S/C ELECTRIC

**Mountings:** Cat. # _____ K.V. _____ Amp _____ Type _____

**Holders:** Cat. # 86644R1 K.V. [illegible] Amp [illegible] Type [illegible]

**Refills:** Cat. # 134175-K4 K.V. [illegible] Amp 20 Type [illegible]

**Resistance Test:** 1. _____ 2. [illegible] 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951



## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

ENT. FACILITIES
TRANSFORMER T.S

Interrupter Switch Specifications: Manuf. S/C ELECTRIC Amps 600

Cat. # 2456244-72 K.V. 27

**Insulation:** Intact and thoroughly cleaned.

**Alignement & Mechanism:** Operated normally. Lubricated where necessary.

**Contacts:** Cleaned, conditioned and sealed against oxidation.

**Interrupting Units:**
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

**Lightning Arrester Specification** Manuf. ASEA Type _____

Cat. # _____ K.V. _____

**Insulation:** Intact and thoroughly cleaned.

**Cementing:** Free from deterioration.

**Insulation Resistance Test:** 1. _____ 2. _____ 3. _____ megohms

The above values are satisfactory.

**Fuse Specifications** Manuf. S/C ELECTRIC

**Mountings:** Cat. # _____ K.V. _____ Amp _____ Type _____

**Holders:** Cat. # 866481 K.V. 24.5 Amp 300 Type SM 5

**Refills:** Cat. # 13404CX4 K.V. 24.5 Amp 25 Type TCC 153-4

**Resistance Test:** 1. 1900 2. 1910 3. 1900 microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9151 SHEET No. 42

INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

ENT FACILITIES
Interrupter Switch Specifications: Manuf. S/C ELECTRIC Amps 600
FEEDER TO LUCASIA PAV
Cat. # 3615R1 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☑ SATISFACTORY
- ☐ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. CANADIAN Type GE
Cat. # 4L61B9 K.V. 24

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. 300 2. 300 3. 300 megohms
The above values are satisfactory.

Fuse Specifications Manuf. _____

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # _____ K.V. _____ Amp _____ Type _____

Refills: Cat. # _____ K.V. _____ Amp _____ Type _____

Resistance Test: 1. _____ 2. _____ 3. _____ microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

Ref. # 9951 SHEET No. 43

## INSPECTION & TEST REPORT FOR SERVICE ENTRANCE POLE & METALCLAD SWITCHGEAR

ENT FACILITIES.
Interrupter Switch Specifications: Manuf. S/C ELECTRIC Amps 600
TRANSFORMER T-7
Cat. # 3605X4-73 K.V. 27

Insulation: Intact and thoroughly cleaned.

Alignement & Mechanism: Operated normally. Lubricated where necessary.

Contacts: Cleaned, conditioned and sealed against oxidation.

Interrupting Units:
- ☐ SATISFACTORY
- ☒ SEE GENERAL SHEET. NOTE #
- ☐ NOT APPLICABLE

Lightning Arrester Specification Manuf. _____ Type _____
Cat. # _____ K.V. _____

Insulation: Intact and thoroughly cleaned.

Cementing: Free from deterioration.

Insulation Resistance Test: 1. _____ 2. _____ 3. _____ megohms
The above values are satisfactory.

Fuse Specifications Manuf. S/C ELECTRIC

Mountings: Cat. # _____ K.V. _____ Amp _____ Type _____

Holders: Cat. # 866441 K.V. 34.5 Amp 300 Type SM-5

Refills: Cat. # 13425R4 K.V. 34.5 Amp 15 Type ~~Type~~ TCC 153.4

Resistance Test: 1. 2180 2. 219.5 3. 2220 microhms

The above values are satisfactory.
All associated insulation was intact and thoroughly cleaned.
Contact surfaces were cleaned, conditioned and sealed against oxidation.
A spare set of refills should be stored in a convenient location at all times.

SH47 · 4

# TRANSFORMER INSPECTION & TEST SHEET No. 1

ENT. FACILITIES T7

nufacturer WESTINGHOUSE Serial No. 827694

o LINN H.V. 27600 | 16000 L.V. 208Y / 120 Taps 4 · 2 ½ %

l. Liquid 150 K.V.A. 225 / 252

Impedance 6.9 VECTOR Wye / Wye

uid Sample

| ial No. | Neut. No. | Colour | I.F.T. | Dielectric | Spec. Gravity |
|---|---|---|---|---|---|

The above results are satisfactory.

sulation Resistance Test — Test Voltage D.C.

H.V. to Ground S/G megohms 1000

L.V. to Ground 55 megohms "

H.V. to L.V. 55 megohms "

The above results are satisfactory.

Station Grounding System: < 50 Ohm

SM-45

# TRANSFORMER INSPECTION & TEST SHEET No. 2

## GENERAL CONDITIONS

Serial No. 827694

**Bushings:** Insulation was intact and thoroughly cleaned. Cementing was free from deterioration.

**Gaskets:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Paint:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Liquid Level:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Thermometer:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

MAXIMUM TEMPERATURE WAS 32 °C

**Cooling System:**
- [x] CLEAR
- [ ] SEE GENERAL SHEET. NOTE

**Gas Detector Relay:**
- [ ] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE
- [x] NOT APPLICABLE

**Terminal Board and/or Tap Switch:** located in position ? for 27600 volts

SHT 46

# TRANSFORMER INSPECTION & TEST SHEET No. 1

ENT. FACILITIES T.S.

nufacturer WESTINGHOUSE Serial No. 850412

o LOAN H.V. 27600Y/16000 L.V. 600Y/347 Taps 4-2½

l. Liquid 310 K.V.A. 500/560

Impedance 6.7 VECTOR WYE/WYE

## Liquid Sample

| ial No. | Neut. No. | Colour | I.F.T. | Dielectric | Spec. Gravity |
|---|---|---|---|---|---|
| | | | | | |

The above results are satisfactory.

## Insulation Resistance Test

| | | | Test Voltage D.C. |
|---|---|---|---|
| H.V. to Ground | 5/9 | megohms | 1000 |
| L.V. to Ground | 65 | megohms | " |
| H.V. to L.V. | 65 | megohms | " |

The above results are satisfactory.

Station Grounding System: < 1.50 Ohm

# TRANSFORMER INSPECTION & TEST SHEET No. 2

## GENERAL CONDITIONS

Serial No. 850912

**Bushings:** Insulation was intact and thoroughly cleaned. Cementing was free from deterioration.

**Gaskets:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Paint:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Liquid Level:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

**Thermometer:**
- [x] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE

MAXIMUM TEMPERATURE WAS 45 ° C

**Cooling System:**
- [x] CLEAR
- [ ] SEE GENERAL SHEET. NOTE

**Gas Detector Relay:**
- [ ] SATISFACTORY
- [ ] SEE GENERAL SHEET. NOTE
- [x] NOT APPLICABLE

**Terminal Board and/or Tap Switch:** located in position 3 for 27600 volts

Ref. # 9951 Sheet # 48

LOW VOLTAGE BREAKER ✓ / DISCONNECT DEVICE _____ & ENCLOSURES

Designation: ENT. FACILITIES - MAIN T-7

**SPECIFICATION:**

Manufacturer : WESTINGHOUSE
Serial # : CP21379-02-A1
Interrupt. Cap : 50KA
Volts : 600
Frame Size : 1600 AMP
Type : DB-50
Elect. Operated: —
Poles : 3
Manul. Operated: ✓
Fixed: _____ / Draw Out: ✓

**TRIPPING DEVICE:**

Type: DB
Coil/C.T. Rating 1000 amps
Longtime P/U : 640 amps
Delay 20 seconds
Shorttime P/U: 4000 amps
Delay 30 CYCLE seconds
Grd Fault P/U: — amps
Delay — seconds
Instant. P/U : — amps
Fused Rating & Manufacturer: —

**CONTACT RESISTANCE:**

Phase I 39 Phase II 42 Phase III 40 microhms

**INSULATION RESISTANCE:**

Phase I 200 Phase II 200 Phase III 200 megohms

| GENERAL: | | O.K. | NOTE# | | | O.K. | NOTE# |
|---|---|---|---|---|---|---|---|
| 1. | Exterior Enclosure Condition | ✓ | | 12. | Lubricated | ✓ | |
| 2. | Arcing Contacts | ✓ | | 13. | Breaker Cleaned | ✓ | |
| 3. | Main Contacts | ✓ | | 14. | Enclosure Cleaned | ✓ | |
| 4. | Exterior Breaker Condition | ✓ | | 15. | Bus Connections | ✓ | |
| 5. | Tripping Device Condition | ✓ | | 16. | Cable Connections | ✓ | |
| 6. | Manual Closing Operation | ✓ | | 17. | Voltmeter | ✓ | |
| 7. | Manual Tripping Operation | ✓ | | 18. | Ammeter | ✓ | |
| 8. | Electrical Closing Operation | | | 19. | Arc Chute Condition | ✓ | |
| 9. | Electrical Tripping Operation | | | 20. | Barrier Condition | ✓ | |
| 0. | Secondary Auxillary Contacts | ✓ | | 21. | Single Phase Indicators | | |
| .1. | Breaker Drawout Clusters | | | 22. | Others | | |

The secondary equipment was serviced and left in satisfactory condition and consisted of

_____ Moulded Case Breakers

6 Fused Switches

TH/11-92R

Sheet # 49

# : # 9951

LOW VOLTAGE BREAKER ✓ / DISCONNECT DEVICE ____ & ENCLOSURES

Designation: ENT. FACILITIES T.S

IFICATION:

Manufacturer : WESTINGHOUSE
Interrupt. Cap : 25KA
Frame Size : 600 A
Elect. Operated: —
Manul. Operated: ✓

Serial # : CP21379-01-A1
Volts : 600
Type : DP-25
Poles : 3
Fixed: ____ / Draw Out: —

TRIPPING DEVICE:

Type: DP-1

Longtime P/U : 600 amps
Shorttime P/U: 3000 amps
Grd Fault P/U: — amps
Instant. P/U : — amps

Coil/C.T. Rating 600 amps
Delay 20 seconds
Delay 6cycle seconds.
Delay — seconds

Fused Rating & Manufacturer: —

O TACT RESISTANCE:

Phase I 45 Phase II 51 Phase III 45 microhms

I LATION RESISTANCE:

Phase I 200 Phase II 200 Phase III 200 megohms

G JERAL:

| | | O.K. | NOTE # |
|---|---|---|---|
| 1. | Exterior Enclosure Condition | ✓ | |
| | Arcing Contacts | ✓ | |
| 3. | Main Contacts | ✓ | |
| | Exterior Breaker Condition | ✓ | |
| 5. | Tripping Device Condition | ✓ | |
| | Manual Closing Operation | ✓ | |
| | Manual Tripping Operation | ✓ | |
| | Electrical Closing Operation | | |
| | Electrical Tripping Operation | | |
| 10. | Secondary Auxillary Contacts | ✓ | |
| | Breaker Drawout Clusters | ✓ | |

| | | O.K. | NOTE # |
|---|---|---|---|
| 12. | Lubricated | ✓ | |
| 13. | Breaker Cleaned | ✓ | |
| 14. | Enclosure Cleaned | ✓ | |
| 15. | Bus Connections | ✓ | |
| 16. | Cable Connections | ✓ | |
| 17. | Voltmeter | ✓ | |
| 18. | Ammeter | ✓ | |
| 19. | Arc Chute Condition | ✓ | |
| 20. | Barrier Condition | ✓ | |
| 21. | Single Phase Indicators | | |
| 22. | Others | | |

The secondary equipment was serviced and left in satisfactory condition and consisted of

____ Moulded Case Breakers
____ Fused Switches

TH/11-92R

G.T. WOOD CO. LTD.
3354 Mavis Rd. Mississauga, Ont. L5C 1T8
TEL: (905) 272-1696 Fax: (905) 272-1425

February 28, 1995

METRO TORONTO ZOO
P.O. Box 280,
West Hill, Ontario,
M1E 4R5

ATTN: Mr. Dean Evans

**RE: Your PO #12124**
**Our Ref #9951**

Dear Sir;

In accordance with your request, we have completed the Inspection and Testing of the substation and associated electrical equipment at the above location.

Please find enclosed our test report for your reference.

Thank you for the favour of this business.

Yours very truly,
G.T. WOOD COMPANY LIMITED

L.A. Snow
LAS/jn

Encl.
RSCL/1

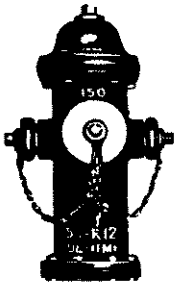
# APPENDIX 6

# LIST OF GAS-FIRED EQUIPMENT

# APPENDIX 7

# FIRE HYDRANT TEST RESULTS

HYDRANT OPERATION SATISFACTORY
HYDRANT OPERATION DEFICIENCY



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


(1)

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: West of Indian Ring Rd
HYDRANT MAKE: M67
DATE: Dec 21 RK

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — LOCATED ☐ — OK ☐ — NOT VISIBLE ☑ — CLOSED ☐ — INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☐ O/L ☐ — OK ☑ — DIFFICULT ☐ — LEAKING ☐ — INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — O/K ☑ LEAKING ☐ — R/S ☑ LEADED ☐ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST 30 — PITOT 109 — USGPM
9. PRESSURE TEST @ 100 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☐ SOLID ☑ — BURIED ☐ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ NO ☑ — TYPE ____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ — N/A ☑ — [illegible] ☐

SERVICED BY: Rick

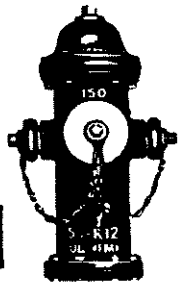
CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. OTHER | OK ☐ | | |
| 59. OTHER | OK ☐ | | |
| 60. OTHER | OK ☐ | | |
| 61. OTHER | OK ☐ | | |
| 62. OTHER | OK ☐ | | |
| 63. OTHER | OK ☐ | | |

HYDRANT OPERATION SATISFACTORY ☑
HYDRANT OPERATION DEFICIENCY ☐



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


(2)

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: South of Ind's Pavilion
HYDRANT MAKE: B50B
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — LOCATED — OK ☐ NOT VISIBLE ☑ — CLOSED ☐ INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ O/L ☐ — OK ☑ DIFFICULT ☐ — LEAKING ☐ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — O/K ☑ LEAKING ☐ — R/S ☑ LEADED ☑ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST 36 — PITOT 1116 — USGPM
9. PRESSURE TEST @ 60 PSIG — PASSED ☐ — FAILED ☐
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☐ — NO ☐
13. GROUND FLANGE — SAFETY ☐ SOLID ☑ — BURIED ☐ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ NO ☑ — TYPE ____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: Max

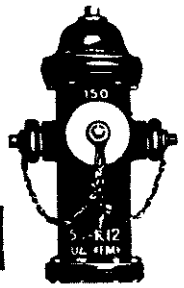
CUSTOMER REPRESENTATIVE:

COMMENTS: Hydrant has minor leak at ground flange.

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 20. BONNET | OK ☐ | | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 58. OTHER | OK ☐ | | | ☐ |
| 59. OTHER | OK ☐ | | | ☐ |
| 60. OTHER | OK ☐ | | | ☐ |
| 61. OTHER | OK ☐ | | | ☐ |
| 62. OTHER | OK ☐ | | | ☐ |
| 63. OTHER | OK ☐ | | | ☐ |

HYDRANT OPERATION SATISFACTORY
HYDRANT OPERATION DEFICIENCY



# A-1 HYDRANT SERVICES LTD.

550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493

3

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: South of Athletic Centre Entrance
HYDRANT MAKE: Century
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — LOCATED ☐ — OK ☐ / NOT VISIBLE ☑ — CLOSED ☐ / INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ / O/L ☐ — OK ☑ / DIFFICULT ☐ — LEAKING ☐ / INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ / DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — OK ☑ / LEAKING ☐ — R/S ☐ / LEADED ☑ — LOOSE ☐ / DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST 20 — PITOT 8 32 — USGPM
9. PRESSURE TEST @ 44 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ / NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ / NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☑ / N/A ☐ — NO ☐
13. GROUND FLANGE — SAFETY ☐ / SOLID ☑ — BURIED ☐ / N/A ☐ — LEAKING ☐ / DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ / NO ☑ — TYPE ____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ / DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

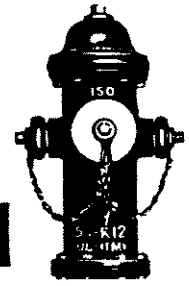
CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50 UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. OTHER | OK ☐ | | ☐ |
| 59. OTHER | OK ☐ | | ☐ |
| 60. OTHER | OK ☐ | | ☐ |
| 61. OTHER | OK ☐ | | ☐ |
| 62. OTHER | OK ☐ | | ☐ |
| 63. OTHER | OK ☐ | | ☐ |

HYDRANT OPERATION SATISFACTORY ☐
HYDRANT OPERATION DEFICIENCY ☑



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


(4)

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave. Scarborough

HYDRANT LOCATION: Outside gorilla door
HYDRANT MAKE: B50S
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE _____ LOCATED — OK ☐ NOT VISIBLE ☑ — CLOSED ☐ INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ O/L ☐ — OK ☐ DIFFICULT ☐ — LEAKING ☑ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER _____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — O/K ☑ LEAKING ☐ — R/S ☐ LEADED ☑ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST 27 — PITOT 9½ — USGPM
9. PRESSURE TEST @ 41 PSIG — PASSED ☐ — FAILED ☑
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR _____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR _____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☐ SOLID ☐ — BURIED ☑ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION _____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ NO ☑ — TYPE _____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

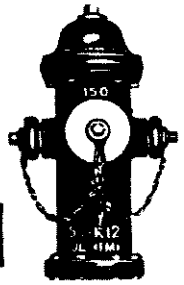
CUSTOMER REPRESENTATIVE:

COMMENTS: Hydrant leaks when fully charged.

## ADDITIONAL WORK

| | | | |
|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. [illegible] | OK ☐ | | |
| 59. [illegible] | OK ☐ | | |
| 60. [illegible] | OK ☐ | | ☐ |
| 61. [illegible] | OK ☐ | | ☐ |
| 62. [illegible] | OK ☐ | | ☐ |
| 63. [illegible] | OK ☐ | | ☐ |

HYDRANT OPERATION SATISFACTORY [ ]
HYDRANT OPERATION DEFICIENCY [ ]



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


5

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: West side of African Par
HYDRANT MAKE: Century
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — 2" slw — LOCATED — OK [✓] — NOT VISIBLE [ ] — CLOGGED [ ] — INOPERABLE [ ]
2. HYDRANT OPERATION — O/R [✓] — O/L [ ] — OK [✓] — DIFFICULT [ ] — LEAKING [ ] — INOPERABLE [ ]
3. CHECK BARREL FOR WATER — WET [ ] — DRY [✓] — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK [✓] — REPLACED [ ]
5. CHECK NOZZLES & THREADS — OK [✓] — LEAKING [ ] — R/S [ ] — LEADED [✓] — LOOSE [ ] — DAMAGED [ ]
6. LUBRICATE HYDRANT — YES [✓] — NOT REQUIRED [ ]
7. LUBE SCREW — OK [✓] — MISSING [ ] — REPLACED [ ]
8. FLOW TEST — 24 — PITOT — 911 — USGPM
9. PRESSURE TEST @ 40 PSIG — PASSED [✓] — FAILED [ ]
10. COLOUR CODED — YES [ ] — NO [✓] — COLOUR ____
11. HYDRANT PAINTED — YES [ ] — NO [✓] — COLOUR ____
12. HYDRANT PUMPED OUT — YES [ ] — N/A [✓] — NO [ ]
13. GROUND FLANGE — SAFETY [ ] — SOLID [✓] — BURIED [ ] — N/A [ ] — LEAKING [ ] — DAMAGED [ ]
14. REQUIRES BARREL EXTENTION ____ — N/A [ ]
15. PUMPER NOZZLE — YES [ ] — NO [✓] — TYPE ____
16. NOZZLE ORIENTATION — OK [✓] — IMPROPER [ ]
17. TRAFFIC BOLLARDS — OK [ ] — DAMAGED [ ] — N/A [✓] — TOO CLOSE [ ]

SERVICED BY: Rex

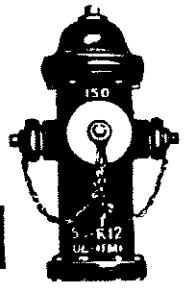
CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK [ ] | N/A [ ] | REPLACED [ ] |
| 19. BONNET BOLTS | OK [ ] | N/A [ ] | REPLACED [ ] |
| 20. BONNET | OK [ ] | | REPLACED [ ] |
| 21. BONNET SEAL | OK [ ] | | REPLACED [ ] |
| 22. OPERATING NUT | OK [ ] | | REPLACED [ ] |
| 23. OPERATING NUT O-RING(S) | OK [ ] | N/A [ ] | REPACK [ ] |
| 24. STUFFING BOX | OK [ ] | N/A [ ] | REPLACED [ ] |
| 25. THRUST BEARING | OK [ ] | N/A [ ] | REPLACED [ ] |
| 26. BEARING HOUSING | OK [ ] | N/A [ ] | REPLACED [ ] |
| 27. BEARING HOUSING BOLTS | OK [ ] | N/A [ ] | REPLACED [ ] |
| 28. HOUSING COVER | OK [ ] | N/A [ ] | REPLACED [ ] |
| 29. HOUSING COVER BOLTS | OK [ ] | N/A [ ] | REPLACED [ ] |
| 30. BEARING HOUSING SEAL(S) | OK [ ] | N/A [ ] | REPLACED [ ] |
| 31. UPPER OPERATING ROD | OK [ ] | | REPLACED [ ] |
| 32. LOWER OPERATING ROD | OK [ ] | | REPLACED [ ] |
| 33. ROD COUPLING | OK [ ] | N/A [ ] | REPLACED [ ] |
| 34. COUPLING BOLTS | OK [ ] | N/A [ ] | REPLACED [ ] |
| 35. LOWER ROD NUT(S) | OK [ ] | | REPLACED [ ] |
| 36. LOWER ROD STOP PIN/PLATE | OK [ ] | N/A [ ] | REPLACED [ ] |
| 37. VALVE BALL SEAL(S) | OK [ ] | N/A [ ] | REPLACED [ ] |
| 38. VALVE BALL BOTTOM | OK [ ] | | REPLACED [ ] |
| 39. VALVE BALL RUBBER | OK [ ] | | REPLACED [ ] |
| 40. VALVE BALL TOP | OK [ ] | N/A [ ] | REPLACED [ ] |
| 41. MAIN VALVE SEAT | OK [ ] | | REPLACED [ ] |
| 42. MAIN VALVE SEAT SEAL(S) | OK [ ] | | REPLACED [ ] |
| 43. DRAIN VALVE | OK [ ] | | REPLACED [ ] |
| 44. DRAIN VALVE SEAL(S) | OK [ ] | | REPLACED [ ] |
| 45. DRAIN VALVE PORT(S) | OK [ ] | CLEARED [ ] | REPLACED [ ] |
| 46. DRAIN VALVE COTTER PIN(S) | OK [ ] | N/A [ ] | REPLACED [ ] |
| 47. LOWER BARREL | OK [ ] | | REPLACED [ ] |
| 48. LOWER BARREL FLANGE(S) | OK [ ] | N/A [ ] | REPLACED [ ] |
| 49. UPPER BARREL | OK [ ] | | REPLACED [ ] |
| 50. UPPER BARREL FLANGE(S) | OK [ ] | N/A [ ] | REPLACED [ ] |
| 51. BARREL EXTENTION(S) | OK [ ] | N/A [ ] | REPLACED [ ] |
| 52. FLANGE GASKET(S) | OK [ ] | N/A [ ] | REPLACED [ ] |
| 53. FLANGE BOLTS | OK [ ] | N/A [ ] | REPLACED [ ] |
| 54. BOOT | OK [ ] | N/A [ ] | REPLACED [ ] |
| 55. NOZZLE(S) | OK [ ] | RECAULKED [ ] | REPLACED [ ] |
| 56. NOZZLE CAP(S) | OK [ ] | | REPLACED [ ] |
| 57. NOZZLE RETAINER(S) | OK [ ] | N/A [ ] | REPLACED [ ] |
| 58. OTHER | OK [ ] | | |
| 59. OTHER | OK [ ] | | |
| 60. OTHER | OK [ ] | | |
| 61. OTHER | OK [ ] | | |
| 62. OTHER | OK [ ] | | |
| 63. OTHER | OK [ ] | | |

HYDRANT OPERATION SATISFACTORY ☑
HYDRANT OPERATION DEFICIENCY ☐



# A-1 HYDRANT SERVICES LTD.

550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493

(6)

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: South of African McDonalds
HYDRANT MAKE: Mueller
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE ____ LOCATED — OK ☐ NOT VISIBLE ☑ — CLOSED ☐ INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ O/L ☐ — OK ☑ DIFFICULT ☐ — LEAKING ☐ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — OK ☑ LEAKING ☐ — R/S ☑ LEADED ☐ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST Flowed — PITOT ____ USGPM
9. PRESSURE TEST @ 35 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☐ SOLID ☐ — BURIED ☑ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ NO ☑ — TYPE ____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | |
|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. OTHER | OK ☐ | | ☐ |
| 59. OTHER | OK ☐ | | ☐ |
| 60. OTHER | OK ☐ | | ☐ |
| 61. OTHER | OK ☐ | | ☐ |
| 62. OTHER | OK ☐ | | ☐ |
| 63. OTHER | OK ☐ | | ☐ |

HYDRANT OPERATION SATISFACTORY ☐
HYDRANT OPERATION DEFICIENCY ☐

# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


(7)

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: N/W of African McDons
HYDRANT MAKE: AVK
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — 2'S/E LOCATED — OK ☑ — NOT VISIBLE ☐ — CLOSED ☐ — INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ — O/L ☐ — OK ☑ — DIFFICULT ☐ — LEAKING ☐ — INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ — DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — OK ☑ — LEAKING ☐ — R/S ☑ — LEADED ☐ — LOOSE ☐ — DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST — 32 — PITOT — 1052 — USGPM
9. PRESSURE TEST @ 41 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ — NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ — NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ — N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☑ — SOLID ☐ — BURIED ☐ — N/A ☐ — LEAKING ☐ — DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☑ — NO ☐ — TYPE ST
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ — DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: Rick

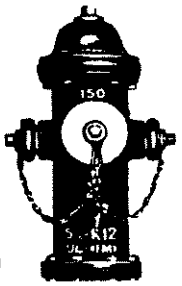
CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. OTHER | OK ☐ | | ☐ |
| 59. OTHER | OK ☐ | | ☐ |
| 60. OTHER | OK ☐ | | ☐ |
| 61. OTHER | OK ☐ | | ☐ |
| 62. OTHER | OK ☐ | | ☐ |
| 63. OTHER | OK ☐ | | ☐ |

HYDRANT OPERATION SATISFACTORY ☐
HYDRANT OPERATION DEFICIENCY ☐



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


80

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: South end of main Entrance
HYDRANT MAKE: M&H
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

| | | | | | |
|---|---|---|---|---|---|
| 1. SECONDARY VALVE | LOCATED ☐ | OK ☐ | NOT VISIBLE ☑ | CLOSED ☐ | INOPERABLE ☐ |
| 2. HYDRANT OPERATION | O/R ☑ O/L ☐ | OK ☑ | DIFFICULT ☐ | LEAKING ☐ | INOPERABLE ☐ |
| 3. CHECK BARREL FOR WATER | WET ☐ DRY ☑ | AMT. OF WATER | | | |
| 4. CHECK CAP GASKETS | OK ☑ | | | REPLACED ☐ | |
| 5. CHECK NOZZLES & THREADS | OK ☑ LEAKING ☐ | R/S ☑ | LEADED ☐ | LOOSE ☐ | DAMAGED ☐ |
| 6. LUBRICATE HYDRANT | YES ☑ | | | NOT REQUIRED ☐ | |
| 7. LUBE SCREW | OK ☑ | MISSING ☐ | | REPLACED ☐ | |
| 8. FLOW TEST 30 | PITOT 10 19 | USGPM | | | |
| 9. PRESSURE TEST @ 56 PSIG | | PASSED ☑ | | FAILED ☐ | |
| 10. COLOUR CODED | YES ☐ NO ☑ | COLOUR | | | |
| 11. HYDRANT PAINTED | YES ☐ NO ☑ | COLOUR | | | |
| 12. HYDRANT PUMPED OUT | YES ☐ N/A ☑ | | | TD ☐ | |
| 13. GROUND FLANGE | SAFETY ☐ SOLID ☐ | BURIED ☑ N/A ☐ | | LEAKING ☐ | DAMAGED ☐ |
| 14. REQUIRES BARREL EXTENTION | | | | N/A ☐ | |
| 15. PUMPER NOZZLE | YES ☐ NO ☑ | | | TYPE | |
| 16. NOZZLE ORIENTATION | OK ☑ | | | IMPROPER ☐ | |
| 17. TRAFFIC BOLLARDS | OK ☐ DAMAGED ☐ | N/A ☑ | | TOO CLOSE ☐ | |

SERVICED BY: [signature]

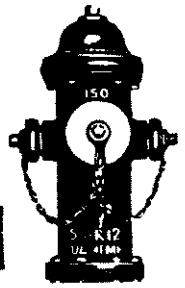
CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 20. BONNET | OK ☐ | | REPLACED ☐ | |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ | |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ | |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ | |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ | |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ | |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ | |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ | |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ | |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ | |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ | |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ | |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ | |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ | |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ | |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ | |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ | |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ | |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ | |
| 58. | OK ☐ | | | |
| 59. | OK ☐ | | | |
| 60. | OK ☐ | | | |
| 61. | OK ☐ | | | |
| 62. | OK ☐ | | | |
| 63. | OK ☐ | | | |

HYDRANT OPERATION SATISFACTORY
HYDRANT OPERATION DEFICIENCY



# A-1 HYDRANT SERVICES LTD.

550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493

(9)

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: Inside/Outside holding
HYDRANT MAKE: 250A
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — LOCATED — OK ☐ NOT VISIBLE ☑ CLOSED ☐ INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ O/L ☐ OK ☐ DIFFICULT ☐ LEAKING ☐ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ REPLACED ☐
5. CHECK NOZZLES & THREADS — O/K ☑ LEAKING ☐ R/S ☐ LEADED ☑ LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ MISSING ☐ REPLACED ☐
8. FLOW TEST — 5 — PITOT — 416 — USGPM
9. PRESSURE TEST @ 79 PSIG — PASSED ☐ FAILED ☑
10. COLOUR CODED — YES ☐ NO ☑ COLOUR ____
11. HYDRANT PAINTED — YES ☐ NO ☑ COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☑ NO ☐
13. GROUND FLANGE — SAFETY ☐ BOLTED ☑ BURIED ☐ N/A ☐ LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ N/A ☐
15. PUMPER NOZZLE — YES ☐ NO ☑ TYPE ____
16. NOZZLE ORIENTATION — OK ☑ IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ N/A ☑ TOO CLOSE ☐

SERVICED BY: [signature]

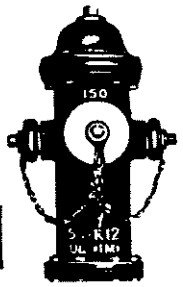
CUSTOMER REPRESENTATIVE: [signature]

COMMENTS: Hydrant leaks when fully charged Secondary valve not visible.

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 20. BONNET | OK ☐ | | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 58. OTHER | OK ☐ | | | ☐ |
| 59. OTHER | OK ☐ | | | ☐ |
| 60. OTHER | OK ☐ | | | ☐ |
| 61. OTHER | OK ☐ | | | ☐ |
| 62. OTHER | OK ☐ | | | ☐ |
| 63. OTHER | OK ☐ | | | ☐ |

HYDRANT OPERATION SATISFACTORY ☑
HYDRANT OPERATION DEFICIENCY ☐



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


(10)

CUSTOMER NAME: Toronto Metro Zoo

SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: West of ~~Africa~~ North American McDon

HYDRANT MAKE: Mueller

DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

| | | | | |
|---|---|---|---|---|
| 1. SECONDARY VALVE | LOCATED ☐ | OK ☐ / NOT VISIBLE ☑ | | CLOSED ☐ / INOPERABLE ☐ |
| 2. HYDRANT OPERATION | O/R ☑ / O/L ☐ | OK ☑ / DIFFICULT ☐ | | LEAKING ☐ / INOPERABLE ☐ |
| 3. CHECK BARREL FOR WATER | WET ☐ / DRY ☑ | AMT. OF WATER ____ | | |
| 4. CHECK CAP GASKETS | OK ☑ | | | REPLACED ☐ |
| 5. CHECK NOZZLES & THREADS | O/K ☑ / LEAKING ☐ | R/S ☑ / LEADED ☐ | | LOOSE ☐ / DAMAGED ☐ |
| 6. LUBRICATE HYDRANT | YES ☑ | | | NOT REQUIRED ☐ |
| 7. LUBE SCREW | OK ☑ | MISSING ☐ | | REPLACED ☐ |
| 8. FLOW TEST 46 | PITOT 124 | | | USGPM |
| 9. PRESSURE TEST @ 57 PSIG | | PASSED ☑ | | FAILED ☐ |
| 10. COLOUR CODED | YES ☐ / NO ☑ | COLOUR ____ | | |
| 11. HYDRANT PAINTED | YES ☐ / NO ☑ | COLOUR ____ | | |
| 12. HYDRANT PUMPED OUT | YES ☐ / N/A ☑ | | | NO ☐ |
| 13. GROUND FLANGE | SAFETY ☐ / SOLID ☐ | BURIED ☑ / N/A ☐ | | LEAKING ☐ / DAMAGED ☐ |
| 14. REQUIRES BARREL EXTENTION ____ | | | | N/A ☐ |
| 15. PUMPER NOZZLE | YES ☐ / NO ☑ | | | TYPE ____ |
| 16. NOZZLE ORIENTATION | OK ☑ | | | IMPROPER ☐ |
| 17. TRAFFIC BOLLARDS | OK ☐ / DAMAGED ☐ | N/A ☑ | | TOO CLOSE ☐ |

SERVICED BY: [signature]

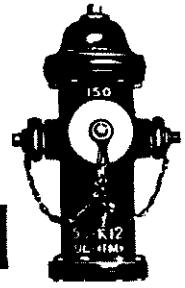
CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | |
|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50 UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. OTHER | OK ☐ | | |
| 59. OTHER | OK ☐ | | |
| 60. OTHER | OK ☐ | | |
| 61. OTHER | OK ☐ | | |
| 62. OTHER | OK ☐ | | |
| 63. OTHER | OK ☐ | | |

HYDRANT OPERATION SATISFACTORY
HYDRANT OPERATION DEFICIENCY



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


11

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: North of North American R
HYDRANT MAKE: Century
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — LOCATED ☐ — OK ☐ NOT VISIBLE ☐ — CLOSED ☐ INOPERABLE ☑
2. HYDRANT OPERATION — O/R ☑ O/L ☐ — OK ☑ DIFFICULT ☐ — LEAKING ☐ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — O/K ☑ LEAKING ☐ — R/S ☑ LEADED ☐ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST — Flowed — PITOT ____ USGPM
9. PRESSURE TEST @ 55 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☐ SOLID ☑ — BURIED ☐ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ NO ☑ — TYPE ____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

CUSTOMER REPRESENTATIVE:

COMMENTS: Secondary valve seized in open position

## ADDITIONAL WORK

| | | | |
|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50 UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. OTHER | OK ☐ | | |
| 59. OTHER | OK ☐ | | |
| 60. OTHER | OK ☐ | | |
| 61. OTHER | OK ☐ | | |
| 62. OTHER | OK ☐ | | |
| 63. OTHER | OK ☐ | | |

HYDRANT OPERATION SATISFACTORY ☑
HYDRANT OPERATION DEFICIENCY ☐

# A-1 HYDRANT SERVICES LTD.

550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493

17

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: N/E of Special Events Te
HYDRANT MAKE: B50B
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — 2' east LOCATED — OK ☑ NOT VISIBLE ☐ — CLOSED ☐ INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ O/L ☐ — OK ☑ DIFFICULT ☐ — LEAKING ☐ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER _____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — OK ☑ LEAKING ☐ — R/S ☑ LEADED ☐ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST 40 PITOT 11 76 USGPM
9. PRESSURE TEST @ 50 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR _____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR _____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☐ BOLID ☑ — BURIED ☐ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION _____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ NO ☑ — TYPE _____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

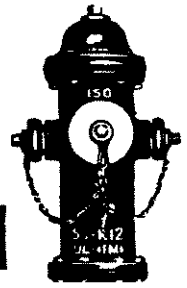
CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 20. BONNET | OK ☐ | | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 58. OTHER | OK ☐ | | | ☐ |
| 59. OTHER | OK ☐ | | | ☐ |
| 60. OTHER | OK ☐ | | | ☐ |
| 61. OTHER | OK ☐ | | | ☐ |
| 62. OTHER | OK ☐ | | | ☐ |
| 63. OTHER | OK ☐ | | | ☐ |

HYDRANT OPERATION SATISFACTORY ☐
HYDRANT OPERATION DEFICIENCY ☐



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


(13)

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: North of Australiasia
HYDRANT MAKE: M67
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — 2 least LOCATED — OK ☑ — NOT VISIBLE ☐ — CLOSED ☐ — INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ — O/L ☐ — OK ☑ — DIFFICULT ☐ — LEAKING ☐ — INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ — DRY ☑ — AMT. OF WATER _____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — OK ☑ — LEAKING ☐ — R/S ☑ — LEADED ☐ — LOOSE ☐ — DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST 4le PITOT 1261 USGPM
9. PRESSURE TEST @ 56 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ — NO ☑ — COLOUR _____
11. HYDRANT PAINTED — YES ☐ — NO ☑ — COLOUR _____
12. HYDRANT PUMPED OUT — YES ☐ — N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☐ — SOLID ☑ — BURIED ☐ — N/A ☐ — LEAKING ☐ — DAMAGED ☐
14. REQUIRES BARREL EXTENTION _____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ — NO ☑ — TYPE _____
16. NOZZLE ORIENTATION — OK ☐ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ — DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

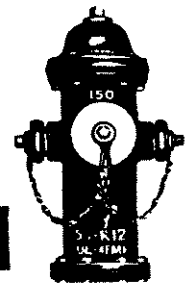
CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | |
|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. OTHER | OK ☐ | | |
| 59. OTHER | OK ☐ | | |
| 60. OTHER | OK ☐ | | |
| 61. OTHER | OK ☐ | | |
| 62. OTHER | OK ☐ | | |
| 63. OTHER | OK ☐ | | |

HYDRANT OPERATION SATISFACTORY ☑
HYDRANT OPERATION DEFICIENCY ☐



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


(14)

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: North of Australasia Area
HYDRANT MAKE: M&H
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — 4" LOCATED — OK ☑ — NOT VISIBLE ☐ — CLOSED ☐ — INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ O/L ☐ — OK ☑ DIFFICULT ☐ — LEAKING ☐ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — O/K ☑ LEAKING ☐ — P/S ☐ LEADED ☐ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST 26 PITOT 948 USGPM
9. PRESSURE TEST @ 56 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☐ SOLID ☑ — BURIED ☐ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ NO ☑ — TYPE ____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: Max

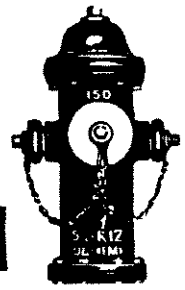
CUSTOMER REPRESENTATIVE:

COMMENTS: Leaks at operating nut packing.

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 20. BONNET | OK ☐ | | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 58. OTHER | OK ☐ | | | ☐ |
| 59. OTHER | OK ☐ | | | ☐ |
| 60. OTHER | OK ☐ | | | ☐ |
| 61. OTHER | OK ☐ | | | ☐ |
| 62. OTHER | OK ☐ | | | ☐ |
| 63. OTHER | OK ☐ | | | ☐ |

HYDRANT OPERATION SATISFACTORY
HYDRANT OPERATION DEFICIENCY



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


15

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361 A Old Finch Ave Scarborough

HYDRANT LOCATION: South of Greenhouse
HYDRANT MAKE: M67
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. SECONDARY VALVE | 2 Twist LOCATED | | OK ☑ NOT VISIBLE ☐ | | CLOSED ☐ INOPERABLE ☐ | |
| 2. HYDRANT OPERATION | O/R ☑ O/L ☐ | | OK ☑ DIFFICULT ☐ | | LEAKING ☐ INOPERABLE ☐ | |
| 3. CHECK BARREL FOR WATER | WET ☐ DRY ☑ | AMT. OF WATER | | | | |
| 4. CHECK CAP GASKETS | OK ☑ | | | | REPLACED ☐ | |
| 5. CHECK NOZZLES & THREADS | O/K ☑ LEAKING ☐ | | R/B ☑ LEADED ☐ | | LOOSE ☐ DAMAGED ☐ | |
| 6. LUBRICATE HYDRANT | YES ☑ | | | | NOT REQUIRED ☐ | |
| 7. LUBE SCREW | OK ☑ | | MISSING ☐ | | REPLACED ☐ | |
| 8. FLOW TEST 34 | PITOT 1085 | | | | USGPM | |
| 9. PRESSURE TEST @ 50 PSIG | | | PASSED ☑ | | FAILED ☐ | |
| 10. COLOUR CODED | YES ☐ NO ☑ | COLOUR | | | | |
| 11. HYDRANT PAINTED | YES ☐ NO ☑ | COLOUR | | | | |
| 12. HYDRANT PUMPED OUT | YES ☐ N/A ☑ | | | | NO ☐ | |
| 13. GROUND FLANGE | SAFETY ☑ SOLID ☐ | | BURIED ☐ N/A ☐ | | LEAKING ☐ DAMAGED ☐ | |
| 14. REQUIRES BARREL EXTENTION | | | | | N/A ☐ | |
| 15. PUMPER NOZZLE | YES ☑ NO ☐ | | | | TYPE ST | |
| 16. NOZZLE ORIENTATION | OK ☑ | | | | IMPROPER ☐ | |
| 17. TRAFFIC BOLLARDS | OK ☐ DAMAGED ☐ | | N/A ☑ | | TOO CLOSE ☐ | |

SERVICED BY: [signature]

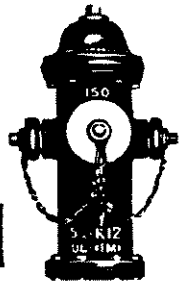
CUSTOMER REPRESENTATIVE:

COMMENTS: Left 2½" inch port cap missing.

## ADDITIONAL WORK

| | | | |
|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. OTHER | OK ☐ | | ☐ |
| 59. OTHER | OK ☐ | | ☐ |
| 60. OTHER | OK ☐ | | ☐ |
| 61. OTHER | OK ☐ | | ☐ |
| 62. OTHER | OK ☐ | | ☐ |
| 63. OTHER | OK ☐ | | ☐ |

HYDRANT OPERATION SATISFACTORY ☑
HYDRANT OPERATION DEFICIENCY ☐



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


16

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: S/E of north service
HYDRANT MAKE: Mc7
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. SECONDARY VALVE | 3 west LOCATED | | OK ☑ | | CLOSED ☐ |
| | | | NOT VISIBLE ☐ | | INOPERABLE ☐ |
| 2. HYDRANT OPERATION | O/R ☑ | | OK ☑ | | LEAKING ☐ |
| | O/L ☐ | | DIFFICULT ☐ | | INOPERABLE ☐ |
| 3. CHECK BARREL FOR WATER | WET ☐ | | AMT. OF WATER | | |
| | DRY ☑ | | | | |
| 4. CHECK CAP GASKETS | OK ☑ | | | | REPLACED ☐ |
| 5. CHECK NOZZLES & THREADS | O/K ☑ | | R/S ☑ | | LOOSE ☐ |
| | LEAKING ☐ | | LEADED ☐ | | DAMAGED ☐ |
| 6. LUBRICATE HYDRANT | YES ☑ | | | | NOT REQUIRED ☐ |
| 7. LUBE SCREW | OK ☑ | | MISSING ☐ | | REPLACED ☐ |
| 8. FLOW TEST | 30 | PITOT | 109 | | USGPM |
| 9. PRESSURE TEST @ | 50 PSIG | | PASSED ☑ | | FAILED ☐ |
| 10. COLOUR CODED | YES ☐ | | COLOUR | | |
| | NO ☑ | | | | |
| 11. HYDRANT PAINTED | YES ☐ | | COLOUR | | |
| | NO ☑ | | | | |
| 12. HYDRANT PUMPED OUT | YES ☐ | | | | NO ☐ |
| | N/A ☑ | | | | |
| 13. GROUND FLANGE | SAFETY ☐ | | BURIED ☐ | | LEAKING ☐ |
| | SOLID ☑ | | N/A ☐ | | DAMAGED ☐ |
| 14. REQUIRES BARREL EXTENTION | | | | | N/A ☐ |
| 15. PUMPER NOZZLE | YES ☐ | | | | TYPE |
| | NO ☑ | | | | |
| 16. NOZZLE ORIENTATION | OK ☑ | | | | IMPROPER ☐ |
| 17. TRAFFIC BOLLARDS | OK ☐ | | N/A ☑ | | TOO CLOSE ☐ |
| | DAMAGED ☐ | | | | |

SERVICED BY:

CUSTOMER REPRESENTATIVE:

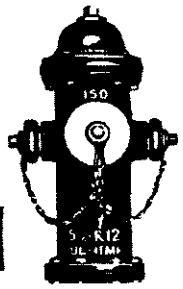
COMMENTS:

## ADDITIONAL WORK

| | | | |
|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50 UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. | OK ☐ | | ☐ |
| 59. | OK ☐ | | ☐ |
| 60. | OK ☐ | | ☐ |
| 61. | OK ☐ | | ☐ |
| 62. | OK ☐ | | ☐ |
| 63. | OK ☐ | | ☐ |

all not operated.

HYDRANT OPERATION SATISFACTORY
HYDRANT OPERATION DEFICIENCY



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550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


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CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: N/E of north service
HYDRANT MAKE: M67
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

| | | | | |
|---|---|---|---|---|
| 1. SECONDARY VALVE | 2 west LOCATED | ☑ OK | ☐ NOT VISIBLE | ☐ CLOSED ☐ INOPERABLE |
| 2. HYDRANT OPERATION | ☑ O/R ☐ O/L | ☑ OK | ☐ DIFFICULT | ☐ LEAKING ☐ INOPERABLE |
| 3. CHECK BARREL FOR WATER | ☐ WET ☑ DRY | AMT. OF WATER | | |
| 4. CHECK CAP GASKETS | ☑ OK | | | ☐ REPLACED |
| 5. CHECK NOZZLES & THREADS | ☑ OK ☐ LEAKING | ☑ R/S | ☐ LEADED | ☐ LOOSE ☐ DAMAGED |
| 6. LUBRICATE HYDRANT | ☑ YES | | | ☐ NOT REQUIRED |
| 7. LUBE SCREW | ☑ OK | ☐ MISSING | | ☐ REPLACED |
| 8. FLOW TEST 34 | PITOT 1085 | | | USGPM |
| 9. PRESSURE TEST @ 50 PSIG | | ☑ PASSED | | ☐ FAILED |
| 10. COLOUR CODED | ☐ YES ☑ NO | COLOUR | | |
| 11. HYDRANT PAINTED | ☐ YES ☑ NO | COLOUR | | |
| 12. HYDRANT PUMPED OUT | ☐ YES ☑ N/A | | | ☐ NO |
| 13. GROUND FLANGE | ☐ SAFETY ☑ SOLID | ☐ BURIED ☐ N/A | | ☐ LEAKING ☐ DAMAGED |
| 14. REQUIRES BARREL EXTENTION | | | | ☐ N/A |
| 15. PUMPER NOZZLE | ☐ YES ☑ NO | TYPE | | |
| 16. NOZZLE ORIENTATION | ☑ OK | | | ☐ IMPROPER |
| 17. TRAFFIC BOLLARDS | ☐ OK ☐ DAMAGED | ☑ N/A | | ☐ TOO CLOSE |

SERVICED BY:

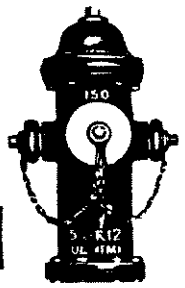
CUSTOMER REPRESENTATIVE:

COMMENTS: Secondary unable to cycle due to depth.

## ADDITIONAL WORK

| | | | |
|---|---|---|---|
| 18. BONNET COVER | ☐ OK | ☐ N/A | ☐ REPLACED |
| 19. BONNET BOLTS | ☐ OK | ☐ N/A | ☐ REPLACED |
| 20. BONNET | ☐ OK | | ☐ REPLACED |
| 21. BONNET SEAL | ☐ OK | | ☐ REPLACED |
| 22. OPERATING NUT | ☐ OK | | ☐ REPLACED |
| 23. OPERATING NUT O-RING(S) | ☐ OK | ☐ N/A | ☐ REPACK |
| 24. STUFFING BOX | ☐ OK | ☐ N/A | ☐ REPLACED |
| 25. THRUST BEARING | ☐ OK | ☐ N/A | ☐ REPLACED |
| 26. BEARING HOUSING | ☐ OK | ☐ N/A | ☐ REPLACED |
| 27. BEARING HOUSING BOLTS | ☐ OK | ☐ N/A | ☐ REPLACED |
| 28. HOUSING COVER | ☐ OK | ☐ N/A | ☐ REPLACED |
| 29. HOUSING COVER BOLTS | ☐ OK | ☐ N/A | ☐ REPLACED |
| 30. BEARING HOUSING SEAL(S) | ☐ OK | ☐ N/A | ☐ REPLACED |
| 31. UPPER OPERATING ROD | ☐ OK | | ☐ REPLACED |
| 32. LOWER OPERATING ROD | ☐ OK | | ☐ REPLACED |
| 33. ROD COUPLING | ☐ OK | ☐ N/A | ☐ REPLACED |
| 34. COUPLING BOLTS | ☐ OK | ☐ N/A | ☐ REPLACED |
| 35. LOWER ROD NUT(S) | ☐ OK | | ☐ REPLACED |
| 36. LOWER ROD STOP PIN/PLATE | ☐ OK | ☐ N/A | ☐ REPLACED |
| 37. VALVE BALL SEAL(S) | ☐ OK | ☐ N/A | ☐ REPLACED |
| 38. VALVE BALL BOTTOM | ☐ OK | | ☐ REPLACED |
| 39. VALVE BALL RUBBER | ☐ OK | | ☐ REPLACED |
| 40. VALVE BALL TOP | ☐ OK | ☐ N/A | ☐ REPLACED |
| 41. MAIN VALVE SEAT | ☐ OK | | ☐ REPLACED |
| 42. MAIN VALVE SEAT SEAL(S) | ☐ OK | | ☐ REPLACED |
| 43. DRAIN VALVE | ☐ OK | | ☐ REPLACED |
| 44. DRAIN VALVE SEAL(S) | ☐ OK | | ☐ REPLACED |
| 45. DRAIN VALVE PORT(S) | ☐ OK | ☐ CLEARED | ☐ REPLACED |
| 46. DRAIN VALVE COTTER PIN(S) | ☐ OK | ☐ N/A | ☐ REPLACED |
| 47. LOWER BARREL | ☐ OK | | ☐ REPLACED |
| 48. LOWER BARREL FLANGE(S) | ☐ OK | ☐ N/A | ☐ REPLACED |
| 49. UPPER BARREL | ☐ OK | | ☐ REPLACED |
| 50 UPPER BARREL FLANGE(S) | ☐ OK | ☐ N/A | ☐ REPLACED |
| 51. BARREL EXTENTION(S) | ☐ OK | ☐ N/A | ☐ REPLACED |
| 52. FLANGE GASKET(S) | ☐ OK | ☐ N/A | ☐ REPLACED |
| 53. FLANGE BOLTS | ☐ OK | ☐ N/A | ☐ REPLACED |
| 54. BOOT | ☐ OK | ☐ N/A | ☐ REPLACED |
| 55. NOZZLE(S) | ☐ OK | ☐ RECAULKED | ☐ REPLACED |
| 56. NOZZLE CAP(S) | ☐ OK | | ☐ REPLACED |
| 57. NOZZLE RETAINER(S) | ☐ OK | ☐ N/A | ☐ REPLACED |
| 58. OTHER | ☐ OK | | |
| 59. OTHER | ☐ OK | | |
| 60. OTHER | ☐ OK | | |
| 61. OTHER | ☐ OK | | |
| 62. OTHER | ☐ OK | | |
| 63. OTHER | ☐ OK | | |

HYDRANT OPERATION SATISFACTORY ☑
HYDRANT OPERATION DEFICIENCY ☐



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Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


18

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: East side of garage
HYDRANT MAKE: Canron
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — 2' South LOCATED ☑ — OK ☑ — NOT VISIBLE ☐ — CLOSED ☐ — INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ O/L ☐ — OK ☑ DIFFICULT ☐ — LEAKING ☐ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER _____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☑ 1
5. CHECK NOZZLES & THREADS — O/K ☑ LEAKING ☐ — R/S ☑ LEADED ☐ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST — 23 — PITOT — 892 — USGPM
9. PRESSURE TEST @ 48 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR _____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR _____
12. HYDRANT PUMPED OUT — YES ☑ N/A ☐ — NO ☐
13. GROUND FLANGE — SAFETY ☑ SOLID ☐ — BURIED ☐ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION _____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ NO ☑ — TYPE _____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

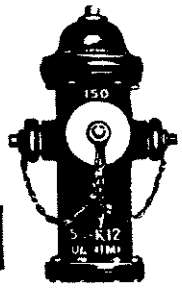
CUSTOMER REPRESENTATIVE:

COMMENTS: Secondary valve box broken & lid missing (4SL) Also box has mud, but still operable. N/D

## ADDITIONAL WORK

| | | | |
|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50 UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. [illegible] | OK ☐ | | |
| 59. [illegible] | OK ☐ | | |
| 60. [illegible] | OK ☐ | | |
| 61. [illegible] | OK ☐ | | |
| 62. [illegible] | OK ☐ | | |
| 63. [illegible] | OK ☐ | | |

HYDRANT OPERATION SATISFACTORY
HYDRANT OPERATION DEFICIENCY



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493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CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough
HYDRANT LOCATION: West end of North serv
HYDRANT MAKE: Century
DATE: Dec 21/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. SECONDARY VALVE | 3 north LOCATED | | OK ☑ NOT VISIBLE ☐ | | CLOSED ☐ INOPERABLE ☐ | |
| 2. HYDRANT OPERATION | O/R ☑ O/L ☐ | | OK ☑ DIFFICULT ☐ | | LEAKING ☐ INOPERABLE ☐ | |
| 3. CHECK BARREL FOR WATER | WET ☐ DRY ☑ | AMT. OF WATER | | | | |
| 4. CHECK CAP GASKETS | OK ☑ | | | | REPLACED ☐ | |
| 5. CHECK NOZZLES & THREADS | O/K ☑ LEAKING ☐ | | R/S ☑ LEADED ☐ | | LOOSE ☐ DAMAGED ☐ | |
| 6. LUBRICATE HYDRANT | YES ☑ | | | | NOT REQUIRED ☐ | |
| 7. LUBE SCREW | OK ☑ | | MISSING ☐ | | REPLACED ☐ | |
| 8. FLOW TEST | 26 | PITOT | 948 | | USGPM | |
| 9. PRESSURE TEST @ | 50 PSIG | | PASSED ☐ | | FAILED ☐ | |
| 10. COLOUR CODED | YES ☐ NO ☑ | COLOUR | | | | |
| 11. HYDRANT PAINTED | YES ☐ NO ☑ | COLOUR | | | | |
| 12. HYDRANT PUMPED OUT | YES ☐ N/A ☑ | | | | NO ☐ | |
| 13. GROUND FLANGE | SAFETY ☐ SOLID ☑ | | BURIED ☐ N/A ☐ | | LEAKING ☐ DAMAGED ☐ | |
| 14. REQUIRES BARREL EXTENTION | | | | | N/A ☐ | |
| 15. PUMPER NOZZLE | YES ☐ NO ☑ | | | | TYPE | |
| 16. NOZZLE ORIENTATION | OK ☑ | | | | IMPROPER ☐ | |
| 17. TRAFFIC BOLLARDS | OK ☐ DAMAGED ☐ | | N/A ☑ | | TCC CLOSE ☐ | |

SERVICED BY:

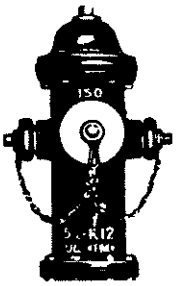
CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 20. BONNET | OK ☐ | | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 58. OTHER | OK ☐ | | | |
| 59. OTHER | OK ☐ | | | |
| 60. OTHER | OK ☐ | | | |
| 61. OTHER | OK ☐ | | | |
| 62. OTHER | OK ☐ | | | |
| 63. OTHER | OK ☐ | | | |

HYDRANT OPERATION SATISFACTORY ☑
HYDRANT OPERATION DEFICIENCY ☐



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


20

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: East of New Zion Holdin
HYDRANT MAKE: AVK
DATE: Dec 23/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE ____ LOCATED — OK ☐ NOT VISIBLE ☑ — CLOSED ☐ INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☐ O/L ☐ — OK ☑ DIFFICULT ☐ — LEAKING ☐ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — OK ☑ LEAKING ☐ — R/S ☑ LEADED ☐ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST 22 PITOT 87.2 USGPM
9. PRESSURE TEST @ 55 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☑ SOLID ☐ — BURIED ☐ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☑ NO ☐ — TYPE ST
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

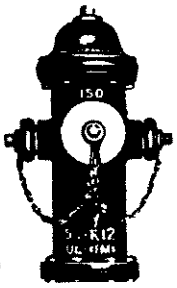
CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. [illegible] | OK ☐ | | |
| 59. [illegible] | OK ☐ | | |
| 60. [illegible] | OK ☐ | | |
| 61. [illegible] | OK ☐ | | |
| 62. [illegible] | OK ☐ | | |
| 63. [illegible] | OK ☐ | | |

HYDRANT OPERATION SATISFACTORY
HYDRANT OPERATION DEFICIENCY



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


(21)

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: Old Matagaska Restaur
HYDRANT MAKE: M67
DATE: Dec 23/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — 4" South — LOCATED ☐ NOT VISIBLE ☐ — OK ☑ — CLOSED ☐ INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ O/L ☐ — OK ☑ DIFFICULT ☐ — LEAKING ☐ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — O/K ☐ LEAKING ☐ — R/S ☑ LEADED ☐ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST 14 — PITOT 69lo — USGPM
9. PRESSURE TEST @ 46 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☐ BOLID ☑ — BURIED ☐ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ NO ☑ — TYPE ____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 20. BONNET | OK ☐ | | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 58. OTHER | OK ☐ | | | ☐ |
| 59. OTHER | OK ☐ | | | ☐ |
| 60. OTHER | OK ☐ | | | ☐ |
| 61. OTHER | OK ☐ | | | ☐ |
| 62. OTHER | OK ☐ | | | ☐ |
| 63. OTHER | OK ☐ | | | ☐ |

HYDRANT OPERATION SATISFACTORY ☑
HYDRANT OPERATION DEFICIENCY ☐

# A-1 HYDRANT SERVICES LTD.

550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493

22

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: North American Domain
HYDRANT MAKE: Mc7
DATE: Dec 23/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — 4' north — LOCATED — OK ☑ — NOT VISIBLE ☐ — CLOSED ☐ — INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ — O/L ☐ — OK ☑ — DIFFICULT ☐ — LEAKING ☐ — INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ — DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — O/K ☑ — LEAKING ☐ — P/S ☑ — LEADED ☐ — LOOSE ☐ — DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST — 12 — PITOT — 64 — USGPM
9. PRESSURE TEST @ 93 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ — NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ — NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ — N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☐ — SOLID ☐ — BURIED ☑ — N/A ☐ — LEAKING ☐ — DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ — NO ☑ — TYPE ____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ — DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

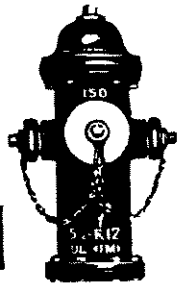
CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 20. BONNET | OK ☐ | | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 36. LOWER ROD NUT(S) | OK ☐ | | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | | REPLACED ☐ |
| 50 UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 58. | OK ☐ | | | ☐ |
| 59. | OK ☐ | | | ☐ |
| 60. | OK ☐ | | | ☐ |
| 61. | OK ☐ | | | ☐ |
| 62. | OK ☐ | | | ☐ |
| 63. | OK ☐ | | | ☐ |

HYDRANT OPERATION SATISFACTORY ☑
HYDRANT OPERATION DEFICIENCY ☐



# A-1 HYDRANT SERVICES LTD.

550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493

23

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: New Savana Restaura
HYDRANT MAKE: AVK
DATE: Dec 23/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE ____ LOCATED — OK ☐ NOT VISIBLE ☑ — CLOSED ☐ INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ O/L ☐ — OK ☑ DIFFICULT ☐ — LEAKING ☐ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — OK ☑ LEAKING ☐ — R/S ☑ LEADED ☐ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☐ — MISSING ☐ — REPLACED ☐
8. FLOW TEST 20 PITOT 83.2 USGPM
9. PRESSURE TEST @ 38 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☑ SOLID ☐ — BURIED ☐ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☑ NO ☐ — TYPE ST
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | |
|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. OTHER | OK ☐ | | ☐ |
| 59. OTHER | OK ☐ | | ☐ |
| 60. OTHER | OK ☐ | | ☐ |
| 61. OTHER | OK ☐ | | ☐ |
| 62. OTHER | OK ☐ | | ☐ |
| 63. OTHER | OK ☐ | | ☐ |

HYDRANT OPERATION SATISFACTORY ☑
HYDRANT OPERATION DEFICIENCY ☐

# A-1 HYDRANT SERVICES LTD.

550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493

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CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: North of Cheetah Building
HYDRANT MAKE: AVK
DATE: Dec 23 98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE ____ LOCATED — OK ☐ NOT VISIBLE ☑ — CLOSED ☐ INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ O/L ☐ — OK ☑ DIFFICULT ☐ — LEAKING ☐ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — O/K ☑ LEAKING ☐ — R/S ☑ LEADED ☐ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST 14 — PITOT 69lb — USGPM
9. PRESSURE TEST @ 34 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☑ SOLID ☐ — BURIED ☐ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☑ NO ☐ — TYPE ST
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

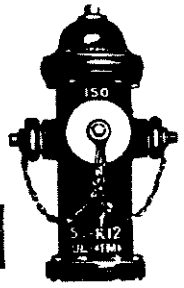
CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | |
|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. | OK ☐ | | ☐ |
| 59. | OK ☐ | | ☐ |
| 60. | OK ☐ | | ☐ |
| 61. | OK ☐ | | ☐ |
| 62. | OK ☐ | | ☐ |
| 63. | OK ☐ | | ☐ |

HYDRANT OPERATION SATISFACTORY ☐
HYDRANT OPERATION DEFICIENCY ☐



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493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CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 3611 Old Finch Ave Scarborough

HYDRANT LOCATION: East of African Pavilion
HYDRANT MAKE: Century
DATE: Dec 23/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE ____ LOCATED — OK ☐ NOT VISIBLE ☑ — CLOSED ☐ INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ O/L ☐ — OK ☑ DIFFICULT ☐ — LEAKING ☐ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — OK ☑ LEAKING ☐ — R/S ☑ LEADED ☐ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST 18 — PITOT 789 — USGPM
9. PRESSURE TEST @ 32 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☑ — NO ☐
13. GROUND FLANGE — BAFETY ☐ SOLID ☐ — BURIED ☑ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ NO ☑ — TYPE ____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

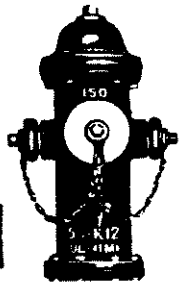
CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | |
|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50 UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. OTHER | OK ☐ | | ☐ |
| 59. OTHER | OK ☐ | | ☐ |
| 60. OTHER | OK ☐ | | ☐ |
| 61. OTHER | OK ☐ | | ☐ |
| 62. OTHER | OK ☐ | | ☐ |
| 63. OTHER | OK ☐ | | ☐ |

HYDRANT OPERATION SATISFACTORY ☑
HYDRANT OPERATION DEFICIENCY ☐



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


26

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: East of Society
HYDRANT MAKE: Mueller
DATE: Dec 23/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

| | | | | |
|---|---|---|---|---|
| 1. SECONDARY VALVE | 3 West LOCATED | OK ☑ | CLOSED ☐ | |
| | | NOT VISIBLE ☐ | INOPERABLE ☑ | |
| 2. HYDRANT OPERATION | O/R ☑ | OK ☑ | LEAKING ☐ | |
| | O/L ☐ | DIFFICULT ☐ | INOPERABLE ☐ | |
| 3. CHECK BARREL FOR WATER | WET ☐ | AMT. OF WATER ____ | | |
| | DRY ☑ | | | |
| 4. CHECK CAP GASKETS | OK ☑ | | REPLACED ☐ | |
| 5. CHECK NOZZLES & THREADS | O/K ☑ | R/S ☑ | LOOSE ☐ | |
| | LEAKING ☐ | LEADED ☐ | DAMAGED ☐ | |
| 6. LUBRICATE HYDRANT | YES ☑ | | NOT REQUIRED ☐ | |
| 7. LUBE SCREW | OK ☑ | MISSING ☐ | REPLACED ☐ | |
| 8. FLOW TEST | Flushed | PITOT ____ | USGPM | |
| 9. PRESSURE TEST @ 120 PSIG | | PASSED ☑ | FAILED ☐ | |
| 10. COLOUR CODED | YES ☐ | COLOUR ____ | | |
| | NO ☑ | | | |
| 11. HYDRANT PAINTED | YES ☐ | COLOUR ____ | | |
| | NO ☑ | | | |
| 12. HYDRANT PUMPED OUT | YES ☐ | | NO ☐ | |
| | N/A ☑ | | | |
| 13. GROUND FLANGE | SAFETY ☑ | BURIED ☐ | LEAKING ☐ | |
| | SOLID ☐ | N/A ☐ | DAMAGED ☐ | |
| 14. REQUIRES BARREL EXTENTION ____ | | | N/A ☐ | |
| 15. PUMPER NOZZLE | YES ☐ | | TYPE ____ | |
| | NO ☑ | | | |
| 16. NOZZLE ORIENTATION | OK ☑ | | IMPROPER ☐ | |
| 17. TRAFFIC BOLLARDS | OK ☐ | N/A ☑ | TOO CLOSE ☐ | |
| | DAMAGED ☐ | | | |

SERVICED BY: [signature]

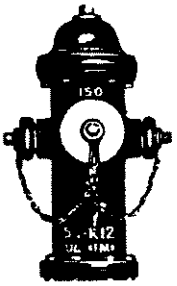
CUSTOMER REPRESENTATIVE:

COMMENTS: Hydrant unable to flow test due to walkways. Secondary inoperable due to valve box full of dirt.

## ADDITIONAL WORK

| | | | |
|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PINPLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. OTHER | OK ☐ | | ☐ |
| 59. OTHER | OK ☐ | | ☐ |
| 60. OTHER | OK ☐ | | ☐ |
| 61. OTHER | OK ☐ | | ☐ |
| 62. OTHER | OK ☐ | | ☐ |
| 63. OTHER | OK ☐ | | ☐ |

HYDRANT OPERATION SATISFACTORY
HYDRANT OPERATION DEFICIENCY



# A-1 HYDRANT SERVICES LTD.


550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493


27

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION: South of Society
HYDRANT MAKE: Mueller
DATE: Dec 23/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE ____ LOCATED — OK ☐ NOT VISIBLE ☑ — CLOSED ☐ INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ O/L ☐ — OK ☑ DIFFICULT ☐ — LEAKING ☐ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — OK ☑ LEAKING ☐ — R/S ☑ LEADED ☐ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST 54 — PITOT 1367 — USGPM
9. PRESSURE TEST @ 58 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☑ SOLID ☐ — BURIED ☐ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ NO ☑ — TYPE ____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☑ DAMAGED ☐ — N/A ☐ — TOO CLOSE ☐

SERVICED BY: [signature]

CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 20. BONNET | OK ☐ | | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | | REPLACED ☐ |
| 58. OTHER | OK ☐ | | | |
| 59. OTHER | OK ☐ | | | |
| 60. OTHER | OK ☐ | | | |
| 61. OTHER | OK ☐ | | | |
| 62. OTHER | OK ☐ | | | |
| 63. OTHER | OK ☐ | | | |

HYDRANT OPERATION SATISFACTORY ☑
HYDRANT OPERATION DEFICIENCY ☐

# A-1 HYDRANT SERVICES LTD.

550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493

28

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave Scarborough

HYDRANT LOCATION:
HYDRANT MAKE: Mc7
DATE: Dec 23/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — LOCATED: N/VE ☐ NOT VISIBLE ☐ — OK ☑ — CLOSED ☐ INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ O/L ☐ — OK ☑ DIFFICULT ☐ — LEAKING ☐ INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — OK ☑ LEAKING ☐ — R/S ☑ LEADED ☐ — LOOSE ☐ DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST — Elevated — PITOT ____ USGPM
9. PRESSURE TEST @ 60 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☐ SOLID ☐ — BURIED ☑ N/A ☐ — LEAKING ☐ DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ NO ☑ — TYPE ____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

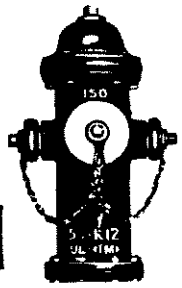
CUSTOMER REPRESENTATIVE:

COMMENTS: Hydrant unable to flow test due temperature & bath-ways

## ADDITIONAL WORK

| | | | | |
|---|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. OTHER | OK ☐ | | ☐ |
| 59. OTHER | OK ☐ | | ☐ |
| 60. OTHER | OK ☐ | | ☐ |
| 61. OTHER | OK ☐ | | ☐ |
| 62. OTHER | OK ☐ | | ☐ |
| 63. OTHER | OK ☐ | | ☐ |

HYDRANT OPERATION SATISFACTORY ☐
HYDRANT OPERATION DEFICIENCY ☐



# A-1 HYDRANT SERVICES LTD.

550 Coronation Dr., Unit # 18
Scarborough, On. M1E 4V1
(416) 282-1665
1-888-349-2493

29

CUSTOMER NAME: Toronto Metro Zoo
SERVICE ADDRESS: 361A Old Finch Ave, Scarborough

HYDRANT LOCATION: West of Parrot Cage
HYDRANT MAKE: M67
DATE: Dec 23/98

## ANNUAL PREVENTATIVE MAINTENANCE (APM)

1. SECONDARY VALVE — LOCATED ☐ — OK ☐ / NOT VISIBLE ☑ — CLOSED ☐ / INOPERABLE ☐
2. HYDRANT OPERATION — O/R ☑ / O/L ☐ — OK ☑ / DIFFICULT ☐ — LEAKING ☐ / INOPERABLE ☐
3. CHECK BARREL FOR WATER — WET ☐ / DRY ☑ — AMT. OF WATER ____
4. CHECK CAP GASKETS — OK ☑ — REPLACED ☐
5. CHECK NOZZLES & THREADS — O/K ☑ / LEAKING ☐ — R/S ☑ / LEADED ☐ — LOOSE ☐ / DAMAGED ☐
6. LUBRICATE HYDRANT — YES ☑ — NOT REQUIRED ☐
7. LUBE SCREW — OK ☑ — MISSING ☐ — REPLACED ☐
8. FLOW TEST 30 PITOT 10/9 USGPM
9. PRESSURE TEST @ 44 PSIG — PASSED ☑ — FAILED ☐
10. COLOUR CODED — YES ☐ / NO ☑ — COLOUR ____
11. HYDRANT PAINTED — YES ☐ / NO ☑ — COLOUR ____
12. HYDRANT PUMPED OUT — YES ☐ / N/A ☑ — NO ☐
13. GROUND FLANGE — SAFETY ☐ / SOLID ☐ — BURIED ☑ / N/A ☐ — LEAKING ☐ / DAMAGED ☐
14. REQUIRES BARREL EXTENTION ____ — N/A ☐
15. PUMPER NOZZLE — YES ☐ / NO ☑ — TYPE ____
16. NOZZLE ORIENTATION — OK ☑ — IMPROPER ☐
17. TRAFFIC BOLLARDS — OK ☐ / DAMAGED ☐ — N/A ☑ — TOO CLOSE ☐

SERVICED BY: [signature]

CUSTOMER REPRESENTATIVE:

COMMENTS:

## ADDITIONAL WORK

| | | | |
|---|---|---|---|
| 18. BONNET COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 19. BONNET BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 20. BONNET | OK ☐ | | REPLACED ☐ |
| 21. BONNET SEAL | OK ☐ | | REPLACED ☐ |
| 22. OPERATING NUT | OK ☐ | | REPLACED ☐ |
| 23. OPERATING NUT O-RING(S) | OK ☐ | N/A ☐ | REPACK ☐ |
| 24. STUFFING BOX | OK ☐ | N/A ☐ | REPLACED ☐ |
| 25. THRUST BEARING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 26. BEARING HOUSING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 27. BEARING HOUSING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 28. HOUSING COVER | OK ☐ | N/A ☐ | REPLACED ☐ |
| 29. HOUSING COVER BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 30. BEARING HOUSING SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 31. UPPER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 32. LOWER OPERATING ROD | OK ☐ | | REPLACED ☐ |
| 33. ROD COUPLING | OK ☐ | N/A ☐ | REPLACED ☐ |
| 34. COUPLING BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 35. LOWER ROD NUT(S) | OK ☐ | | REPLACED ☐ |
| 36. LOWER ROD STOP PIN/PLATE | OK ☐ | N/A ☐ | REPLACED ☐ |
| 37. VALVE BALL SEAL(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 38. VALVE BALL BOTTOM | OK ☐ | | REPLACED ☐ |
| 39. VALVE BALL RUBBER | OK ☐ | | REPLACED ☐ |
| 40. VALVE BALL TOP | OK ☐ | N/A ☐ | REPLACED ☐ |
| 41. MAIN VALVE SEAT | OK ☐ | | REPLACED ☐ |
| 42. MAIN VALVE SEAT SEAL(S) | OK ☐ | | REPLACED ☐ |
| 43. DRAIN VALVE | OK ☐ | | REPLACED ☐ |
| 44. DRAIN VALVE SEAL(S) | OK ☐ | | REPLACED ☐ |
| 45. DRAIN VALVE PORT(S) | OK ☐ | CLEARED ☐ | REPLACED ☐ |
| 46. DRAIN VALVE COTTER PIN(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 47. LOWER BARREL | OK ☐ | | REPLACED ☐ |
| 48. LOWER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 49. UPPER BARREL | OK ☐ | | REPLACED ☐ |
| 50. UPPER BARREL FLANGE(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 51. BARREL EXTENTION(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 52. FLANGE GASKET(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 53. FLANGE BOLTS | OK ☐ | N/A ☐ | REPLACED ☐ |
| 54. BOOT | OK ☐ | N/A ☐ | REPLACED ☐ |
| 55. NOZZLE(S) | OK ☐ | RECAULKED ☐ | REPLACED ☐ |
| 56. NOZZLE CAP(S) | OK ☐ | | REPLACED ☐ |
| 57. NOZZLE RETAINER(S) | OK ☐ | N/A ☐ | REPLACED ☐ |
| 58. OTHER | OK ☐ | | ☐ |
| 59. OTHER | OK ☐ | | ☐ |
| 60. OTHER | OK ☐ | | ☐ |
| 61. OTHER | OK ☐ | | ☐ |
| 62. OTHER | OK ☐ | | ☐ |
| 63. OTHER | OK ☐ | | ☐ |

A-1 HYDRANT SERVICES LTD.
550 Coronation Dr., Unit #18
Scarborough, Ont. M1E 4V1
282-1665

SITE NAME Toronto Metro Zoo DATE Dec 21/98

LOCATION 361A Old Finch Ave

TEST DATA

TIME OF TEST 10:15 am

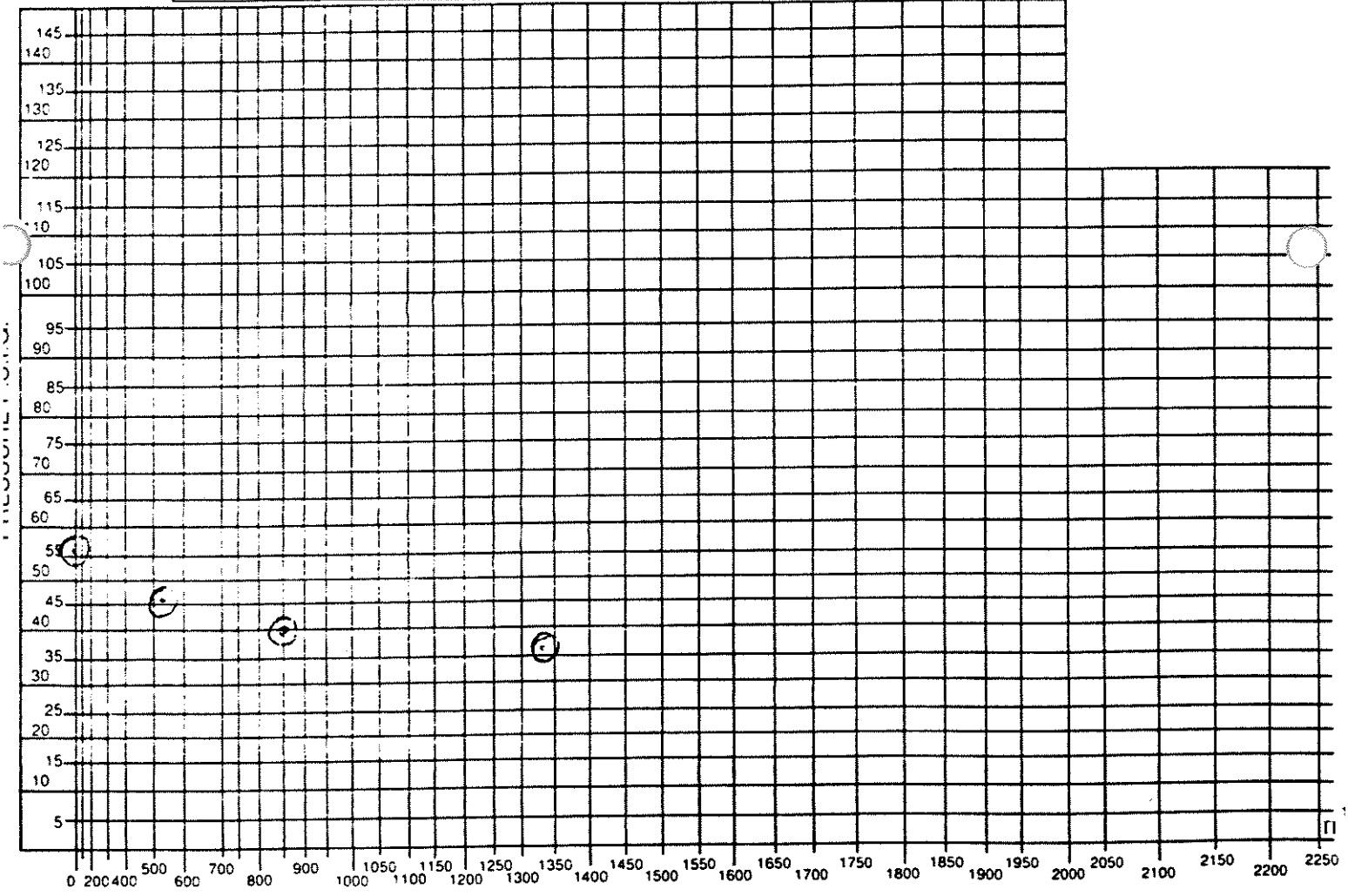
LOCATION OF TEST: (FLOW) Hydrant (Australasia McDonalds) #14

(RESIDUAL) Hydrant (north end of Australasia Building) #1

MAIN SIZE 4" & 8" inch

STATIC PRESSURE 56 psi

| | NUMBER OF OUTLETS & ORIFICE SIZE | PITOT PRESSURE | FLOW (U.S.G.P.M.) | RESIDUAL PRESSURE |
|---|---|---|---|---|
| #1 | 1 X 1 3/4" | 41 | 525 | 46 |
| #2 | 1 X 2 1/2" | 26 | 852 | 40 |
| #3 | 2 X 2 1/2" | 16 | 1336 | 36 |
| #4 | | | | |




COMMENTS FLOW TEST - BCUK

Authorized Signature _____ A-1 HYDRANT Signature _____

A-1 HYDRANT SERVICES LTD.
550 Coronation Dr., Unit #18
Scarborough, Ont. M1E 4V1
282-1665

SITE NAME Toronto Metro Zoo DATE Dec 21/98

LOCATION 3161A Old Finch Ave

TEST DATA

TIME OF TEST 9:00 am

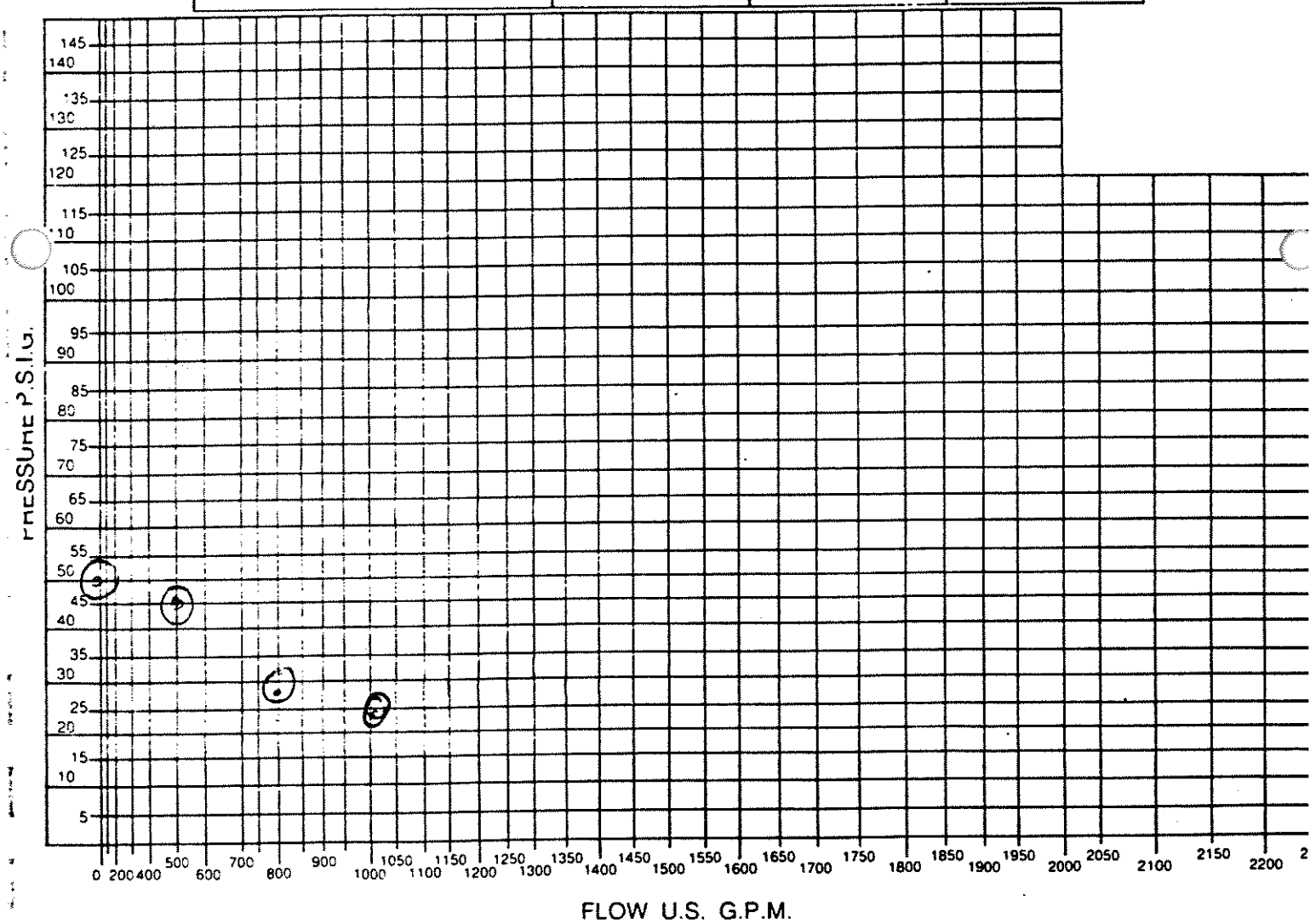
LOCATION OF TEST: (FLOW) Hydrant (East side of garage) #18

(RESIDUAL) Hydrant (West end of north service) #19

MAIN SIZE 6" inch

STATIC PRESSURE 50 psi

| | NUMBER OF OUTLETS & ORIFICE SIZE | PITOT PRESSURE | FLOW (U.S.G.P.M.) | RESIDUAL PRESSURE |
|---|---|---|---|---|
| #1 | 1 x 1 3/4" | 40 | 518 | 45 |
| #2 | 1 x 2 1/2" | 23 | 800 | 28 |
| #3 | 2 x 2 1/2" | 11 | 1108 | 25 |
| #4 | | | | |




COMMENTS Flow test - Green

Authorized Signature _____ A-1 HYDRANT Signature

A-1 HYDRANT SERVICES LTD.
550 Coronation Dr., Unit #18
Scarborough, Ont. M1E 4V1
282-1665

SITE NAME Toronto Metro Zoo DATE Dec 21/98

LOCATION 361A Old Finch Ave

TEST DATA

TIME OF TEST 11:00am

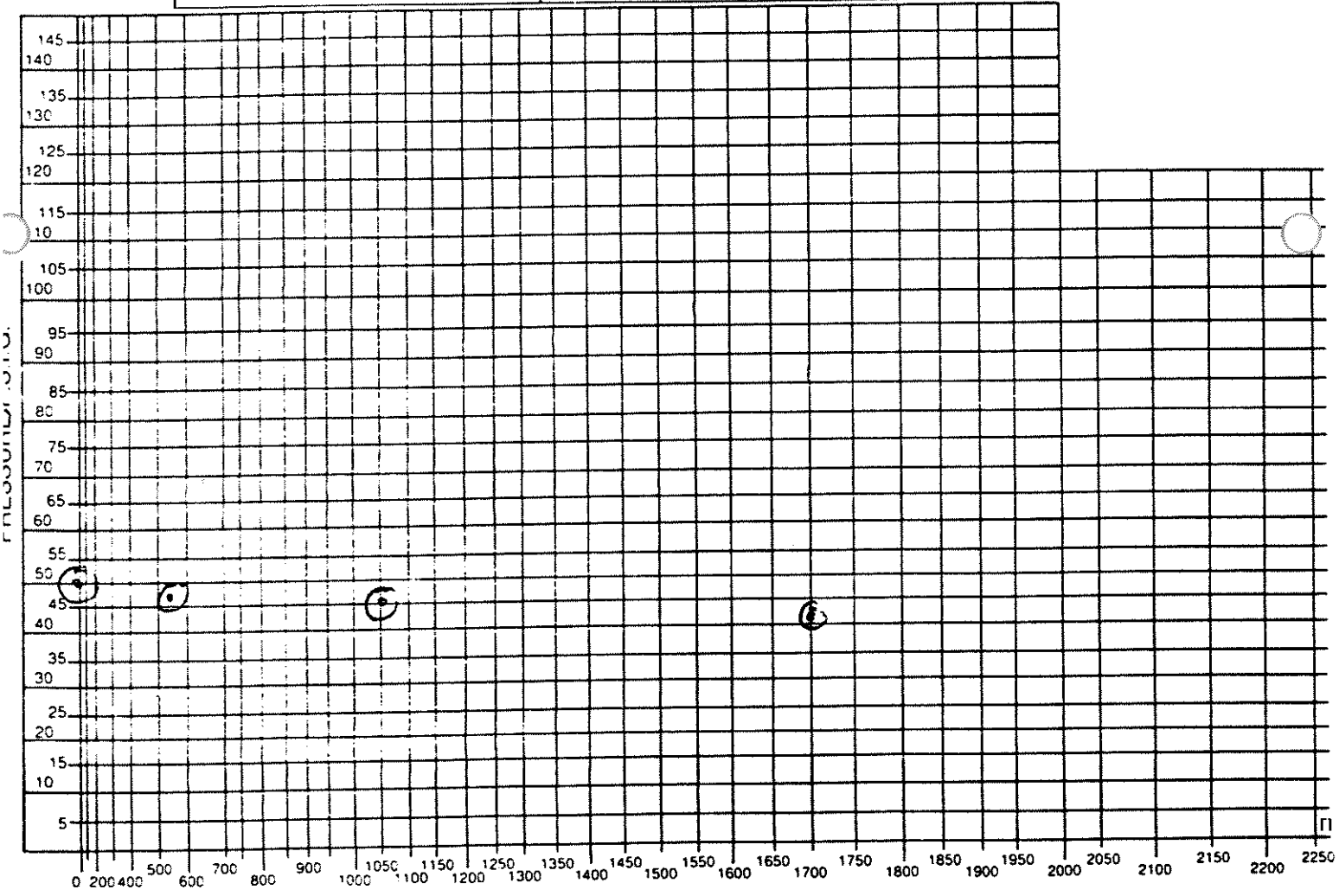
LOCATION OF TEST (FLOW) Hydrant (N/E of Special Events Tent) #12

(RESIDUAL) 3/4 hose bib (Siberian Tiger building) ✓

MAIN SIZE 4" inch

STATIC PRESSURE 50 psi

| | NUMBER OF OUTLETS & ORIFICE SIZE | PITOT PRESSURE | FLOW (U.S G P M) | RESIDUAL PRESSURE |
|---|---|---|---|---|
| #1 | 1 X 1 3/4" | 44 | 1744 | 47 |
| #2 | 1 X 2 1/2" | 40 | 1056 | 45 |
| #3 | 2 X 2 1/2" | 26 | 1703 | 42 |
| #4 | | | | |




FLOW U.S. G.P.M.

COMMENTS FLOW TEST - BLUE.

Authorized Signature _____ A-1 HYDRANT Signature _____

A-1 HYDRANT SERVICES LTD.

550 Coronation Dr., Unit #18
Scarborough, Ont. M1E 4V1
282-1665

SITE NAME: Toronto Metro Zoo DATE: Dec 21/98

LOCATION: 361A Old Finch Ave

TEST DATA

TIME OF TEST: 11:30 am

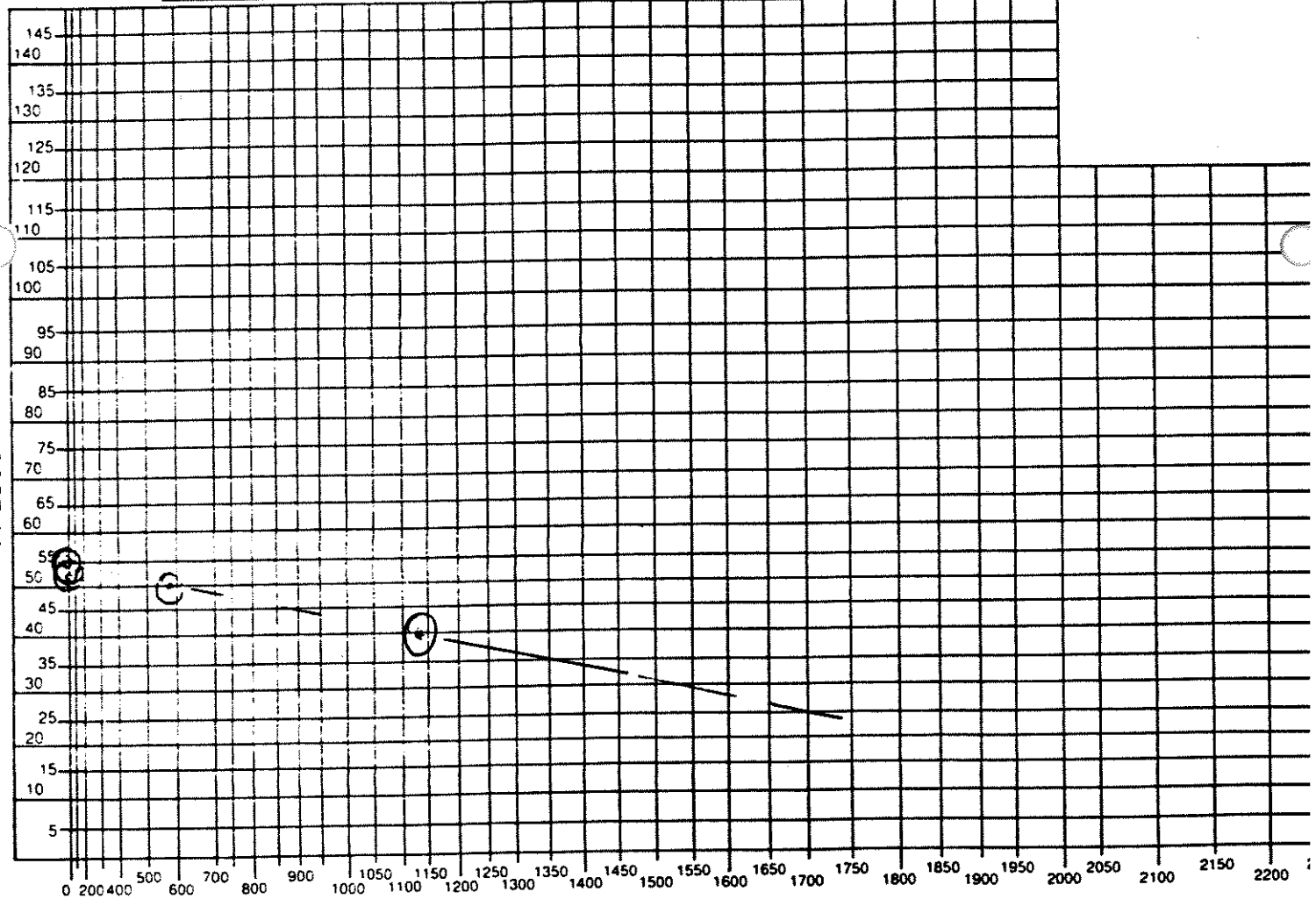
LOCATION OF TEST: (FLOW) Hydrant (West of ~~American~~ North American Mc Donald's) #10

(RESIDUAL) Hydrant (North of North American Pavillion) #11

MAIN SIZE: 8" inch

STATIC PRESSURE: 55 psi

| | NUMBER OF OUTLETS & ORIFICE SIZE | PITOT PRESSURE | FLOW (U.S.G.P.M.) | RESIDUAL PRESSURE |
|---|---|---|---|---|
| #1 | 1 X 1 3/4" | 52 | 591 | 50 |
| #2 | 1 X 2 1/2" | 46 | 1133 | 40 |
| #3 | | | | |
| #4 | | | | |




COMMENTS: Unable to flow 2X2 1/2" inch due to surroundings. - FLOW TEST - Bluff

Authorized Signature _____ A-1 HYDRANT Signature _____

A-1 HYDRANT SERVICES LTD.
550 Coronation Dr., Unit #18
Scarborough, Ont. M1E 4V1
282-1665

SITE NAME Toronto Metro Zoo DATE Dec 21/98

LOCATION 361A Old Finch Ave

TEST DATA

TIME OF TEST 12:00 pm

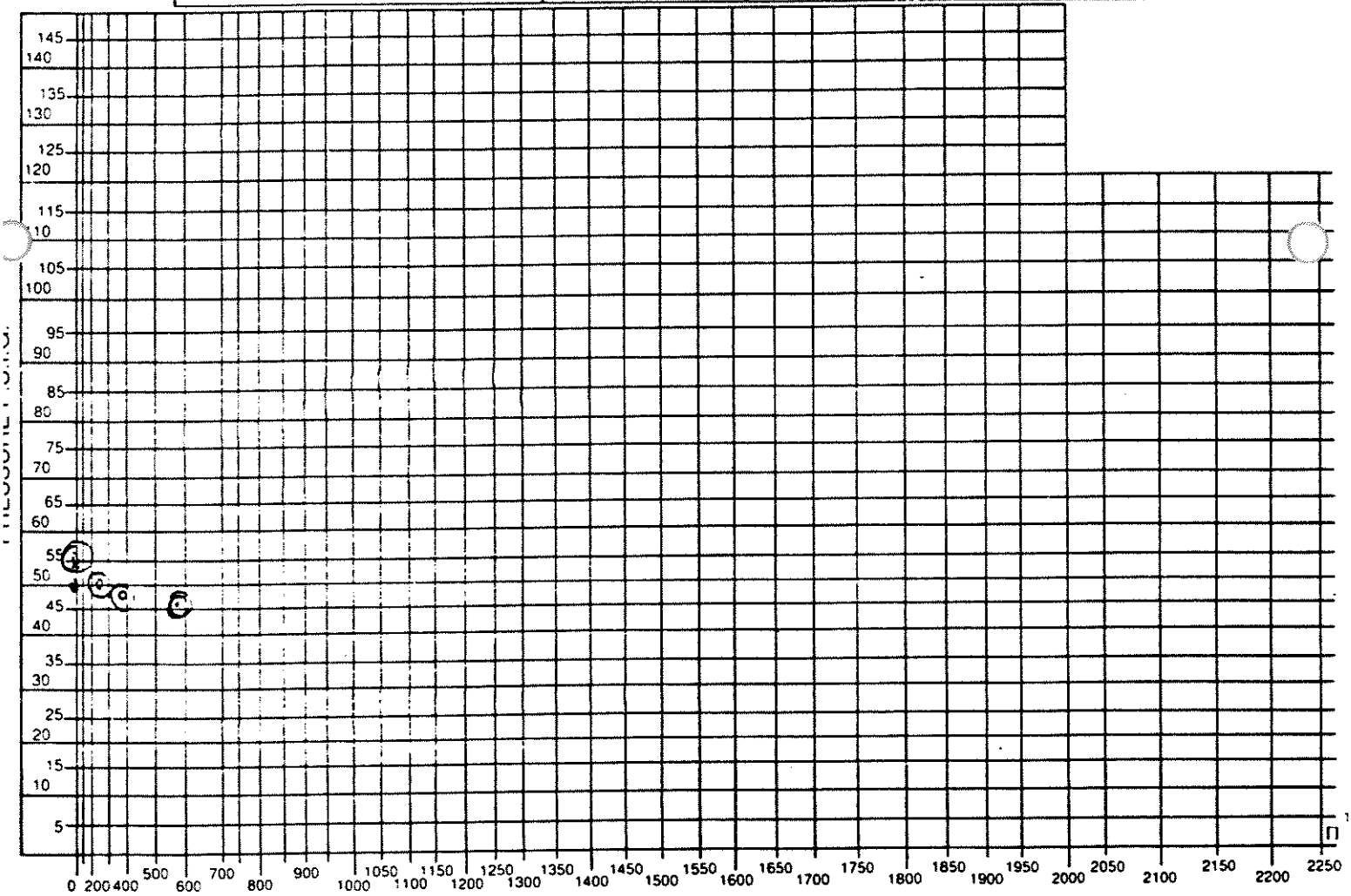
LOCATION OF TEST: (FLOW) Hydrant (Outside holding area) #9

(RESIDUAL) Hydrant (South end of main temple) #8

MAIN SIZE 6" & 4" inch

STATIC PRESSURE 56 psi

| | NUMBER OF OUTLETS & ORIFICE SIZE | PITOT PRESSURE | FLOW (U.S.G.P.M.) | RESIDUAL PRESSURE |
|---|---|---|---|---|
| #1 | 1 X 1 3/4" | 9 | 246 | 50 |
| #2 | 1 X 2 1/2" | 5 | 373 | 48 |
| #3 | 2 X 2 1/2" | 3 | 578 | 46 |
| #4 | | | | |




COMMENTS FLOW TEST - FLOW HYDRANT - RED
RES. HYDRANT - BLUE OR GREEN

Authorized Signature _____ A-1 HYDRANT Signature _____

A-1 HYDRANT SERVICES LTD.

550 Coronation Dr., Unit #18
Scarborough, Ont. M1E 4V1
282-1665

SITE NAME Toronto Metro Zoo DATE: Dec 21/98

LOCATION 361A Old Finch Ave

TEST DATA

TIME OF TEST 1:00 pm

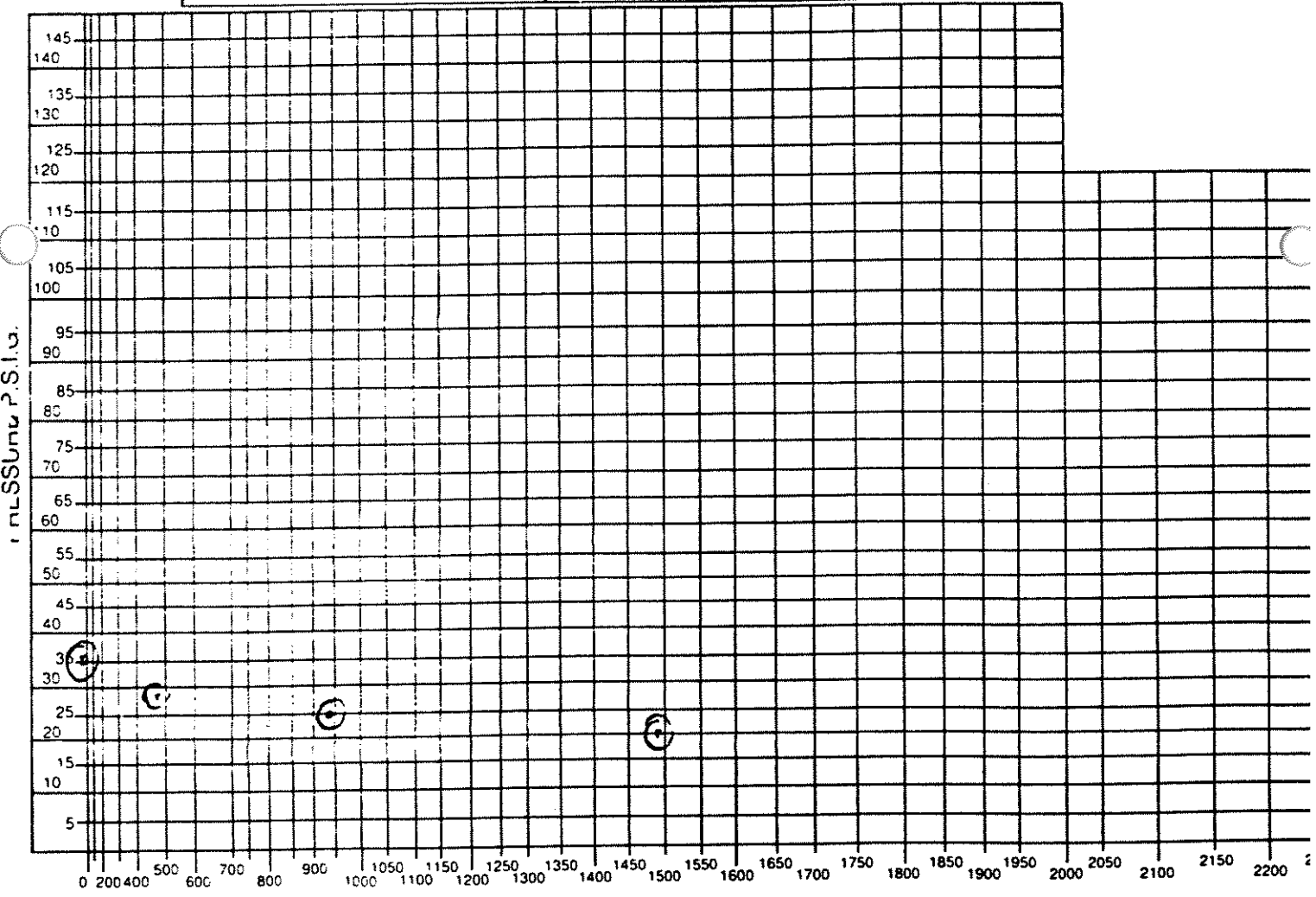
LOCATION OF TEST: (FLOW) Hydrant (n/w of African McDonald's) #7

(RESIDUAL) Hydrant (south of African McDonald's) #6

MAIN SIZE 6 inch

STATIC PRESSURE: 35 psi

| | NUMBER OF OUTLETS & ORIFICE SIZE | PITOT PRESSURE | FLOW (U.S.G.P.M.) | RESIDUAL PRESSURE |
|---|---|---|---|---|
| #1 | 1 X 1 3/4" | 34 | 478 | 28 |
| #2 | 1 X 2 1/2" | 32 | 945 | 25 |
| #3 | 2 X 2 1/2" | 20 | 1494 | 20 |
| #4 | | | | |




COMMENTS Flow Test - Green

Authorized Signature _____ A-1 HYDRANT Signature _____

A-1 HYDRANT SERVICES LTD.
550 Coronation Dr., Unit #18
Scarborough, Ont. M1E 4V1
282-1665

SITE NAME Toronto Metro Zoo DATE Dec 21/98

LOCATION 361A Old Finch Ave

TEST DATA

TIME OF TEST: 1:45 pm

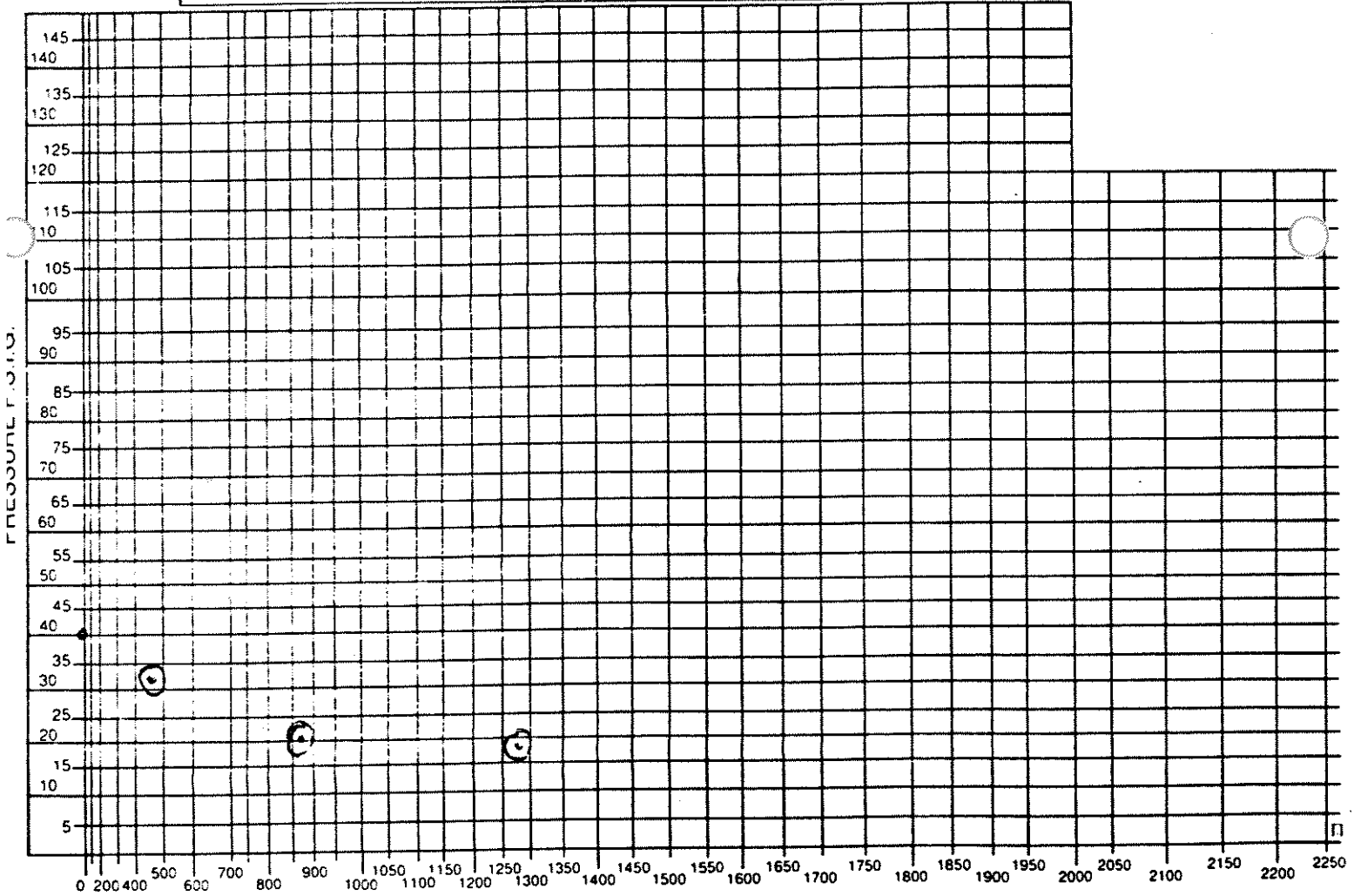
LOCATION OF TEST: (FLOW) Hydrant (Outside gorilla door) #4

(RESIDUAL) Hydrant (West side of African Pavilion) #5

MAIN SIZE 10" inch

STATIC PRESSURE 40

| | NUMBER OF OUTLETS & ORIFICE SIZE | PITOT PRESSURE | FLOW (U.S.G.P.M.) | RESIDUAL PRESSURE |
|---|---|---|---|---|
| #1 | 1 X 1 3/4" | 32 | 463 | 32 |
| #2 | 1 X 2 1/2" | 27 | 868 | 20 |
| #3 | 2 X 2 1/2" | 15 | 1294 | 28 |
| #4 | | | | |




FLOW U.S. G.P.M.

COMMENTS FLOW TEST - ONE GATE / GREEN

Authorized Signature _____ A-1 HYDRANT Signature _____

A-1 HYDRANT SERVICES LTD.
550 Coronation Dr., Unit #18
Scarborough, Ont. M1E 4V1
282-1665

SITE NAME Toronto Metro Zoo DATE Dec 21/98

LOCATION 361A Old Finch Ave

TEST DATA

TIME OF TEST 3:50 pm

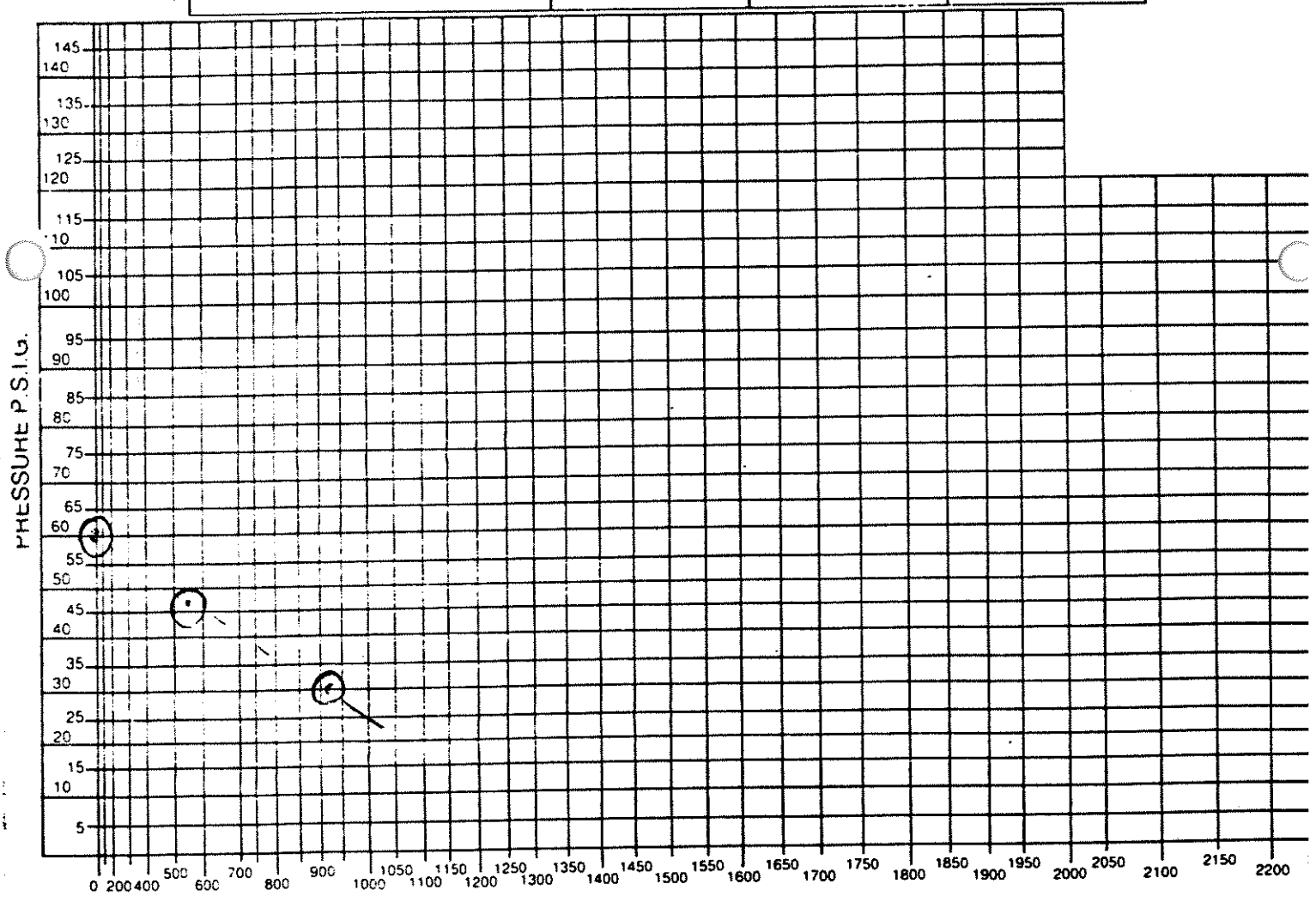
LOCATION OF TEST: (FLOW) Hydrant (West of Indian Rino building) #1

(RESIDUAL) 3/4" hose bib (Inside Indian Rino building) #

MAIN SIZE 6" inch

STATIC PRESSURE 60 psi

| | NUMBER OF OUTLETS & ORIFICE SIZE | PITOT PRESSURE | FLOW (U.S.G.P.M.) | RESIDUAL PRESSURE |
|---|---|---|---|---|
| #1 | 1 X 1 3/4" | 46 | 556 | 47 |
| #2 | 1 X 2 1/2" | 30 | 914 | 30 |
| #3 | | | | |
| #4 | | | | |




COMMENTS FLOW TEST - GREEN

Authorized Signature _____ A-1 HYDRANT Signature

A-1 HYDRANT SERVICES LTD.
550 Coronation Dr., Unit #18
Scarborough, Ont. M1E 4V1
282-1665

SITE NAME Toronto Metro Zoo DATE Dec 23/98

LOCATION 361A Old Finch Ave

TEST DATA

TIME OF TEST 10:30am

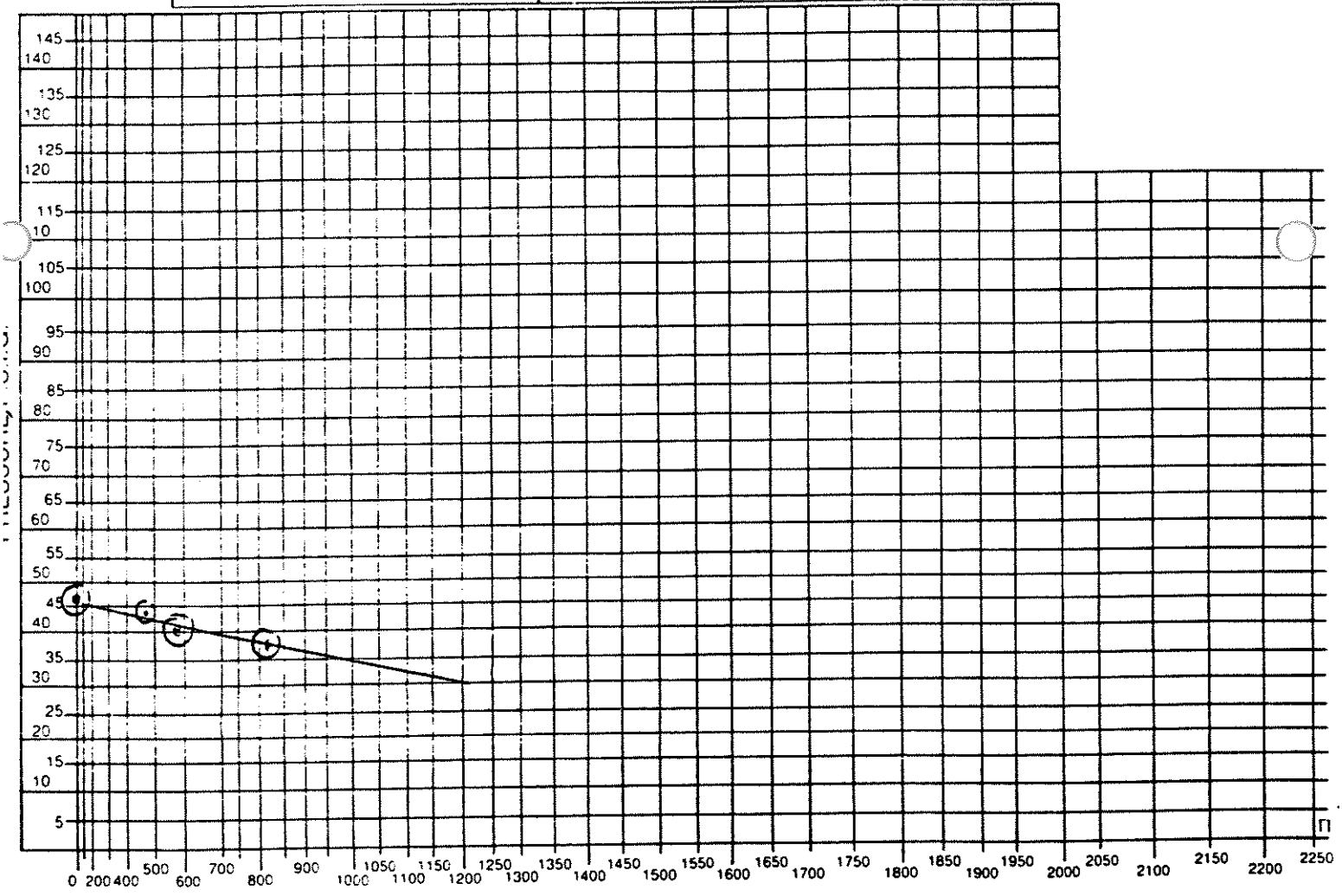
LOCATION OF TEST (FLOW) Hydrant (North American Domain) #22

(RESIDUAL) Hydrant (South of Old Mataqaska Restaurant) #21

MAIN SIZE 4" inch

STATIC PRESSURE 46 psi

| | NUMBER OF OUTLETS & ORIFICE SIZE | PITOT PRESSURE | FLOW (U.S.G.P.M.) | RESIDUAL PRESSURE |
|---|---|---|---|---|
| #1 | 1 X 1 3/4" | 83 | 471 | 44 |
| #2 | 1 X 2 1/2" | 12 | 580 | 40 |
| #3 | 2 X 2 1/2" | 60 | 820 | 38 |
| #4 | | | | |




COMMENTS FLOW TEST - FLOW HYD - ORANGE
RES HYD - GREEN BLUE

Authorized Signature _____ A-1 HYDRANT Signature _____

A-1 HYDRANT SERVICES LTD.
550 Coronation Dr., Unit #18
Scarborough, Ont. M1E 4V1
282-1665

SITE NAME Toronto Metro Zoo DATE Dec 23/98

LOCATION 361A Old Finch Ave

TEST DATA

TIME OF TEST 8:45 a.m.

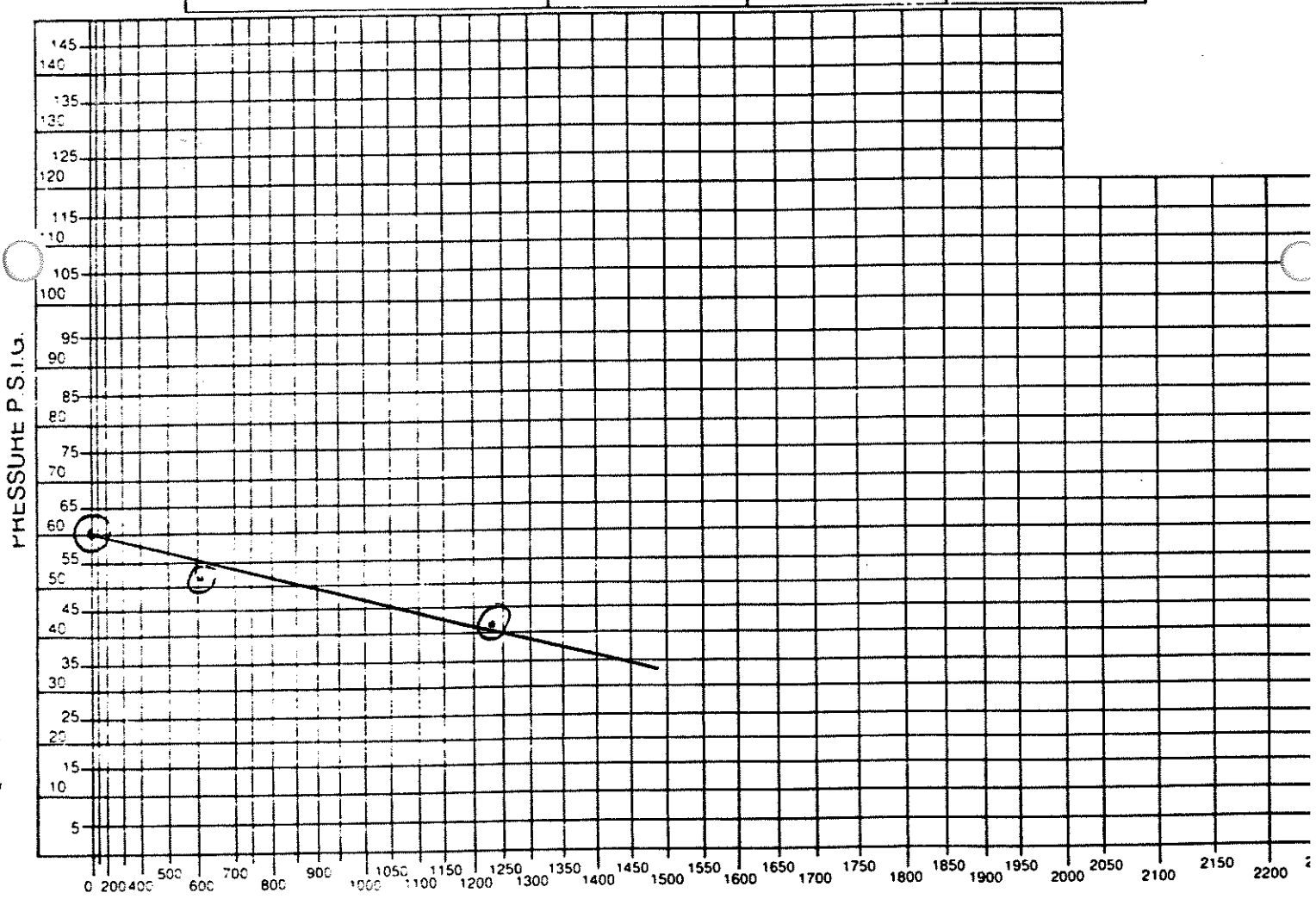
LOCATION OF TEST. (FLOW) Hydrant (East of Society) #26

(RESIDUAL) Hydrant (South of Society) #27

MAIN SIZE 6" inch

STATIC PRESSURE 60 psi

| | NUMBER OF OUTLETS & ORIFICE SIZE | PITOT PRESSURE | FLOW (U.S.G.P.M.) | RESIDUAL PRESSURE |
|---|---|---|---|---|
| #1 | 1 X 1 3/4" | 54 | 602 | 52 |
| #2 | 1 X 2 1/2" | 54 | 1230 | 42 |
| #3 | | | | |
| #4 | | | | |




COMMENTS FLOW TEST — BLUE.

Authorized Signature _____ A-1 HYDRANT Signature _____

A-1 HYDRANT SERVICES LTD.
550 Coronation Dr., Unit #18
Scarborough, Ont. M1E 4V1
282-1665

SITE NAME Toronto Metro Zoo DATE Dec 23/98

LOCATION 361A Old Finch Ave

TEST DATA

TIME OF TEST 10:00am

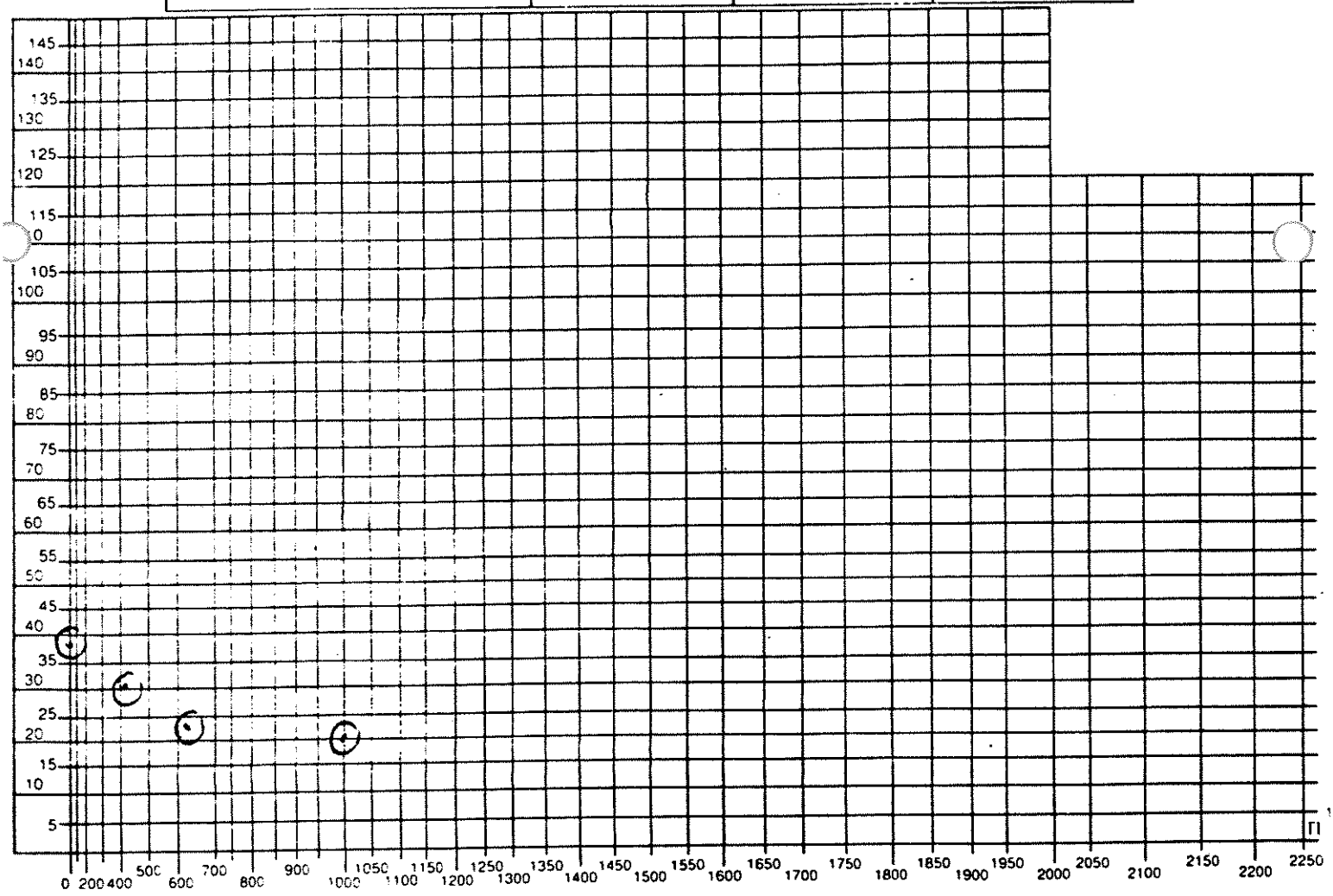
LOCATION OF TEST: (FLOW) Hydrant (North of Cheetah Building) #24

(RESIDUAL) Hydrant (New Lavana Restaurant) #23

MAIN SIZE 4" inch

STATIC PRESSURE 38 psi

| | NUMBER OF OUTLETS & ORIFICE SIZE | PITOT PRESSURE | FLOW (U.S.G.P.M.) | RESIDUAL PRESSURE |
|---|---|---|---|---|
| #1 | 1 X 1¾" | 26 | 417 | 30 |
| #2 | 1 X 2½" | 14 | 626 | 24 |
| #3 | 2 X 2½" | 9 | 1004 | 20 |
| #4 | | | | |




COMMENTS FLOW TEST - FLOW HYD - ORANGE

Authorized Signature _____ A-1 HYDRANT Signature _____

A-1 HYDRANT SERVICES LTD.
550 Coronation Dr., Unit #18
Scarborough, Ont. M1E 4V1
282-1665

SITE NAME Toronto Metro Zoo DATE Dec 21/98

LOCATION 361A Old Finch Ave

TEST DATA

TIME OF TEST 9:20 am

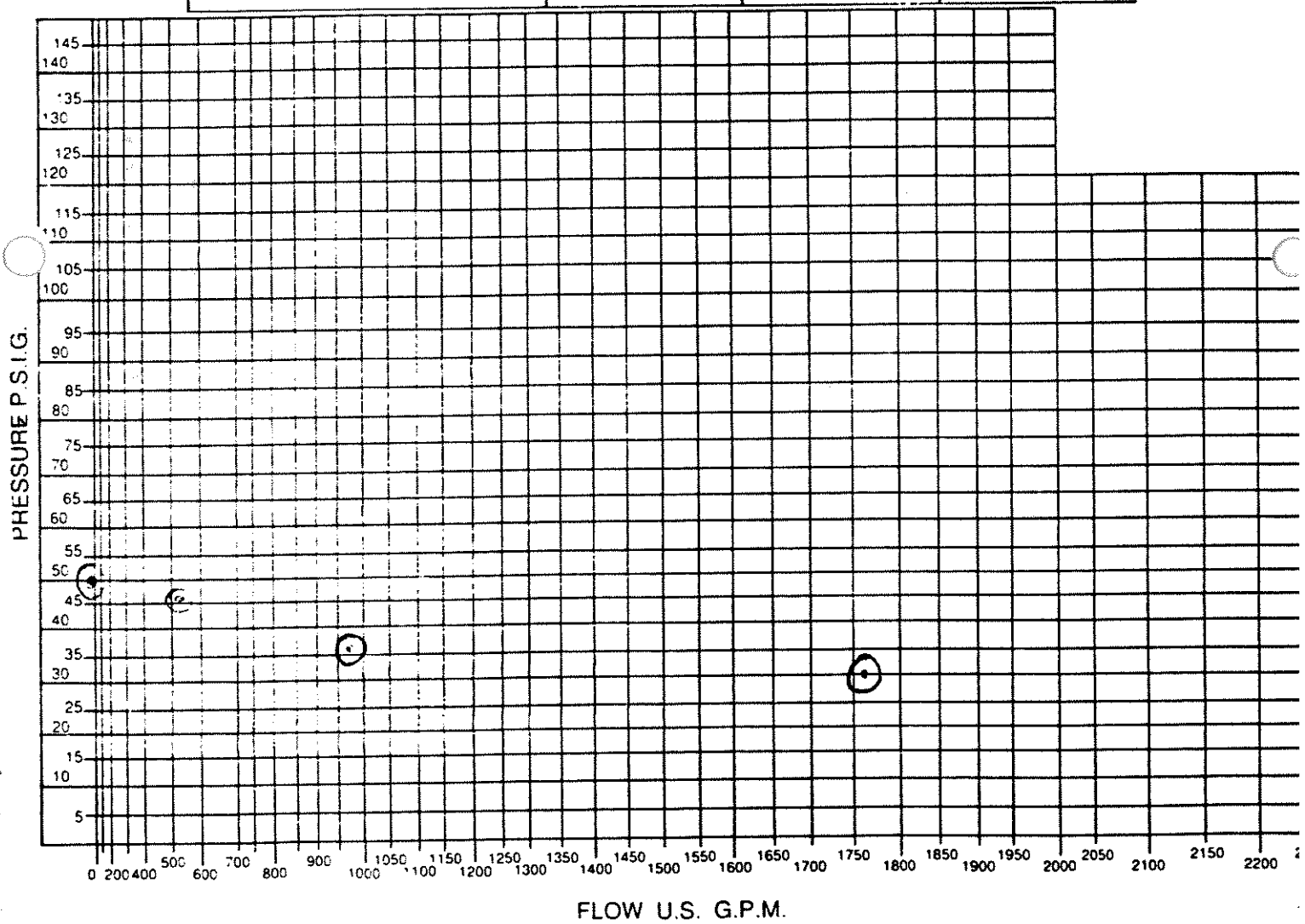
LOCATION OF TEST (FLOW) Hydrant (W/E of north service) #17

(RESIDUAL) Hydrant (S/E of north service) #16

MAIN SIZE 8" inch

STATIC PRESSURE 50 psi

| | NUMBER OF OUTLETS & ORIFICE SIZE | PITOT PRESSURE | FLOW (U.S.G.P.M.) | RESIDUAL PRESSURE |
|---|---|---|---|---|
| #1 | 1 x 1 3/4" | 41 | 525 | 46 |
| #2 | 1 x 2 1/2" | 34 | 974 | 36 |
| #3 | 2 x 2 1/2" | 28 | 1767 | 30 |
| #4 | | | | |




COMMENTS Flow TEST - BLUE

Authorized Signature _____ A-1 HYDRANT Signature

**A-1 HYDRANT SERVICES LTD.**
**550 Coronation Dr., Unit # 18**
**Scarborough, On. M1E 4V1**
**TEL: (416) 282-1665**
**FAX: (416) 282-7702**
**1-888-FIX-A-HYD**

Metro Toronto Zoo c/o
Paradigm Engineering Ltd.
1300 Don Mills Road, Suite 235,
North York, ON
M3B 2W6

Attention: Mr. Doug Shields
416-444-5211
416-444-9222

| | |
|---|---|
| INVOICE#: | H9159-1 |
| DATE: | December 30/98 |
| Customers'#: | D.Shields |
| OUR JOB#: | H9159 |
| G.S.T. #: | R100371152 |
| P.S.T.#: | 85685569 |
| TERMS: | NET 15 DAYS |

| DESCRIPTION | AMOUNT | TOTAL |
|---|---|---|
| LOCATION: Metro Toronto Zoo | | |
| To bill for the following: | | |
| 12 flow tests at $75.00 each | 900.00 | |
| 29 hydrant a.p.m.'s at $40.00 each | 1,160.00 | |
| | 2,060.00 | |
| G.S.T. | 144.20 | |
| TOTAL AMOUNT DUE: | | $ 2,204.20 |

# APPENDIX 8

# GAS TEST RESULTS

# INVOICE

4204

**Trade Gas Services (Toronto) Ltd.**
29 Golden Gate Court
SCARBOROUGH, ONTARIO M1P 3A4

(416) 293-6742 Fax (416) 293-6765
GST #R105339410

TO

PARADIGM ENGINEERING GROUP INC.
1300 Don Mills Road, Suite 235
North York, Ont. M3B 2W6

DATE Jan 5. 1999 JOB NO.
JOB NAME Metro Zoo
JOB LOCATION

| QUANTITY | DESCRIPTION | PRICE | AMOUNT |
|---|---|---|---|
| | Test checked gas supply lines as requested by | | |
| | Paradigm Engineering Group Inc. | | |
| | Indo-Malaya Pavilion #1 Test | | |
| | To determin the static pressure and working pressure | | |
| | at three points (branch lines) of the gas service. | | |
| | 11 M meter with Fisher Type 133L-3 Reg. | | |
| | Max inlet 60 P.S.I. | | |
| | Max outlet 2 P.S.I. | | |
| | 2 - National Champion Furnaces 4,350.000 each. | | |
| | 1 - Pool heater Hayward H-250 250,000 BTU each | | |
| | 1 - DHW Aerco heater 1,000,000 BTU each | | |
| | 1 - Pool heater Hayward H-150 150,000 BTU each | | |
| | Shut off each appliance, shut gas valve at meter | | |
| | and tested pressure + 43 P.S.I. | | |
| | Shut off appliances, shut gas, removed gage and | | |
| | started appliances again. | | |
| | North Main Service Bldg. #2 Test. | | |
| | 7 M meter with Fisher type S203 Reg. 3/4" Orf. | | |
| | 1 - Eng. Air HE40 (Paint Shop) 250,000 BTU each | | |
| | 2 - Teledyne Laars HB-3000 3,000,000 BTU each | | |
| | 2 - Teledyne Laars HB-3500 3,500,000 BTU each | | |
| | 4 - Rheem Ruud RF76-Z50C (DHW) 250,000 BTU each | | |
| | 2 - Rheem Ruud PV40-36M (DHW) 36,000 BTU each | | |
| | Shut off each appliance, shut off gas valve at meter | | |

TERMS:

Cont.....

| | |
|---|---|
| SUBTOTAL | |
| GST | |
| | |
| PST | |
| TOTAL | |

THANK YOU

# INVOICE

**rade Gas Services (Toronto) Ltd.**
29 Golden Gate Court
SCARBOROUGH, ONTARIO M1P 3A4

(416) 293-6742 Fax (416) 293-6765
GST #R105339410

INVOICE # 4204

TO

DATE _____ JOB NO. _____

JOB NAME _____

JOB LOCATION _____

| QUANTITY | DESCRIPTION | PRICE | AMOUNT |
|---|---|---|---|
| | and tested static pressure = 44 P.S.I. | | |
| | Started appliances and tested working pressure = 40 P.S.I. | | |
| | Shut off appliances, shut gas at meter and removed gage. | | |
| | Opened gas at meter and relit pilots. | | |
| | Started appliances up again. | | |
| | | | |
| | Consumers Gas Main Station #3 Test. | | |
| | Removed plug on test point at station. | | |
| | Installed gage and checked pressure = 44 P.S.I. | | |
| | Removed gage and installed plug. | | |

# APPENDIX 9

# WATER TEST RESULTS

# APPENDIX 10

# SANITARY SEWER TEST RESULTS (PRINT)

Trans-Video Inspection Limited
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: NONE GIVEN

DATE: Jan 26 1999
TIME: 09:11:07

| | | | |
|---|---|---|---|
| INSP. BY: | F.H. | REF. AREA: | WO #1685 |
| DISK No: | 01FH | FILE NAME: | TVI91773.RPT |
| TAPE No: | 01FH | TAPE COUNT: | 00:00:00 |
| PIPE SIZE: | 375mm | PIPE TYPE: | SANITARY/AC |
| FLOW DIR: | North | CAMERA DIR: | Against Flow |

| STARTING LOCATION: | ENDING LOCATION: |
|---|---|
| 3RD MH N OF THE INDO PAVILLION | 2ND MH N OF THE INDO PAVILLION |
| PIPE DEPTH:4.0m | PIPE DEPTH:N/A-NO ACCESS |

| STARTING MANHOLE | CAMERA DIRECTION ----> | ENDING MANHOLE |
|---|---|---|
| 03 | TOTAL: 32.0 Metres | 02 |
| | FLOW DIRECTION <---- | |

Summary Comments

LIGHT DEBRIS UNDER THE FLOW.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 03 |
| 1.5 | | Moderate steam hampering inspection |
| 32.0 | | Ending manhole - 02 |
| 32.0 | | End of inspection |

Trans-Video Inspection Limited
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: NONE GIVEN

DATE: Jan 26 1999
TIME: 09:40:11

| | | | |
|---|---|---|---|
| INSP. BY: | F.H. | REF. AREA: | WO #1685 |
| DISK No: | 01FH | FILE NAME: | TVI91774.RPT |
| TAPE No: | 01FH | TAPE COUNT: | 00:02:25 |
| PIPE SIZE: | 375mm | PIPE TYPE: | SANITARY/AC |
| FLOW DIR: | North | CAMERA DIR: | Against Flow |

| STARTING LOCATION: | ENDING LOCATION: |
|---|---|
| 2ND MH N OF THE INDO PAVILLION | 1ST MH N OF THE INDO PAVILLION |
| PIPE DEPTH:N/A-NO ACCESS | PIPE DEPTH:N/A-NO ACCESS |

| STARTING MANHOLE | CAMERA DIRECTION ----> | ENDING MANHOLE |
|---|---|---|
| 02 | TOTAL: 63.5 Metres | 01 |
| | FLOW DIRECTION <---- | |

Summary Comments

EXTRA MH NOT SHOWN ON THE MAP.LIGHT
DEBRIS IN THE LINE.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 02 |
| 0.0 | 7.0 | Light debris in line - Invert |
| 7.0 | | Extra manhole not shown |
| 63.6 | | Ending manhole - 01 |
| 63.5 | | Ending manhole - 01 |
| 63.5 | | End of inspection |

Trans-Video Inspection Limited
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: NONE GIVEN

DATE: Jan 26 1999
TIME: 10:14:35

| | |
|---|---|
| INSP. BY: F.H. | REF. AREA: WO #1685 |
| DISK No: 01FH | FILE NAME: TVI91775.RPT |
| TAPE No: 01FH | TAPE COUNT: 00:06:50 |
| PIPE SIZE: 200mm | PIPE TYPE: SANITARY/AC |
| FLOW DIR: West | CAMERA DIR: Against Flow |

| STARTING LOCATION: | ENDING LOCATION: |
|---|---|
| EAST OF THE OLD ELEPHANT HOUSE | FENCE LINE OF OLD ELELPHNT HOUSE |
| PIPE DEPTH:3.4m | PIPE DEPTH:N/A-NO ACCESS |

CAMERA DIRECTION ---->

| STARTING MANHOLE | TOTAL: 51.0 Metres | ENDING MANHOLE |
|---|---|---|
| 04 | | 05 |

FLOW DIRECTION <----

Summary Comments

LIGHT CALCITE AT A SERVICE CONNECTION.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 04 |
| 3.4 | | Light calcite at service connection - 2 O'clock |
| 51.0 | | Ending manhole - 05 |
| 51.0 | | End of inspection |

Report generated by Ratech Data Tech V Sewer TV Inspection System

Trans-Video Inspection Limited
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: NONE GIVEN

DATE: Jan 26 1999
TIME: 10:36:17

| | | | |
|---|---|---|---|
| INSP. BY: | F.H. | REF. AREA: | WO #1685 |
| DISK No: | 01FH | FILE NAME: | TVI91776.RPT |
| TAPE No: | 01FH | TAPE COUNT: | 00:12:55 |
| PIPE SIZE: | 200mm | PIPE TYPE: | SANITARY/AC |
| FLOW DIR: | West | CAMERA DIR: | Against Flow |

| STARTING LOCATION: | ENDING LOCATION: |
|---|---|
| FENCE LINE OF OLD ELEPHANT HOUSE | ELEPHANT WATERING HOLE |
| PIPE DEPTH:N/A-NO ACCESS | PIPE DEPTH:N/A-NO ACCESS |

CAMERA DIRECTION ---->

| STARTING MANHOLE | TOTAL: 66.0 Metres | ENDING MANHOLE |
|---|---|---|
| 05 | | 06 |

FLOW DIRECTION <----

Summary Comments

THE PIPE APPEARS TO BE IN GOOD CONDITION

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 05 |
| 66.0 | | Ending manhole - 06 |
| 66.0 | | End of inspection |

Trans-Video Inspection Limited
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: NONE GIVEN

DATE: Jan 26 1999
TIME: 10:43:06

| | | | |
|---|---|---|---|
| INSP. BY: | F.H. | REF. AREA: | WO #1685 |
| DISK No: | 01FH | FILE NAME: | TVI91777.RPT |
| TAPE No: | 01FH | TAPE COUNT: | 00:17:10 |
| PIPE SIZE: | 200mm | PIPE TYPE: | SANITARY/AC |
| FLOW DIR: | West | CAMERA DIR: | Against Flow |

| STARTING LOCATION: | ENDING LOCATION: |
|---|---|
| ELEPHANT WATERING HOLE | BUSH CAMP |
| PIPE DEPTH:N/A-NO ACCESS | PIPE DEPTH:N/A-NO ACCESS |

| STARTING MANHOLE | CAMERA DIRECTION ----> | ENDING MANHOLE |
|---|---|---|
| 06 | TOTAL: 70.0 Metres | 07 |
| | FLOW DIRECTION <---- | |

Summary Comments

THE PIPE APPEARS TO BE IN GOOD CONDITION

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 06 |
| 70.0 | | Ending manhole - 07 |
| 70.0 | | End of inspection |

Trans-Video Inspection Limited
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: MAIN PARKING LOT "P" SECTION

DATE: Jan 26 1999
TIME: 11:50:34

| | | | |
|---|---|---|---|
| INSP. BY: | F.H. | REF. AREA: | WO #1685 |
| DISK No: | 01FH | FILE NAME: | TVI91778.RPT |
| TAPE No: | 01FH | TAPE COUNT: | 00:21:55 |
| PIPE SIZE: | 525mm | PIPE TYPE: | SANITARY/AC |
| FLOW DIR: | East | CAMERA DIR: | With Flow |

STARTING LOCATION:
2ND MH E OF THE RIVER
PIPE DEPTH:5.3m

ENDING LOCATION:
1ST MH E OF THE RIVER
PIPE DEPTH:N/A-NO ACCESS

| STARTING MANHOLE | CAMERA DIRECTION ----> | ENDING MANHOLE |
|---|---|---|
| 08 | TOTAL: 92.5 Metres | 09 |
| | FLOW DIRECTION ----> | |

Summary Comments

LIGHT DEBRIS UNDER THE FLOW.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 08 |
| 92.5 | | Ending manhole - 09 |
| 92.5 | | End of inspection |

Trans-Video Inspection Limited
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: MAIN PARKING LOT "P" SECTION

DATE: Jan 26 1999
TIME: 12:26:58

| | | | |
|---|---|---|---|
| INSP. BY: | F.H. | REF. AREA: | WO #1685 |
| DISK No: | 01FH | FILE NAME: | TVI91779.RPT |
| TAPE No: | 01FH | TAPE COUNT: | 00:26:05 |
| PIPE SIZE: | 525mm | PIPE TYPE: | SANITARY/AC |
| FLOW DIR: | East | CAMERA DIR: | With Flow |

STARTING LOCATION:
1ST MH E OF THE RIVER
PIPE DEPTH:N/A-NO ACCESS

ENDING LOCATION:
1ST MH W OF THE RIVER
PIPE DEPTH:N/A-NO ACCESS

| STARTING MANHOLE | CAMERA DIRECTION ----> | ENDING MANHOLE |
|---|---|---|
| 09 | TOTAL: 81.0 Metres | 10 |
| | FLOW DIRECTION ----> | |

Summary Comments

LIGHT DEBRIS UNDER THE FLOW.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 09 |
| 81.0 | | Ending manhole - 10 |
| 81.0 | | End of inspection |

# APPENDIX 11

# SANITARY SEWER TEST RESULTS (VIDEO)

# APPENDIX 12

# STORM SEWER TEST RESULTS (PRINT)

# Trans-Video Inspection Ltd.
# SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: "D" GATE SOUTH OF OLD FINCH RD

DATE: Feb 5 1999
TIME: 08:22:26

| | | | |
|---|---|---|---|
| INSP. BY: | F.H. | REF. AREA: | |
| DISK No: | 02FH | FILE NAME: | TVI90517.RPT |
| TAPE No: | 02FH | TAPE COUNT: | 00:00:00 |
| PIPE SIZE: | 675mm | PIPE TYPE: | STORM/CONC |
| FLOW DIR: | South | CAMERA DIR: | With Flow |

STARTING LOCATION:
NORTH OF GATE "D"
PIPE DEPTH:2.5m

ENDING LOCATION:
SOUTH OF GATE "D"
PIPE DEPTH:N/A

CAMERA DIRECTION ---->

| STARTING MANHOLE | TOTAL: 59.5 Metres | ENDING MANHOLE |
|---|---|---|
| 01 | | 02 |

FLOW DIRECTION ---->

## Summary Comments

PONDING AND DEBRIS IN THE LINE.HEAVY
CALCITE BELOW A SERVICE CONNECTION.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 01 |
| 1.5 | 48.4 | Moderate ponding in line |
| 4.9 | 9.1 | Moderate debris in line - Invert |
| 9.1 | | Service connection - 11 O'clock |
| 9.1 | | Service protruding greater than 1" - 2 O'clock |
| 14.2 | 58.2 | Moderate debris in line - Invert |
| 26.0 | | Service connection - 11 O'clock |
| 26.0 | 26.0 | Heavy calcite in line - 8 O'clock |
| 26.9 | | Service connection - Crown |
| 36.8 | | Service connection - 11 O'clock |
| 48.4 | | Service connection - 1 O'clock |
| 59.5 | | Ending manhole - 02 |
| 59.5 | | End of inspection |

Report generated by Ratech Data Tech V Sewer TV Inspection System

Trans-Video Inspection Ltd.
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: "D" GATE SOUTH OF OLD FINCH RD

DATE: Feb 5 1999
TIME: 09:11:29

| | | | |
|---|---|---|---|
| INSP. BY: | F.H. | REF. AREA: | |
| DISK No: | 02FH | FILE NAME: | TVI90518.RPT |
| TAPE No: | 02FH | TAPE COUNT: | 00:06:05 |
| PIPE SIZE: | 675mm | PIPE TYPE: | STORM/CONC |
| FLOW DIR: | South | CAMERA DIR: | With Flow |

STARTING LOCATION:
SOUTH OF GATE "D"
PIPE DEPTH:N/A

ENDING LOCATION:
2ND MH S OF OF "D" GATE
PIPE DEPTH:N/A

CAMERA DIRECTION ----->

| STARTING MANHOLE | TOTAL: 46.0 Metres | ENDING MANHOLE |
|---|---|---|
| 02 | | 03 |

FLOW DIRECTION ----->

Summary Comments

LIGHT PONDING IN THE LINE.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 02 |
| 1.1 | | Service connection - 11 O'clock |
| 6.7 | | Service connection - 11 O'clock |
| 6.7 | 13.7 | Light ponding in line |
| 15.1 | | Service connection - Crown |
| 17.6 | | Service connection - Crown |
| 23.7 | | Service connection - 2 O'clock |
| 31.2 | | Service connection - 11 O'clock |
| 46.0 | | Ending manhole - 03 |
| 46.0 | | End of inspection |

Report generated by Ratech Data Tech V Sewer TV Inspection System

Trans-Video Inspection Ltd.
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: "D" GATE SOUTH OF OLD FINCH RD

DATE: Feb 5 1999
TIME: 09:19:08

INSP. BY: F.H.
DISK No: 02FH
TAPE No: 02FH
PIPE SIZE: 675mm
FLOW DIR: South

REF. AREA:
FILE NAME: TVI90519.RPT
TAPE COUNT: 00:10:50
PIPE TYPE: STORM/CONC
CAMERA DIR: With Flow

STARTING LOCATION:
2ND MH S OF OF "D" GATE
PIPE DEPTH:N/A

ENDING LOCATION:
3RD MH S OF OF "D" GATE
PIPE DEPTH:N/A

CAMERA DIRECTION ----->

| STARTING MANHOLE | TOTAL: 40.0 Metres | ENDING MANHOLE |
|---|---|---|
| 03 | | 04 |

FLOW DIRECTION ----->

Summary Comments

MH LID IN THE ENDING MH.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 03 |
| 19.6 | 38.3 | Light ponding in line |
| 40.0 | | MH LID IN THE |
| 40.0 | | Ending manhole - 04 |
| 40.0 | | End of inspection |

Report generated by Ratech Data Tech V Sewer TV Inspection System

Trans-Video Inspection Ltd.
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: "D" GATE SOUTH OF OLD FINCH RD

DATE: Feb 5 1999
TIME: 09:38:42

INSP. BY: F.H.
DISK No: 02FH
TAPE No: 02FH
PIPE SIZE: 675mm
FLOW DIR: South

REF. AREA:
FILE NAME: TVI90520.RPT
TAPE COUNT: 00:10:50
PIPE TYPE: STORM/CONC
CAMERA DIR: With Flow

STARTING LOCATION:
2ND MH S OF OF "D" GATE
PIPE DEPTH:N/A

ENDING LOCATION:
3RD MH S OF OF "D" GATE
PIPE DEPTH:N/A

CAMERA DIRECTION ---->

| STARTING MANHOLE | TOTAL: ------.- Metres | ENDING MANHOLE |
|---|---|---|
| 03 | | 04 |

FLOW DIRECTION ---->

Report generated by Ratech Data Tech V Sewer TV Inspection System

Trans-Video Inspection Ltd.
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: AREA 8

DATE: Feb 5 1999
TIME: 09:39:24

INSP. BY: F.H.
DISK No: 02FH
TAPE No: 02FH
PIPE SIZE: 600mm
FLOW DIR: East

REF. AREA:
FILE NAME: TVI90521.RPT
TAPE COUNT: 00:13:25
PIPE TYPE: STORM/CONC
CAMERA DIR: Against Flow

STARTING LOCATION:
1ST MH W OF EURASIA PAV.
PIPE DEPTH:3.3m

ENDING LOCATION:
N OF NORTH AMERICAN PAV.
PIPE DEPTH:N/A

CAMERA DIRECTION ---->

| STARTING MANHOLE | TOTAL: 67.0 Metres | ENDING MANHOLE |
|---|---|---|
| 05 | | 06 |

FLOW DIRECTION <----

Summary Comments

LIGHT DEBRIS AND PONDING IN THE LINE.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 05 |
| 33.1 | 60.9 | Light debris in line - Invert |
| 35.5 | | Service connection - 9 O'clock |
| 54.4 | | Service connection - 10 O'clock |
| 60.9 | 65.4 | Moderate ponding in line |
| 67.0 | | Ending manhole - 06 |
| 67.0 | | End of inspection |

Report generated by Ratech Data Tech V Sewer TV Inspection System

Trans-Video Inspection Ltd.
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: AREA 8

DATE: Feb 5 1999
TIME: 09:52:20

INSP. BY: F.H.
DISK No: 02FH
TAPE No: 02FH
PIPE SIZE: 675mm
FLOW DIR: East

REF. AREA:
FILE NAME: TVI90522.RPT
TAPE COUNT: 00:18:20
PIPE TYPE: STORM/CONC
CAMERA DIR: With Flow

STARTING LOCATION:
1ST MH W OF EURASIA PAV.
PIPE DEPTH:3.3m

ENDING LOCATION:
@ URASIA PAV.
PIPE DEPTH:N/A

CAMERA DIRECTION ---->

| STARTING MANHOLE | TOTAL: 70.0 Metres | ENDING MANHOLE |
|---|---|---|
| 05 | | 07 |

FLOW DIRECTION ---->

Summary Comments

LIGHT PONDING AND DEBRIS IN THE LINE.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 05 |
| 1.5 | 19.0 | Light ponding in line |
| 8.7 | 19.8 | Moderate debris in line - Invert |
| 46.4 | | Service connection - 2 O'clock |
| 67.5 | | Internal drop in pipe |
| 70.0 | | Ending manhole - 07 |
| 70.0 | | End of inspection |

Report generated by Ratech Data Tech V Sewer TV Inspection System

Trans-Video Inspection Ltd.
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: AREA 8

DATE: Feb 5 1999
TIME: 10:19:52

INSP. BY: F.H.
DISK No: 02FH
TAPE No: 02FH
PIPE SIZE: 900mm
FLOW DIR: East

REF. AREA:
FILE NAME: TVI90523.RPT
TAPE COUNT: 00:18:20
PIPE TYPE: STORM/CONC
CAMERA DIR: With Flow

STARTING LOCATION:
@ URASIA PAV.
PIPE DEPTH:3.6m

ENDING LOCATION:
EAST OF MH 07
PIPE DEPTH:N/A

CAMERA DIRECTION ---->

| STARTING MANHOLE | TOTAL: 74.0 Metres | ENDING MANHOLE |
|---|---|---|
| 07 | | 08 |

FLOW DIRECTION ---->

Summary Comments

THE PIPE APPEARS TO BE IN GOOD CONDITION

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 07 |
| 3.3 | | Service connection - 10 O'clock |
| 8.9 | | Service connection - 2 O'clock |
| 24.0 | | Service connection - 3 O'clock |
| 27.9 | | Service connection - 10 O'clock |
| 74.0 | | Ending manhole - 08 |
| 74.0 | | End of inspection |

Report generated by Ratech Data Tech V Sewer TV Inspection System

Trans-Video Inspection Ltd.
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: AREA 8

DATE: Feb 5 1999
TIME: 10:27:06

INSP. BY: F.H.
DISK No: 02FH
TAPE No: 02FH
PIPE SIZE: 900mm
FLOW DIR: East

REF. AREA:
FILE NAME: TVI90524.RPT
TAPE COUNT: 00:26:55
PIPE TYPE: STORM/CONC
CAMERA DIR: With Flow

STARTING LOCATION:
EAST OF MH 07
PIPE DEPTH:N/A

ENDING LOCATION:
EAST OF MH 08
PIPE DEPTH:N/A

CAMERA DIRECTION ---->

| STARTING MANHOLE | TOTAL: 134.0 Metres | ENDING MANHOLE |
|---|---|---|
| 08 | | 09 |

FLOW DIRECTION ---->

Summary Comments

THE PIPE APPEARS TO BE IN GOOD CONDITION

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 08 |
| 21.5 | | Service connection - 2 O'clock |
| 103.9 | | Service protruding greater than 1" - 1 O'clock |
| 134.0 | | Ending manhole - 09 |
| 134.0 | | End of inspection |

Report generated by Ratech Data Tech V Sewer TV Inspection System

Trans-Video Inspection Ltd.
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: AREA 17

DATE: Feb 5 1999
TIME: 12:02:36

INSP. BY: F.H.
DISK No: 02FH
TAPE No: 02FH
PIPE SIZE: 450mm
FLOW DIR: S/W

REF. AREA:
FILE NAME: TVI90525.RPT
TAPE COUNT: 00:33:25
PIPE TYPE: STORM/CONC
CAMERA DIR: Against Flow

STARTING LOCATION:
S OF THE SAV. REST. S/S OF ROAD
PIPE DEPTH:N/A

ENDING LOCATION:
N/E OF MH 10
PIPE DEPTH:N/A

CAMERA DIRECTION ---->

| STARTING MANHOLE | TOTAL: 29.3 Metres | ENDING MANHOLE |
|---|---|---|
| 10 | | 11 |

FLOW DIRECTION <----

Summary Comments

THE CAMERA WAS BLOCKED BY HEAVY GRAVEL.
REVERSE SETUP WAS NOT REQUESTED.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 10 |
| 1.5 | 9.8 | Light debris in line - Invert |
| 4.2 | | Service connection - 2 O'clock |
| 9.8 | 29.3 | Moderate debris in line - Invert |
| 27.8 | | Service connection - 2 O'clock |
| 28.7 | | Service connection - 9 O'clock |
| 29.3 | 29.3 | Heavy debris in line - Invert |
| 29.3 | | Camera blocked in line |
| 29.3 | | End of inspection |

Report generated by Ratech Data Tech V Sewer TV Inspection System

Trans-Video Inspection Ltd.
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: AREA 17

DATE: Feb 5 1999
TIME: 12:14:58

INSP. BY: F.H.
DISK No: 02FH
TAPE No: 02FH
PIPE SIZE: 450mm
FLOW DIR: West

REF. AREA:
FILE NAME: TVI90526.RPT
TAPE COUNT: 00:38:05
PIPE TYPE: STORM/CONC
CAMERA DIR: With Flow

STARTING LOCATION:
S OF THE SAV. REST. S/S OF ROAD
PIPE DEPTH:N/A

ENDING LOCATION:
WEST OF MH 10
PIPE DEPTH:N/A

CAMERA DIRECTION ----->

| STARTING MANHOLE | TOTAL: 50.0 Metres | ENDING MANHOLE |
|---|---|---|
| 10 | | 12 |

FLOW DIRECTION ----->

Summary Comments

THE CAMERA WAS BLOCKED BY DEBRIS.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 10 |
| 23.3 | 50.0 | Light ponding in line |
| 27.9 | 50.0 | Light debris in line - Invert |
| 50.0 | | Camera blocked in line |
| 50.0 | | End of inspection |

Report generated by Ratech Data Tech V Sewer TV Inspection System

**Trans-Video Inspection Ltd.**
**SEWER TV. INSPECTION REPORT**

CLIENT: METRO TORONTO ZOO.
STREET: AREA 18

DATE: Feb 5 1999
TIME: 13:20:43

| | |
|---|---|
| INSP. BY: | F.H. |
| DISK No: | 02FH |
| TAPE No: | 02FH |
| PIPE SIZE: | 525mm |
| FLOW DIR: | South |
| REF. AREA: | |
| FILE NAME: | TVI90527.RPT |
| TAPE COUNT: | 00:43:10 |
| PIPE TYPE: | STORM/CONC |
| CAMERA DIR: | Against Flow |

STARTING LOCATION:
S/E CORNER OF THE ELEPHANT HOUSE
PIPE DEPTH:3.6m

ENDING LOCATION:
S/E OF AFRICAN PAVILLION
PIPE DEPTH:N/A

CAMERA DIRECTION ---->

| STARTING MANHOLE | TOTAL: 42.5 Metres | ENDING MANHOLE |
|---|---|---|
| 13 | | 14 |

FLOW DIRECTION <----

## Summary Comments

THE PIPE APPEARS TO BE IN GOOD CONDITION

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 13 |
| 23.2 | | Service connection - 9 O'clock |
| 26.7 | | Service connection - 11 O'clock |
| 42.5 | | Ending manhole - 14 |
| 42.5 | | End of inspection |

Report generated by Ratech Data Tech V Sewer TV Inspection System

Trans-Video Inspection Ltd.
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: AREA 18

DATE: Feb 5 1999
TIME: 13:29:01

INSP. BY: P.H.
DISK No: 02FH
TAPE No: 02FH
PIPE SIZE: 525mm
FLOW DIR: South

REF. AREA:
FILE NAME: TVI90528.RPT
TAPE COUNT: 00:46:10
PIPE TYPE: STORM/CONC
CAMERA DIR: Against Flow

STARTING LOCATION:
S/E OF THE AFRICAN PAV.
PIPE DEPTH:N/A

ENDING LOCATION:
EAST ENTERANCE AFRICAN PAV.
PIPE DEPTH:N/A

| STARTING MANHOLE | CAMERA DIRECTION ----> | ENDING MANHOLE |
|---|---|---|
| 14 | TOTAL: 20.2 Metres | 15 |
| | FLOW DIRECTION <---- | |

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 14 |
| 18.0 | | Service connection - 2 O'clock |
| 20.2 | | Service protruding greater than 1" - 9 O'clock |
| 20.2 | | Camera blocked in line |
| 20.2 | | End of inspection |

**Trans-Video Inspection Ltd.**
**SEWER TV. INSPECTION REPORT**

**CLIENT:** METRO TORONTO ZOO.
**STREET:** AREA 18

**DATE:** Feb 5 1999
**TIME:** 13:36:11

| | |
|---|---|
| **INSP. BY:** | F.H. |
| **DISK No:** | 02FH |
| **TAPE No:** | 02FH |
| **PIPE SIZE:** | 525mm |
| **FLOW DIR:** | East |
| **REF. AREA:** | |
| **FILE NAME:** | TVI90529.RPT |
| **TAPE COUNT:** | 00:48:20 |
| **PIPE TYPE:** | STORM/CONC |
| **CAMERA DIR:** | Against Flow |

**STARTING LOCATION:**
S/E CORNER OF THE ELEPHANT HOUSE
PIPE DEPTH:3.6m

**ENDING LOCATION:**
S/W CORNER OF THE AFRICAN PAV.
PIPE DEPTH:N/A

| STARTING MANHOLE | CAMERA DIRECTION ----> | ENDING MANHOLE |
|---|---|---|
| 13 | TOTAL: ------.- Metres | 16 |
| | FLOW DIRECTION <---- | |

# Trans-Video Inspection Ltd.
## SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: AREA 18

DATE: Feb 5 1999
TIME: 13:38:34

INSP. BY: F.H.
DISK No: 02FH
TAPE No: 02FH
PIPE SIZE: 525mm
FLOW DIR: East

REF. AREA:
FILE NAME: TVI90530.RPT
TAPE COUNT: 00:48:20
PIPE TYPE: STORM/CONC
CAMERA DIR: Against Flow

STARTING LOCATION:
S/E CORNER OF THE ELEPHANT HOUSE
PIPE DEPTH:3.6m

ENDING LOCATION:
S/W CORNER OF THE AFRICAN PAV.
PIPE DEPTH:N/A

| STARTING MANHOLE | CAMERA DIRECTION ----> | ENDING MANHOLE |
|---|---|---|
| 13 | TOTAL: 31.2 Metres | 16 |
| | FLOW DIRECTION <---- | |

### Summary Comments

THE CAMERA WAS BLOCKED BY DEBRIS.REVERSE SETUP IS REQUESTED.UNABLE TO GIVE THE SURFACE LENGTH,THERE ARE BUILDING IN BETWEEN THE MH'S

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 13 |
| 1.5 | 31.2 | Moderate debris in line - Invert |
| 31.2 | | Camera blocked in line |
| 31.2 | | End of inspection |

# Trans-Video Inspection Ltd.
## SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: AREA 18

DATE: Feb 5 1999
TIME: 13:52:21

INSP. BY: F.H.
DISK No: 02FH
TAPE No: 02FH
PIPE SIZE: 450mm
FLOW DIR: East

REF. AREA:
FILE NAME: TVI90531.RPT
TAPE COUNT: 00:52:50
PIPE TYPE: STORM/PVC
CAMERA DIR: With Flow

STARTING LOCATION:
S/W CORNER OF THE AFRICAN PAV.
PIPE DEPTH:N/A

ENDING LOCATION:
S/W CORNER OF THE ELEPHANT HOUSE
PIPE DEPTH:3.6m

CAMERA DIRECTION ----->

| STARTING MANHOLE | TOTAL: 51.5 Metres | ENDING MANHOLE |
|---|---|---|
| 16 | | 13 |

FLOW DIRECTION ----->

### Summary Comments

THE PIPE SIZE IS 450mm.THE PIPE MATERIAL IS PVC.DEBRIS IN THE LINE.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 16 |
| 2.2 | 51.5 | Moderate ponding in line |
| 4.7 | 51.5 | Moderate debris in line - Invert |
| 51.5 | | Extra manhole not shown |
| 51.5 | | End of inspection |

Report generated by Envista Ltd. V Sewer TV Inspection System

Trans-Video Inspection Ltd.
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: AREA 18

DATE: Feb 5 1999
TIME: 14:03:13

INSP. BY: F.H.
DISK No: 02FH
TAPE No: 02FH
PIPE SIZE: 525mm
FLOW DIR: South

REF. AREA:
FILE NAME: TVI90532.RPT
TAPE COUNT: 00:55:35
PIPE TYPE: STORM/CONC
CAMERA DIR: Against Flow

STARTING LOCATION:
S/W CORNER OF THE AFRICAN PAV.
PIPE DEPTH:N/A

ENDING LOCATION:
1ST MH N OF MH 16
PIPE DEPTH:N/A

CAMERA DIRECTION ——>

| STARTING MANHOLE | TOTAL: 20.5 Metres | ENDING MANHOLE |
|---|---|---|
| 16 | | 17 |

FLOW DIRECTION <——

Summary Comments

THE CAMERA WAS BLOCKED BY DEBRIS.REVERSE SETUP WAS NOT REQUESTED.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole — 16 |
| 2.0 | 20.5 | Moderate debris in line — Invert |
| 20.5 | | Camera blocked in line |
| 20.5 | | End of inspection |

[redacted]

Trans-Video Inspection Ltd.
SEWER TV. INSPECTION REPORT

CLIENT: METRO TORONTO ZOO.
STREET: AREA ?

DATE: Feb 5 1999
TIME: 14:38:38

INSP. BY: F.H.
DISK No: 02FH
TAPE No: 02FH
PIPE SIZE: 250mm
FLOW DIR: West

REF. AREA:
FILE NAME: TVI90533.RPT
TAPE COUNT: 00:57:20
PIPE TYPE: STORM/CONC
CAMERA DIR: With Flow

STARTING LOCATION:
1ST MH W OF THE CAMEL PEN
PIPE DEPTH:2.1m

ENDING LOCATION:
2ND MH W OF THE CAMEL PEN
PIPE DEPTH:N/A

CAMERA DIRECTION ----->

| STARTING MANHOLE | TOTAL: 11.0 Metres | ENDING MANHOLE |
|---|---|---|
| 19 | | 19 |

FLOW DIRECTION ----->

Summary Comments

DEBRIS IN THE LINE.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 19 |
| 0.0 | 11.0 | Moderate debris in line - Invert |
| 11.0 | | Ending manhole - 19 |
| 11.0 | | End of inspection |

Report generated by Ratech Data Tech V Sewer TV Inspection System

**Trans-Video Inspection Ltd.**
**SEWER TV. INSPECTION REPORT**

CLIENT: METRO TORONTO ZOO.
STREET: AREA ?

DATE: Feb 5 1999
TIME: 14:45:04

INSP. BY: F.H.
DISK No: 02FH
TAPE No: 02FH
PIPE SIZE: 300mm
FLOW DIR: West

REF. AREA:
FILE NAME: TVI90534.RPT
TAPE COUNT: 00:59:00
PIPE TYPE: STORM/CONC
CAMERA DIR: With Flow

STARTING LOCATION:
2ND MH W OF THE CAMEL PEN
PIPE DEPTH:N/A

ENDING LOCATION:
3RD MH W OF THE CAMEL PEN
PIPE DEPTH:N/A

CAMERA DIRECTION ----->

| STARTING MANHOLE | TOTAL: 46.5 Metres | ENDING MANHOLE |
|---|---|---|
| 19 | | 20 |

FLOW DIRECTION ----->

## Summary Comments

THE PIPE APPEARS TO BE IN GOOD CONDITION

## Inspection Comments

| Distance At | To | |
|---|---|---|
| 0.0 | | Starting manhole - 19 |
| 1.1 | | Service connection - 9 O'clock |
| 46.5 | | Ending manhole - 20 |
| 46.5 | | End of inspection |

Report generated by Ratech Data Tech V Sewer TV Inspection System

**Trans-Video Inspection Ltd.**
**SEWER TV. INSPECTION REPORT**

CLIENT: METRO TORONTO ZOO.
STREET: AREA ?

DATE: Feb 5 1999
TIME: 14:49:40

| | |
|---|---|
| INSP. BY: F.H. | REF. AREA: |
| DISK No: 02FH | FILE NAME: TVI90535.RPT |
| TAPE No: 02FH | TAPE COUNT: 01:02:10 |
| PIPE SIZE: 375mm | PIPE TYPE: STORM/CONC |
| FLOW DIR: West | CAMERA DIR: With Flow |

STARTING LOCATION:
3RD MH W OF THE CAMEL PEN

ENDING LOCATION:
4TH MH W OF THE CAMEL PEN

PIPE DEPTH:N/A

| STARTING MANHOLE | CAMERA DIRECTION ----> | ENDING MANHOLE |
|---|---|---|
| 20 | TOTAL: 55.0 Metres | 21 |
| | FLOW DIRECTION ----> | |

**Summary Comments**

THE MAP IS WRONG SUPOSSED TO MEET WITH MH 08.NOT THE CASE.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 20 |
| 5.2 | | Service connection - 2 O'clock |
| 9.5 | | Service connection - 9 O'clock |
| 23.8 | | Service connection - 10 O'clock |
| 31.8 | 55.0 | Light ponding in line |
| 38.0 | | Service connection - Crown |
| 38.0 | 38.0 | Moderate calcite in line - Around pipe |
| 55.0 | | Ending manhole - 21 |
| 55.0 | | End of inspection |

Report generated by Ratech Data Tech V Sewer TV Inspection System

**Trans-Video Inspection Ltd.**
**SEWER TV. INSPECTION REPORT**

CLIENT: METRO TORONTO ZOO. DATE: Feb 5 1999
STREET: AREA ? TIME: 14:57:35

| | |
|---|---|
| INSP. BY: F.H. | REF. AREA: |
| DISK No: 02FH | FILE NAME: TVI90536.RPT |
| TAPE No: 02FH | TAPE COUNT: 01:07:35 |
| PIPE SIZE: 375mm | PIPE TYPE: STORM/CONC |
| FLOW DIR: West | CAMERA DIR: With Flow |

| STARTING LOCATION: | ENDING LOCATION: |
|---|---|
| 4TD MH W OF THE CAMEL PEN | 5TH MH W OF THE CAMEL PEN |

| STARTING MANHOLE | CAMERA DIRECTION ----> | ENDING MANHOLE |
|---|---|---|
| 21 | TOTAL: 0.0 Metres | 08 |
| | FLOW DIRECTION ----> | |

## Summary Comments

THE CAMERA WAS UNABLE TO MAKE THE BEND
IN THE MH.

| Distance At | To | Inspection Comments |
|---|---|---|
| 0.0 | | Starting manhole - 21 |
| 0.0 | | CAMERA NOT ABLE TO MAKE THE BEND |
| 0.0 | | Camera blocked in line |
| 0.0 | | End of inspection |

# APPENDIX 13

# STORM SEWER TEST RESULTS (VIDEO)

# APPENDIX 14

# COMPONENT QUANTITY TAKE-OFFS

SITE SERVICES COMPONENTS
QUANTITY TAKE-OFF

| | Totals | Area 1 | Area 2 | Area 3 | Area 4 | Area 5 | Area 6 | Area 7 | Area 8 | Area 9 | Area 10 | Area 11 | Area 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water** | | | | | | | | | | | | | |
| 1. Fire Hydrant | 28 | | 1 | 5 | | | | | 6 | 1 | | | 1 |
| 2. Gate Valves | 5 | | | | | | | | | | | | 1 |
| 3. Main Valve | 95 | | 3 | 12 | 3 | | | 4 | 20 | 10 | | | 7 |
| 4. Drinking Fountain | 18 | | | | 2 | | | | 2 | 3 | | | 1 |
| 5. Building Valves | 39 | | | 2 | 2 | | | 1 | 7 | 5 | | | 3 |
| 6. Man Holes | 5 | | | 1 | | | | | 3 | 1 | | | |
| 7. Main Sprinkler Building Valve | 1 | | | 1 | | | | | | | | | |
| 8. Non Freeze Hydrant | 9 | | 1 | | | | | 1 | 2 | 6 | | | |
| 9. Pumping Stations | 1 | | | | | | | 1 | | | | | |
| 10. Pool Valve/Water Tap | 8 | | | | 6 | | | | | 2 | | | 3 |
| 11. Curb Stop | 50 | | 1 | 1 | | | | | 4 | 14 | | | 5 |
| 12. Curb Stop/Bldg. Valve | 1 | | | 1 | 1 | | | | | | | | |
| 13. Water Bowl | 8 | | | 2 | | | | | 5 | | | | |
| 14. Sprinklers | 2 | | | | | | | | | | | | |
| 15. Water Main Chamber | 1 | | | | | | | | | | | | |
| 16. Water Spray Post | 1 | | | | | | | | | | | | |
| **Gas** | | | | | | | | | | | | | |
| 1. Gas Valves | 3 | | | 2 | | | | | | | | | |
| 2. Building Valve | 1 | | | | | | | | | | | | |
| **Sanitary/Storm** | | | | | | | | | | | | | |
| 1. Area Drains | 4 | | | | | | | | | | | | |
| 2. Clean Outs | 5 | | | | | | | | 2 | | | | |
| 3. Catch Basins | 275 | | 2 | 46 | 15 | 10 | | 2 | 27 | 17 | 11 | | 23 |
| 4. Man Holes | 328 | | 2 | 36 | 24 | 3 | | 12 | 33 | 35 | 10 | | 25 |
| 5. Pool Drains | 1 | | | | | | | | | | | | 1 |
| 6. Pumping Stations | 4 | | | | 1 | | | | 1 | 1 | | | |
| 7. Catch Basin/Man Hole | 1 | | | | | | | | | | 1 | | |
| 8. Floor Drain | 2 | | | | | | | | 2 | | | | |
| **Electrical** | | | | | | | | | | | | | |
| 1. Electrical Panels | 3 | | 1 | | | | | 1 | 1 | | | | |
| 2. Hydro Outlet | 7 | | | | | | | | | 4 | | | |
| 3. Light Standards | 33 | | | | | | | | | | | | |
| 4. Hydro Vault (transformer) | 27 | | 1 | 2 | | | | 1 | 3 | 7 | | | 3 |
| 5. Transformer | 49 | | | | | | | | | | | | |
| 6. Electrical Man Holes | 1 | | | | | | | | | | | | |
| 7. Junction Boxes | 14 | | | | | | | | | | | | |
| 8. Elec. Post | 2 | | | | 1 | | | | 1 | | | | |

SITE SERVICES COMPONENTS
QUANTITY TAKE-OFF

| | Area 13 | Area 14 | Area 15 | Area 16 | Area 17 | Area 18 | Area 19 | Area 20 | Area 21 | Area 22 | Area 23 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water** | | | | | | | | | | | |
| 1. Fire Hydrant | 5 | 1 | | | | 7 | | 1 | | | |
| 2. Gate Valves | 4 | | | | | | | | | | |
| 3. Main Valve | 11 | 2 | | | 12 | 10 | | | | | 1 |
| 4. Drinking Fountain | 1 | 4 | | | 3 | 2 | | | | | |
| 5. Building Valves | 5 | 2 | | | 7 | 5 | | | | | |
| 6. Man Holes | | | | | | | | | | | |
| 7. Main Sprinkler Building Valve | | | | | | | | | | | |
| 8. Non Freeze Hydrant | | | | | | 1 | | | | | |
| 9. Pumping Stations | | | | | | | | | | | |
| 10. Pool Valve/Water Tap | | 1 | | | | 2 | | | | | |
| 11. Curb Stop | 5 | 7 | | | 4 | 3 | | | | | |
| 12. Curb Stop/Bldg. Valve | | | | | | | | | | | |
| 13. Water Bowl | | | | | | | | | | | |
| 14. Sprinklers | | | | | | | 2 | | | | |
| 15. Water Main Chamber | | | | | | | | | | | |
| 16. Water Spray Post | | | | | | | | | | | |
| **Gas** | | | | | | | | | | | |
| 1. Gas Valves | 1 | | | | | | | | | | |
| 2. Building Valve | | | | | | | | | | | |
| **Sanitary/Storm** | | | | | | | | | | | |
| 1. Area Drains | | | | | | 4 | | | | | |
| 2. Clean Outs | | | | | 3 | | | | | | |
| 3. Catch Basins | 22 | 27 | | | 25 | 30 | 16 | | | | 2 |
| 4. Man Holes | 27 | 13 | | | 40 | 48 | 12 | | | | 8 |
| 5. Pool Drains | | | | | | | | | | | |
| 6. Pumping Stations | | | | | | | | | | | |
| 7. Catch Basin/Man Hole | | | | | | | | | | | |
| 8. Floor Drain | | | | | | | | | | | |
| **Electrical** | | | | | | | | | | | |
| 1. Electrical Panels | | | | | | | | | | | |
| 2. Hydro Outlet | | 3 | | | | | | | | | |
| 3. Light Standards | | 14 | | | | | 19 | | | | |
| 4. Hydro Vault (transformer) | 2 | | | | 3 | 5 | | | | | |
| 5. Transformer | | | | | | | | | | | |
| 6. Electrical Man Holes | | | | | | | 1 | | | | |
| 7. Junction Boxes | | 7 | | | | | 7 | | | | |
| 8. Elec. Post | | | | | | | | | | | |

SITE SERVICES COMPONENTS
QUANTITY TAKE-OFF

| | Area 24 | Area 25 |
|---|---|---|
| **Water** | | |
| 1. Fire Hydrant | | |
| 2. Gate Valves | | |
| 3. Main Valve | | |
| 4. Drinking Fountain | | |
| 5. Building Valves | | |
| 6. Man Holes | | |
| 7. Main Sprinkler Building Valve | | |
| 8. Non Freeze Hydrant | | |
| 9. Pumping Stations | | |
| 10. Pool Valve/Water Tap | | |
| 11. Curb Stop | | |
| 12. Curb Stop/Bldg. Valve | | |
| 13. Water Bowl | | |
| 14. Sprinklers | | |
| 15. Water Main Chamber | 1 | |
| 16. Water Spray Post | | |
| **Gas** | | |
| 1. Gas Valves | | |
| 2. Building Valve | | |
| **Sanitary/Storm** | | |
| 1. Area Drains | | |
| 2. Clean Outs | | |
| 3. Catch Basins | | |
| 4. Man Holes | | |
| 5. Pool Drains | | |
| 6. Pumping Stations | | |
| 7. Catch Basin/Man Hole | | |
| 8. Floor Drain | | |
| **Electrical** | | |
| 1. Electrical Panels | | |
| 2. Hydro Outlet | | |
| 3. Light Standards | | |
| 4. Hydro Vault (transformer) | | |
| 5. Transformer | | |
| 6. Electrical Man Holes | | |
| 7. Junction Boxes | | |
| 8. Elec. Post | | |

# APPENDIX 15

# CITY OF SCARBOROUGH FIRE PROTECTION WATER SERVICES POILCY

Thomas L. Powell, Fire Chief
Guidelines for Water Services for Fire Protection
February 26, 1992

E) Minimum size of water supply:

1. A single private hydrant only -
   6" (150mm);
2. A single private hydrant and sprinklers and/or standpipes -
   8" (200mm) to the hydrant or to the sprinklers/standpipe, 6" (150mm) to the rest. Alternatively hydraulic calculations proving the required water supply.
3. Two private hydrants -
   8" (200mm). Alternatively hydraulic calculations proving the required water supply.
4. More than two private hydrants -
   8" (200mm). Looped system required. (N.B. Main size may be reduced if hydraulic calculations are submitted proving the required water supply.)

Note: Scarborough Public Utilities Commission requirements for domestic water supply taken within building from same water service as the fire protection systems:

1. A 1" domestic supply may be taken from a 6" (150mm) service;
2. A 2" domestic supply may be taken from an 8" (200mm) service;
3. Alternatively hydraulic calculations proving the required water supply for both the fire protection system(s) and the domestic system.

5 PUC -

James C. Macdon
Director
Fire Prevention D

412 - 4526

JCM/vs

LOUIS MAGNUND
292-1530 EXT. 2012

File #SP130992.J

MARIO ZAMMIT 412-4527

RANDALL LAFRANCE 412-4537

# APPENDIX 16

# CORRESPONDENCE FROM ENBRIDGE CONSUMERS GAS

500 Consumers Road,
Toronto ON M2J 1P8
Tel 416 495-5489
Fax 416 495-6189
Email brian.black@cgc.enbridge.com

ENBRIDGE
Consumers Gas

# fax

File Number:

| | |
|---|---|
| To: Earnes Onyido | From: Brian Black |
| Organization: Paradigm Engineering Group | No. of pages (including this cover): 1 |
| Department: | Date: 1999-05-21 |
| Fax: Recipient 416-335-1449 | If this transmission is not received in good order, please call: Sender 416-495-5489 |

Re: Metro Toronto Zoo – Natural Gas Supply and Piping

As I had verbally informed you, The pipe on the property of the Metro Toronto Zoo is owned by the Zoo and does not fall under the jurisdiction of Enbridge Consumers Gas. This means that Enbridge Consumers Gas is only able to provide information regarding the gas that is supplied to the system on the Zoo property.

Concerning the present load which is utilized by the zoo under peak hour conditions as supplied by Enbridge Consumers Gas is 1050 M^3 / Hr at a maximum of 45 psi. This pressure could be boosted to deliver 60 psi to the zoo system. The maximum supply that could be provided using present equipment would be 3000 m^3/ Hr. This increase however may be limited by the downstream Zoo piping system. An evaluation should be made by the Metro Toronto Zoo to establish whether any increase in capacity delivered by Enbridge Consumers Gas will be acceptable for the zoo's piping system.

As I mentioned previously, there has been no corrosion survey performed on the Zoo's system in approximately the last 12 years. A leak survey however, is completed annually and was completed three weeks ago for 1999. The results of the leak survey identified no leak indications. It is recommended that a corrosion survey be completed by the Metro Toronto Zoo the secure the integrity of the system and identify any upgrades required in the cathodic protection of the plant.

Please contact me if you have any further questions.

Brian Black

# APPENDIX 17

# CORRESPONDENCE FROM GRAIG ROSE OF MARSHALL MACKLIN MONAGHAN CONSULTING ENGINEERS

18-93081
memo to file
metro toronto zoo

I spoke with Andy Empringham from Scarborough Fire Prevention on Feb. 14 1995. He said that he sent a copy of my Jan. 19 submission to his fire inspector at the City of Scarborough (Steve Doran). He said that they see our design as an improvement to the existing system and will not require the existing mains to be upgraded. He said that he has the final say on this issue and that there was no need for him to provide a letter to me.

Craig Rose

18-93081-03-SU1

Post-it™ Fax Note 7671E | Date MAY 19/99 | # of pages ▸ 2

| | |
|---|---|
| To ERNEST ONYIDO | From CRAIG ROSE |
| Co./Dept | Cc. MMM |
| Phone # | Phone # |
| Fax # 416 3351449 | Fax # |

# APPENDIX 18

# FIRE PROTECTION WATER SUPPLY GUIDELINE FOR PART 3 IN THE ONTARIO BUILDING CODE

DRAFT

Office of the Fire Marshal

OFM-TG-07-98

# FIRE PROTECTION WATER SUPPLY GUIDELINE FOR PART 3 IN THE ONTARIO BUILDING CODE

O

F

M

TECHNICAL GUIDELINE

October 1998

# TABLE OF CONTENTS

# ABSTRACT

This guideline will assist those trying to establish an adequate fire protection-water supply for new and renovated Part 3 buildings as required by Article 3.2.5.7. or Part 11 of the Ontario Building Code. The criteria for "adequate water supply" will be detailed and the limitations of this criteria explained. Several other factors will be explained as they relate to the fire protection water supply, such as the fire department, environmental impact and cost.

The guideline provides a method of simple calculation of an on-site water supply, taking into account building occupancy, size, construction and exposure, as well as minimum water duration requirements. Other issues that may effect the need for an on-site water supply or design factors are discussed as well. Sample problems are included to assist the user.

# INTRODUCTION

The Office of the Fire Marshal, in cooperation with the Ministry of Municipal Affairs and Housing and the Water Supply Adequacy Committee has developed this guideline to help building owners, consultants and others involved in life safety design of buildings, meet the requirements for **"adequate water supply for fire fighting"** as found in Part 3 of the Ontario Building Code (OBC). This guideline is not intended for farm buildings or buildings that fall within Part 9 of the OBC.

This guideline has been developed in conjunction with the A-3.2.5.7. Appendix Note on Adequate Water Supply in the 1997 Ontario Building Code.

The *primary purpose* of this guideline is to provide an adequate fire protection water supply to support evacuation and fire department search and rescue operations during a fire, and prevent fire spread to other buildings.

The *secondary purpose* of this guideline is to provide a fire protection water supply that can be used to provide a good measure of property protection during the early stages of a fire.

With the exception of sprinklered buildings, this guideline does not intend to provide the optimum for property protection. However with a timely response by a well trained fire department, the water supply designated in this guideline should be sufficient to allow the fire department to extinguish building fires where adverse circumstances are not encountered.

It should be noted that where "property protection" is a primary expectation of the building owner, or where significant environmental contamination from a fire is a concern, other recognized fire protection guidelines should be referenced (such as the Fire Underwriters Survey) to ensure adequate water supplies for manual fire suppression by available fire fighting means, or the building should be sprinklered. **Building owners should be made aware of the limitations of the fire protection water supply as required in this guideline, prior to the design and construction of their building and/or the design of an on-site water supply.**

It should be noted that other guidelines, such as the Fire Underwriters Survey, should be used when designing water supply systems for newly developed municipal areas, as this fire protection water supply guideline is not intended to address domestic service water needs.

# OVERVIEW OF THE BUILDING CODE REQUIREMENTS

**Article 3.2.5.7.** of the Ontario Building Code (OBC) 1997 states: "an adequate water supply for fire fighting shall be provided for every building".

**Q1 What does this mean for unsprinklered buildings?**

As interpreted in this guideline, an adequate fire protection water supply for unsprinklered buildings means an immediately available and accessible water supply, with sufficient volume and/or flow to enable the fire department to use their fire hoses to control fire growth until the building is safely evacuated and search and rescue operations have been complete, and to prevent the fire from spreading to adjacent buildings. This water supply should also be sufficient to provide a limited measure of both property protection and protection against fire growth in buildings with contents that could result in a significant environmental impact.

**Q2 What does this mean for sprinklered buildings?**

For sprinklered buildings, an adequate fire protection water supply means a reliable water supply providing sufficient water flow for the sprinkler systems in terms of pressure, volume, and duration to limit fire growth until the fire department arrives to suppress the fire. This automatic protection is expected to provide time for the evacuation of buildings, assist the fire department in preventing fire spread to adjacent buildings, limit the environmental impact of fires, and provide significant property protection.

**Note: A properly designed sprinkler system, and especially those using modern technology sprinkler heads, will often extinguish a fire even without additional manual fire fighting intervention.**

# FIRE DEPARTMENT RESPONSE

**Q1 How does fire department response influence water supply requirements?**

Determining an adequate water supply for manual fire protection is not dependent solely on building characteristics. A major factor will be the response time and intervention provided by the local fire department. This guideline assumes a prompt response by a well equipped fire department using modern fire fighting techniques, and assumes that buildings will be evacuated in accordance with established building fire safety plans and fire department pre-fire plans. Where there is no fire department see Q3 in the Special Cases Section.

An immediately available fire protection water supply permits the fire department, at their discretion, to enter a burning building with hose lines to conduct search and rescue operations. The duration of this water supply should, as a minimum, be sufficient to allow complete search and rescue throughout buildings. Once the search and rescue operations are complete, additional water may be required for exposure protection or for fire suppression to limit property damage. Exposure protection and fire suppression to limit property damage go beyond the minimum for life safety as established by water supply requirements set out in this guideline.

The fire department has discretion as to how they will use hose streams on any given fire. Where a limited amount of fire protection water is available on site, decisions will be made on how much water will be used in the initial "search and rescue" stage, the suppression stage and for exposure protection. The Fire Chief may deem it most beneficial to concentrate all fire department resources to suppress a fire in its early growth stage, thereby drawing-down the limited water supply quickly, or may instead "nurse" the limited water supply until the search

and rescue procedure is completed and then concentrate on exposure protection until supplemental water supplies arrive.

Fire departments serving remote or rural areas often have to respond to a fire with a transportable water supply having a duration of approximately five to ten minutes when using one or two 38 mm hose lines. This provides minimal hose streams allowing immediate search and rescue and fire suppression in small buildings with simple layouts. However, where a fire has had a significant head start, this transported water supply is unlikely to be sufficient to save the building.

For larger, more complex buildings, an on-site fire protection water supply is needed to provide an extended duration of hose stream use by the fire department to allow search and rescue of the building, exposure protection and fire suppression. The volume of this on-site fire protection water supply is dependent on the building size, construction, occupancy, exposure and environmental impact potential, and shall be sufficient to allow at least 30-minutes of fire department hose stream use.

# COST IMPACT

Q1 How significant a cost impact will it be to provide an adequate fire water supply?

Cost impact on buildings constructed in rural or remote areas will typically be more than for buildings constructed within areas provided with municipal water mains. The great majority of existing municipal water systems will be able to satisfy the requirements of this guideline for new building construction. This would not preclude situations where new large "high fire demand" type buildings are being proposed in areas where the municipal water supply is not adequate. In these cases the building owner may need to provide supplemental fire protection water to meet the requirements of this guideline. The building owner may alternatively make design modifications to his building to reduce the water supply requirements. These modifications could include providing firewalls, using noncombustible construction in lieu of combustible construction, sprinklering the building, reducing the amount of window openings exposing a property line, etc.

Buildings constructed in rural or remote areas without a municipal water supply or an adjacent accessible body of water (i.e. river or large pond) may require on-site water storage tanks or a water reservoir for the fire protection water supply required by this guideline. Hydrants, suction connections for fire department "drafting", or underground dry mains may also be needed to provide appropriate building coverage. (See Q7 in the Special Cases Section)

# SIGNIFICANT ADVERSE ENVIRONMENTAL IMPACT

Q1 What types of building fires could result in a significant adverse environmental impact and thus require additional fire protection water supplies?

Any building used for the storage or processing of chemicals or materials should be deemed to have the potential for significant adverse environmental impact, if a fully developed fire would result in significant contamination of ground or surface water through direct runoff or atmospheric dispersion.

**Q2 What fire protection criteria should be used for these buildings?**

Properly designed sprinkler protection should be provided in these buildings to prevent fully developed fires. Sprinklered buildings typically require reduced amounts of water for control or suppression of a fire, thus reducing the potential for environmental impact from contaminated water run-off.

Where sprinkler protection is not provided, other recognized fire protection guidelines (e.g. Fire Underwriters Survey) may instead be used to determine the manual fire fighting water supply needs for these buildings. The Chief Building Official or Fire Official should evaluate these special cases on an individual basis.

**Q3 Why do unsprinklered buildings with occupancies that constitute an adverse environmental impact typically require an increased water supply for manual fire fighting?**

An increased water supply gives the fire department the option of conducting an all out fire hose suppression attack in the early stages of a fire. A successful hose deluge attack at this time may result in extinguishment before significant amounts of environmentally hazardous chemicals and materials are involved.
**Note: Unsprinklered buildings will require careful preplanning by fire departments to ensure judicious application of this greater amount of fire fighting water to prevent significant adverse environmental impact due to water run-off.**

# WATER SUPPLY REQUIREMENTS

**Q1 How do I determine water supply requirements?**

To simplify this guide, requirements have been placed into four categories. It is best to use a process of elimination to determine the correct category of water supply requirements. This guideline is not intended to be used for farm buildings or Part 9 buildings. (see Q8 in the Special Cases Section)

The four categories are:

- buildings not requiring on-site fire protection water supply
- sprinklered buildings
- buildings requiring on-site fire protection water supply
- additions to existing buildings

## 1. Buildings Not Requiring On-Site Fire Protection Water Supply

(a) A building would not require an on-site water supply for fire fighting if the building satisfies the criteria set out in Item 1(b) or Item 1(c), provided that:

(i) the building is serviced by a municipal water supply system that satisfies Item 3(b), or

(ii) the fire department can respond with a transportable water supply of sufficient quantity to allow them to conduct an effective search and rescue of the building, determined on the basis of other guidelines or standards (such as NFPA 1231, "Standard on Water Supplies for Suburban and Rural Fire Fighting"). (also see Q1 to Q3 in the Special Cases Section)

(b) A building does not require an on-site water supply for fire fighting where all the following criteria are met

(ii) the building height is 2 stories or less,
(iii) the building does not have a Group B occupancy (care or detention),
(iv) the building does not require a sprinkler system or a standpipe and hose system,
(v) the limiting distance from the property line is at least 13 metres if the building has an F-1 occupancy (high hazard industrial), and
(vi) the building constitutes no significant environmental contamination potential under fire conditions.

(c) A building that exceeds 200 $m^2$ in building area or 2 storeys in building height may not require an on-site water supply for fire fighting where it has an F-3 occupancy with an insignificant combustible loading (such as found in cement plants, steel stock storage sheds, etc.), as determined by the Chief Building Official.

## 2. Sprinklered Buildings

For sprinklered buildings, NFPA 13, "Standard for the Installation of Sprinkler Systems", as referenced by Article 3.2.5.13. of the Ontario Building Code, shall be used to obtain sprinkler and hosestream water requirements. (see Q1 of the Further Explanation of Guideline Requirements Section)

## 3. Buildings Requiring On-Site Fire Protection Water Supply

(a) Except for sprinklered buildings and as required by Items 3(c) and 3(d), new buildings shall be provided with a supply of water available for fire fighting purposes not less than the quantity derived from the following formula:

$$Q = KVS_{Tot}$$

where
$Q$ = minimum supply of water in litres
$K$ = water supply coefficient from Table 1
$V$ = total building volume in cubic metres
$S_{Tot}$ = total of spatial coefficient values from property line exposures on all sides, as obtained from the formula:

$$S_{Tot} = 1.0 + [(S_{Side1}) + (S_{Side2}) + (S_{Side3}) + \text{... etc.}]$$

where $S_{Side}$ values are obtained from Figure 1, as modified by Items 3(e) and (f), and
$S_{Tot}$ need not exceed 2.0

(see Explaining the Calculations Section)

(b) Except as provided in Item 3(d), water supply flow rates shall not be less than that specified in Table 2. Where the water supply is from a municipal or industrial water supply system then the required flow rate shall be available at a minimum pressure of 140 kPa

(c) Except as provided in Item 3(d), the minimum fire protection water supply (Q) required in Item 3(a) shall not be less than what is needed to provide the minimum flow rate specified in Table 2 for a duration of **30 minutes**.

(d) In elementary and secondary schools, the water supply determined in accordance with Items 3(a) and 3(b) may be reduced. The level of reduction to be applied would be at the discretion of the local jurisdictional authority, and should not exceed 30%. Factors to consider should include fire department response time, fire department resources and the size and complexity of the school building. (see Q10 of the Special Cases Section)

(e) Where a masonry wall with a minimum fire-resistance rating of 2 hr. and no unprotected openings is provided as an exterior wall, the spatial coefficient ($S_{side}$) for this side of the new building may be considered equal to 0. This exterior masonry wall shall be provided with a minimum 150 mm parapet.

Firewalls that divide a structure into two or more buildings may be given similar consideration when evaluating the exposure of the buildings to each other.

(f) The spatial coefficient ($S_{side}$) may be considered equal to 0 when the exposed building is on the same property and is less than $10m^2$ in building area.

## 4. Additions to Existing Buildings

(a) Except as permitted in Items 4(b) and (c), additions to existing buildings shall be provided with a fire protection water supply as required in Items 3(a) to 3(f). (See Q2 in the Further Explanation of Guideline Requirements Section)

(b) Buildings with new additions falling into any one of the following criteria would not require an additional water supply for fire fighting where:

(i) the expanded building complies with all the requirements of Item 1(a),

(ii) the new addition does not exceed $100m^2$ in building area, or

(iii) the new addition exceeds $100m^2$ but does not exceed $400m^2$ in building area, contains an assembly, business and personal services, mercantile or low hazard industrial occupancy, is of noncombustible construction, does not result in a significant increase in exposure to other existing buildings, has no combustible storage or process, and is separated from the existing building by a minimum 1 hour fire-rated separation.

(c) Where a firewall is provided between the new addition and the existing building, the fire protection water supply may be determined in accordance with Items 1(a) and 3(a), using only the building volume of the new addition.

**Note: Consideration should be given to designing the water supply to the more stringent requirements of the two separated buildings.**

## TABLE 1
## WATER SUPPLY COEFFICIENT – K

| TYPE OF CONSTRUCTION | Classification by Group or Division in Accordance with Table 3.1.2.1 of the Ontario Building Code | | | | |
|---|---|---|---|---|---|
| | A-2<br>B-1<br>B-2<br>B-3<br>C<br>D | A-4<br>F-3 | A-1<br>A-3 | E<br>F-2 | F-1 |
| Building is of noncombustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, including loadbearing walls, columns and arches. | 10 | 12 | 14 | 17 | 23 |
| Building is of noncombustible construction or of heavy timber construction conforming to Article 3.1.4.6. of the OBC. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating. | 16 | 19 | 22 | 27 | 37 |
| Building is of combustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, including loadbearing walls, columns and arches. Noncombustible construction may be used in lieu of fire-resistance rating where permitted in Subsection 3.2.2. | 18 | 22 | 25 | 31 | 41 |
| Building is of combustible construction. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating. | 23 | 28 | 32 | 39 | 53 |
| Column 1 | 2 | 3 | 4 | 5 | 6 |

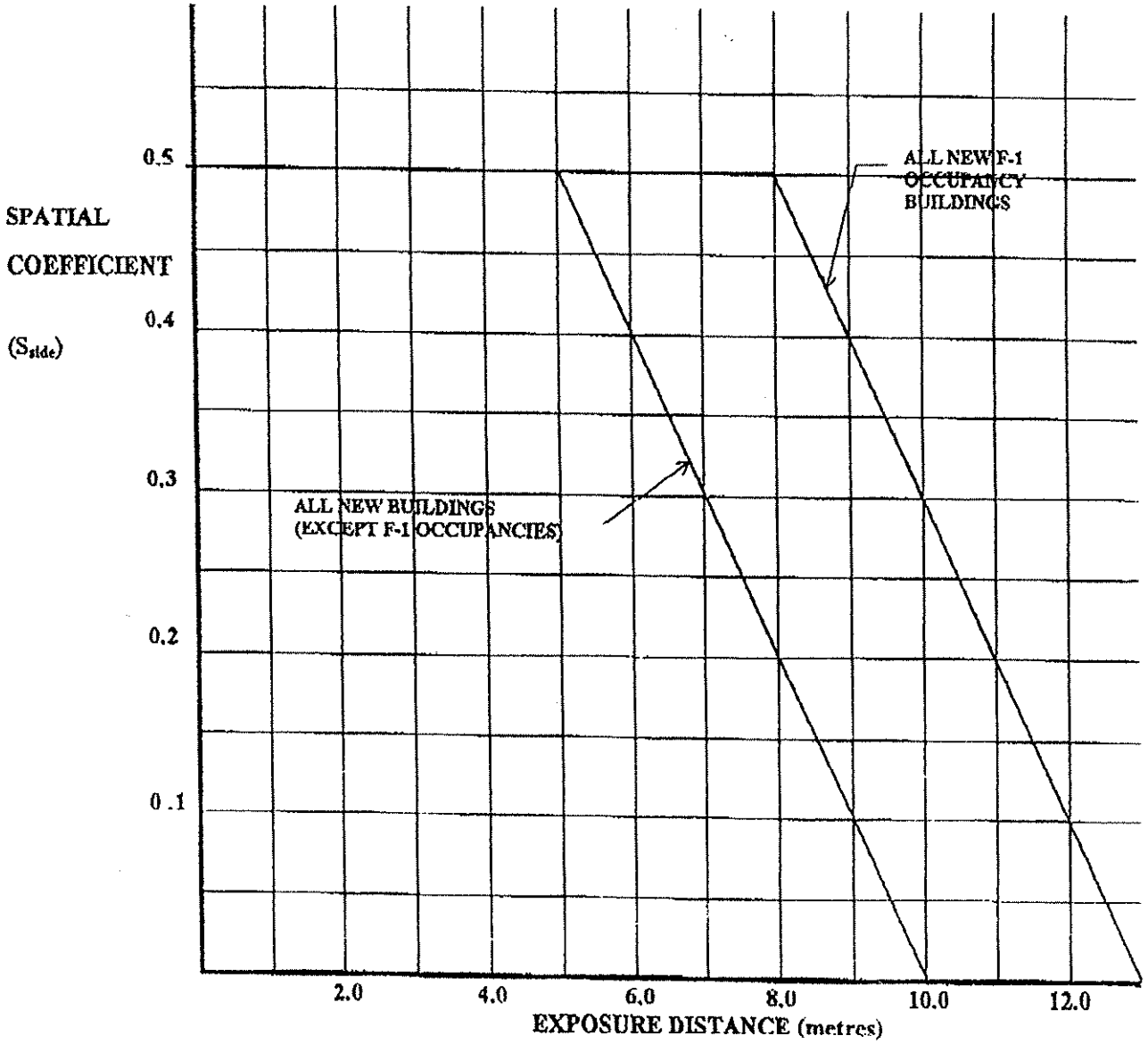
## TABLE 2
## MINIMUM WATER SUPPLY FLOW RATES

| OBC Part 3 Buildings | Required Minimum Water Supply Flow Rate (L/Min.) |
|---|---|
| One-storey building with building area not exceeding 600m² (excluding F-1 occupancies) | 1800 |
| All other buildings | 2700 (If Q ≤ 108,000L)[1]<br>3600 (If Q > 108,000L and ≤ 135,000L)[1]<br>4500 (If Q > 135,000L and ≤ 162,000L)[1]<br>5400 (If Q > 162,000L and ≤ 190,000L)[1]<br>6300 (If Q > 190,000L and ≤ 270,000L)[1]<br>9000 (If Q > 270,000L)[1] |

Note [1] $Q=KVS_{tot}$ as referenced in Item 3(3)

## FIGURE 1

SPATIAL COEFFICIENT VS EXPOSURE DISTANCE



# EXPLAINING THE CALCULATIONS

**Q1 What is the "K" factor and how were these values developed?**

The K factor, also known as water supply coefficient, is a value that takes into account typical compartmentalization of buildings, combustibility of construction, combustible loading of the building occupancy and evacuation responses by the building occupants.

These factors were developed using the "occupancy hazard classification numbers" and "construction classification numbers" in NFPA 1231, adjusting them to fall within the occupancy classifications of buildings within the Ontario Building Code, and then modifying them so that the final units of the equation are in litres. Table 1 of this guideline lists K values according to type of construction and occupancy classification.

**Q2 What volume is included in "V"?**

All spaces below and above grade within a building, measured to the underside of the roof deck, should be included in the volume (cubic metres) for the fire protection water supply formula. An exception may be made to exclude a non-combustible crawl space (with no combustible services) below a non-combustible floor, located under the lowest building floor area, if it will not be developed in the future or used as a storage area.

**Q3 How are "exposures" measured?**

Exposure distances from a new building will be measured from the exterior building faces to the property lines of that building. The distance from the face of the building to the property line shall be determined as per OBC 3.2.3.1.(3). When facing a street, the property line shall be deemed to be the centre of the street.

When facing an existing building (exceeding 10 m² in building area) on the same property, the exposure distance (for use in Figure 1) shall be the greater of either the "limiting distance" of the new building face as obtained in OBC 3.2.3.1.(1), or the mid-point between the two buildings.

**Q4 How are spatial coefficient values obtained from Figure 1?**

Once the exposure distance for each building face has been determined, these values can be located along the horizontal arm at the bottom of Figure 1. By following straight up from these points the graph line may be intersected providing a spatial coefficient value ($S_{side}$) along the left vertical arm of Figure 1. Exposure distance values of at least 10 m. (except F-1 occupancies which require a minimum of 13.0 m) result in a spatial coefficient value of 0.

**Q5 How are multiple exposures calculated?**

Where a new building has exposures on more than one side, the percentage increase in the fire protection water supply due to the exposures on each side should be totaled to reflect all exposure protection requirements. [e.g. if exposure to one side results in a 50% increase in water volume (i.e. $S_{side1} = 0.50$), and exposure to another side results in a 25% increase in water volume (i.e. $S_{side2} = 0.25$), then the total increase in water volume for exposure protection is 75%. The totaled spatial coefficient ($S_{tot}$) is then

**Q6 What is the rationale for the minimum 30 minute water supply duration and what new buildings will be most affected by this requirement?**

The minimum 30 minute fire protection water supply duration requirements as stated in Item 3(b), recognizes life safety concerns by providing a dependable and immediately available fire protection water supply for the fire department's use. It is intended that the duration be long enough to allow complete search and rescue of any building by the fire department. This minimum fire protection water supply should also give the fire department a reasonable opportunity to control and/or extinguish a small fire upon their arrival, thereby preventing its growth and spread to adjacent buildings and limit any negative environmental impact. This minimum 30 minute duration requirement also allows a reasonable time for the fire department to arrange for supplementary water supplies using a water shuttle system for most buildings.

Concerns for minimum fire protection water supply volumes are mostly relevant for building sites not serviced by municipal water supply systems, where an on-site fire protection water supply has to be provided. Building sites serviced by municipal water supply systems will usually be provided with sufficient water volumes for their fire protection needs. The guideline focuses on water supply flow rates at minimum pressures for these buildings. It should be noted however that some municipalities have fairly limited water supply storage capacities and should therefore be evaluated when a new "high demand" building is to be constructed.

**Q7 How do exterior 2 hr. rated masonry walls with parapets and no unprotected openings and interior firewalls influence exposure, and thus water supply calculations?**

Interior firewalls and exterior masonry walls fire-rated for 2 hours, with parapets and no unprotected openings, are expected to remain in place during the period that fire exposure is greatest. Exposure to adjacent buildings is reduced to a point where additional exposure protection water may not be needed.

Judgment by the Chief Building Official should be used in determining the design of exterior 2 hour fire-rated masonry walls and interior firewalls with regard to exposures. The usual 6 inch parapet may not be considered adequate exposure protection where a new building exposes a much higher existing building in close proximity. Rather than having to increase the water supply due to exposure, a higher parapet may be sufficient protection. In situations where parapet design or other exposure protection methods do not provide adequate exposure protection for the existing building, then additional exposure fire protection water may be required.

Where firewalls divide a new facility into separate buildings, the fire protection water supply should be sized to the building with the greatest water supply demand.

**Q8 What would be the impact on fire protection water supply requirements for a new building if an existing exposed property has its own on-site fire protection water supply?**

Where a new building exposes an existing property provided with its own independent on-site fire protection water supply, the Chief Fire Official may deduct this water supply from the quantity needed by the new building due to this exposure. This neighbouring water supply should be accessible to the fire department to protect exposed buildings.

The Chief Fire Official should be satisfied that the two property owners will properly maintain their respective fire protection water supplies for the life of their buildings. This agreement may require approval from the municipality and may be subject to criteria provided by the Building Code Commission.

# FURTHER EXPLANATION OF GUIDELINE REQUIREMENTS

**Q1 Regarding sprinklered buildings, where in NFPA 13 are hose stream requirements specified?**

NFPA 13 contains the hose stream requirement for sprinklered buildings in the "Occupancy Hazard Fire Control Approach" section (in Chapter 5 of 1992 to 1998 NFPA 13 edition). Within, is a table entitled "Hose Stream Demand and Water Supply Duration Requirements". This table provides total inside and outside hosestream requirements and duration for each hazard classification of sprinkler system design.

A sprinkler contractor designing a sprinkler system for a building will determine the minimum water supply requirements for the sprinkler system. Using the duration period obtained from the above referenced table, the contractor will add the sprinkler and hose stream requirements and calculate the total fire protection water supply required for the building.

**Q2 Where new additions are added to existing buildings that do not have an on-site water supply, what volumes of water are considered adequate for life safety and exposure?**

Whereas Part 11 of the OBC indicates that only the addition to an existing building is required to conform to OBC Part 3, this might in reality not be adequate to deal with life safety and exposure where fire protection water supply needs are concerned.

When an addition is added to an existing building and water supply calculations are based only on the volume of the addition, the fire protection water supply provided on-site might not be adequate to allow full search and rescue throughout the entire building. As well, exposure to neighbouring buildings from the new addition may not be reflective of the nature and size of a potential fire in the enlarged building. Calculations using the entire volume of an expanded building therefore are the only accurate indication of fire protection water supply needs.

**Q3 Does this guideline apply to buildings that are being renovated under Part 11 of the Building Code?**

Part 11 of the Building Code should be reviewed to determine the conditions under which Article 3.2.5.7. applies. This is found in the Compliance Alternative tables in Part 11.

Where Article 3.2.5.7. does apply, the existing water supply should be evaluated to determine if it is sufficient for the renovated building. Some discretion may be used by the building official if the water supply for the renovated building is not significantly greater than the existing water supply.

# SPECIAL CASES

**Q1 Can water transported by the fire department be satisfactory to protect small buildings?**

Smaller buildings of 2 stories or less and with a building area of 200m$^2$ or less, may be adequately protected by a fire department using proper pre-planning methods and transported fire protection water supplies. NFPA 1231, "Standard on Water Supplies for Suburban and Rural Fire Fighting", provides methods to assist the fire department with this pre-planning. Where the fire department does not have the equipment necessary for a proper water shuttle system to adequately protect these smaller buildings as per NFPA 1231, an on-site fire protection water supply should be considered.

**Q2 What extra precautions, if any, should be taken for institutional occupancies?**

Buildings with Group B, Division 1, 2 and 3 occupancies should be treated in a special manner with respect to fire protection water supplies. The occupants of these buildings require direct supervisory assistance for phased evacuation during a fire. This could result in a prolonged search and rescue by the fire department. If this type of building is located in areas not serviced by municipal water mains, the fire protection water supply that the fire department is capable of transporting to the site may not be adequate for the duration of this search and rescue period. Only a properly sized on-site fire protection water supply will provide the hose stream duration that the fire department needs. Alternatively, sprinkler protection could be provided.

**Q3 What provisions should be made where fire department response is slow or nonexistent?**

For new buildings constructed in areas where fire department response is not expected in a reasonable time, the building should be sprinklered to help ensure safe evacuation. In locations where a fire department pumper truck is not provided, consideration should be given to installing a private water supply capable of providing a minimum 700 kPa (100 psi) water pressure at the required flow rate to permit fire fighters or other persons trained in the use of fire hoses, to effectively use a "fog-nozzle" hose spray on the fire. This type of hose spray is most effective at controlling fires. Alternatively, sprinkler protection could be provided.

**Q4 How should an outdoor reservoir be designed to take into account ice formation?**

When designing an open, unheated reservoir to provide a fire protection water supply as required in this guideline, a 600 mm ice depth allowance should be included in the water volume calculations. Where local winter temperature conditions result in a greater ice depth (as typically found on local lakes or ponds), this should be factored into the volume calculations.

**Q5 What provisions should be made to ensure that water reservoir supplies do not drop to unsafe levels as a result of evaporation or leakage?**

A make-up water supply should be provided to maintain the design volume of fire protection water supply reservoirs. Storage tanks should be provided with limit switches, pressure gauges or water-level gauges to monitor volume.

If make-up water supply for open water supply reservoirs is provided by natural refill methods (i.e water table seepage) and periods of drought are common, the reservoir capacity should be increased to take into account the reduced water table levels expected from the evaporation of water.

**Q6 What standards should be used to provide an acceptable water supply design?**

Tanks should conform to NFPA 22, "Water Tanks for Private Fire Protection", and the local fire department should be consulted to determine appropriate connections for their pumping equipment.

Fire main installations should conform to NFPA 24, "Private Fire Service Mains and Their Appurtenances".

On-site fire pump installations should conform to NFPA 20, "Standard for the Installation of Centrifugal Fire Pumps".

Sprinkler standards other than NFPA 13, "Standard for the Installation of Sprinkler Systems", such as NFPA 13D, "Installation of Sprinkler Systems in One- and Two-Family Dwellings and Mobile Homes", and NFPA 13R, "Installation of Sprinkler Systems in Residential Occupancies Up To and Including Four Stories", may be used where appropriate for the type of building covered by these standards. These other standards should be acceptable to the local jurisdictional authority.

For new buildings that present a special hazard to a community as a result of their size, occupancy or economic importance, the Fire Underwriters Survey Guide should be used to determine suitable water supply and hydrant siting.

### Q7 For evaluation of the fire protection water supply and associated fire hydrants, are there other considerations in addition to those set out in the OBC?

Impounded fire protection water supply for a remote building shall be accessible to the fire department to allow the use of suction lines for drafting either directly from the impounded water source, or from a dry hydrant supplied from the impounded water source. This water source or hydrant shall be located in adherence to OBC 3.2.5.7.(2).

Where at least two widely separated private fire hydrants are required to protect a building and water is to be supplied from a single on-site fire protection water supply (e.g. reservoir), it is acceptable to provide a fire department pumper connection adjacent to the water supply to allow a pumper truck to pump into an underground "dry" main feeding the two remote hydrants. This arrangement permits fire fighters to attach hoses directly to the hydrants or to use a second pumper truck to draw boosted water from these hydrants.

Existing water flow test information obtained to determine the adequacy of the municipal or private water supply for fire protection of a new building should be evaluated with regard to how dated the test information is, whether the flow test was conducted during high or low demand periods, and the possibility that future development in the area will significantly affect the supply. A current hydrant flow test at the proposed construction site will provide the most accurate information.

When dealing with new buildings serviced by municipal or industrial pressurized fire protection water systems, this guideline specifies a minimum water flow rate at 140 kPa pressure. The 140 kPa pressure is the accepted minimum that most fire departments will allow service mains to be drawn down to. Water main and/or booster pump damage could occur from cavitation at pressures below this level.

### Q8 Can this guideline be used for Part 9 of the OBC?

The OBC does not currently require that Part 9 buildings be provided with an adequate water supply for fire fighting. However, this guideline may be used on a voluntary basis to provide a suitable fire protection water supply for these buildings.

The Water Supply Adequacy Committee recommends that an on-site fire protection water supply as required by this guideline be provided for multi-unit residential (Group C) type buildings (i.e. hotels, motels, apartments, townhouse complexes, etc.) that fall within Part 9 of the OBC. These buildings inherently have delayed building evacuation, resulting in more extensive search and rescue operations, and will likely benefit from an on-site fire protection water supply.

**Q9 How are standpipes and hose systems affected by these requirements?**

Where a building requires a standpipe and hose system per the OBC, the standpipe system should continue to be designed to Article 3.2.9.2. The standpipe will draw from the required water supply specified in this guideline, still leaving a significant fire protection water supply for exterior hose stream use.

**Q10 Can the water supply requirements of this guideline be reduced in buildings with an established fire safety plan that can ensure a rapid building evacuation?**

Elementary and secondary schools have a record of well established and practiced fire safety plans which allow complete school evacuations within 4 minutes. Because of this and the inherent high level of supervision in these types of facilities, a reduction of up to 30% in the fire protection water supply requirements as set out for unsprinklered buildings in this guideline may be given. However, caution should be used if the duration of water supply is reduced to less than 30 minute, unless other compensating features are also provided.

Other considerations to keep in mind should include disabled students and teachers that are being introduced into the general school population. A delayed evacuation may be expected for them. This could result in prolonged search and rescue operations by the fire department and should be considered when determining water supply reductions.

**Q11 Can the water supply requirements of this guideline be reduced if alternate fire suppression methods are proposed?**

Alternate fire suppression methods may result in reduced water supply requirements when compared to design parameters set out in this guideline. Questions should be directed to the local authority that has jurisdiction over these matters.

Alternative fire suppression methods being considered for allowing a reduction in the water supply requirements of this guideline are, foam/water extinguishing systems, carbon dioxide extinguishing systems or dry chemical extinguishing systems. Exterior water curtain (deluge) systems may be considered in lieu of fire protection water supply requirements for exposure purposes.

## WATER SUPPLY ADEQUACY COMMITTEE

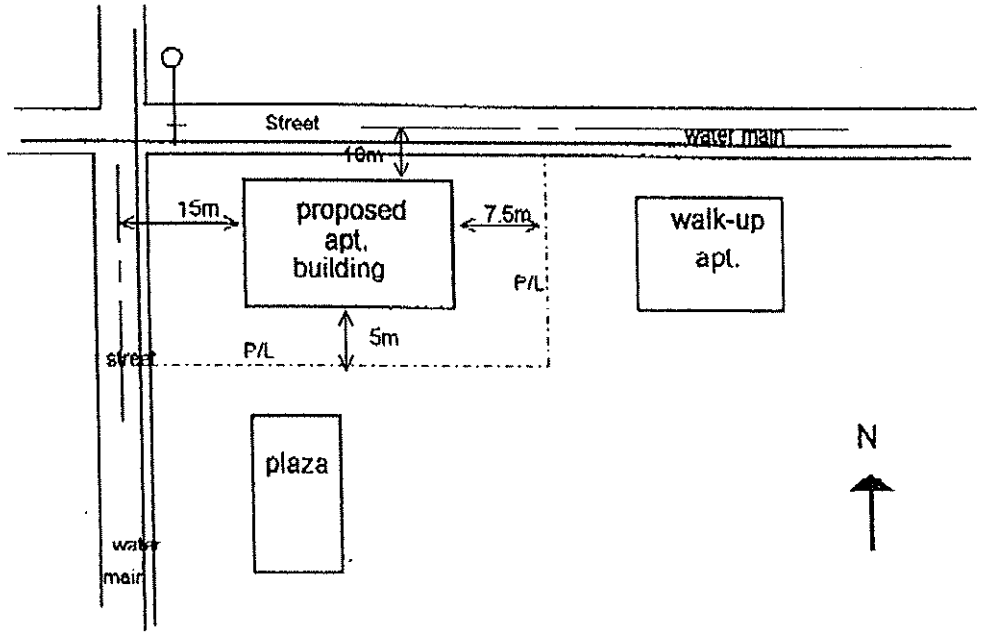
Kim Bailey - Office of the Fire Marshal
John Braun - American Water Works Association
Roy Chalk - Ontario Municipal Fire Prevention Officers Association
Steve Penna - Ontario Building Officials Association
David Shantz - Municipal Engineers Association
Tom Eyre - Ontario Municipal Water Association
Don Livingston - Ministry of Housing, Buildings Branch
Ed Coe - Insurers Advisory Organization
Chief Tom Powell - Ontario Association of Fire Chiefs

# EXAMPLE PROBLEMS

## PROBLEM #1

A new apartment building is to be constructed in your municipality. The building will measure 30m by 25m, with 3m between floors, and consists of 3 storeys plus a basement used for storage and laundry facilities. Parking will be outside. The building is to be of combustible construction and is to conform to 1997 OBC 3.2.2.47. An attic space is also provided in this building with a 750m$^3$ volume. A 30 min. fire separation is provided between the 3rd floor and the attic space. The building is not to be sprinklered nor provided with a standpipe system.

The building is located on a corner lot and faces 2 streets (see diagram). Property lines are located 5m to the south and 7.5m to the east of the proposed building. All of the buildings are serviced by municipal water mains and hydrants. What is the required minimum flow rate of the municipal main for an adequate fire protection water supply?



## SOLUTION - PROBLEM #1

**(1) Determine building classification**

*-residential apartment is Group C*

**(2) Check parameters of Item 1(a) to determine whether building requires an on-site water supply.** *- building exceeds 200m², has two stories with significant combustibles and is not a Part 9 building, therefore needs water supply evaluation*

**(3) Calculate $Q=KVS_{Tot}$**

*(i) determine K*

*- from Table 1, based on building construction and classification, the water supply coefficient K=18*

*(ii) calculate the building volume, $V= L \times W \times H$*

*- use total height of building, 3 storeys plus basement, and attic space (750m³).*
*(3m between floors x 4 floors =12m)*
*$V=$ (30m x 25m x 12m) + 750m³ = 9750m³*

*(iii) Determine $S_{Tot}$ from Figure 1*

*- consider each side of the building:*
*- the north and west sides of the building each face a street and the distance to the centre of the streets exceed 10m, so $S_{Side}$ will be equal to 0.0 on both sides.*
*- the property line is 5m to the south of the building. From Fig. 1, $S_{Side}$ is equal to 0.5, meaning that a 50% increase in the volume of water will be required to protect this side.*
*- the property line to the east of the building is 7.5m. From Fig. 1, $S_{Side}$ is equal to 0.25, meaning that a 25% increase in the volume of water will be required to protect this side.*
*-therefore, because of the exposure on the south and east sides of the building, it will be necessary to increase the total volume of the water by 75% ( the sum of all the spatial coefficients from each side ).*

*i.e.* $S_{Tot}$ = 1+ (total of spatial coefficients)
= 1+ ( 0.5 + 0.25 )
= 1.75 (Note: $S_{Tot}$ need not exceed 2.0)

*therefore,* $Q = KVS_{Tot}$
$= 18 \times 9750 \times 1.75$
$= 307,125$ litres

**(4) determine the water supply flow rate**

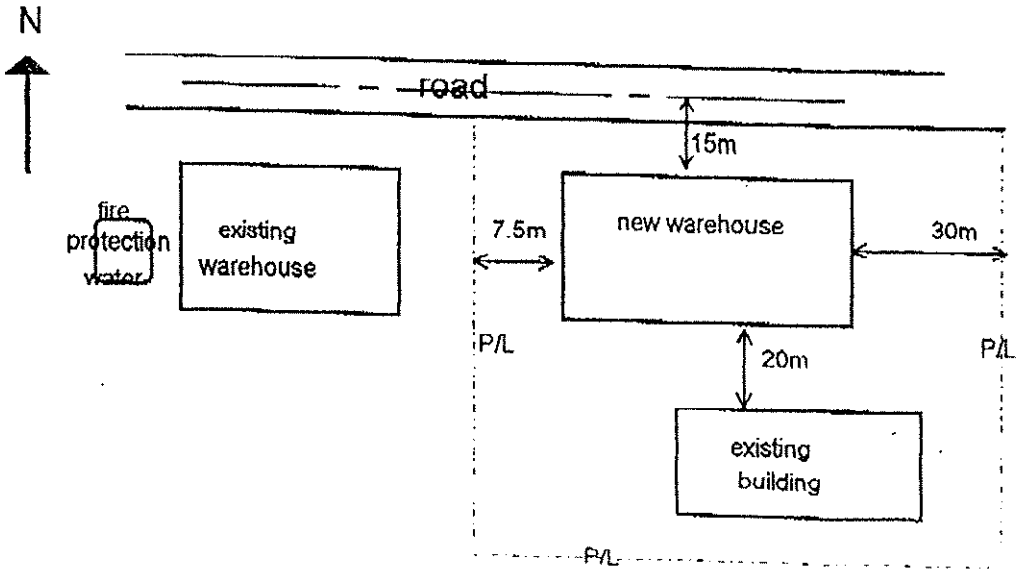
*- from Table 2, since the building either exceeds 1 storey or its area is greater than 600 m², and the calculated Q is greater than 270,000 litres, the required minimum water supply flow rate from the municipal system would be 9000 L/Min.*
*- this flow rate is required at 140 kPa in accordance with Item 3(b).*

## PROBLEM #2

A single storey warehouse and distribution center, classified as a low industrial hazard occupancy, is to be built in an area not serviced by a municipal water supply. The building is to be 1500 m² in area, 4 metres high and of noncombustible construction conforming to Subsection 3.1.5. of the Ontario Building Code. This building falls within 1997 OBC 3.2.2.80. Storage commodities vary, but in general are farm implements in wood crates.

The warehouse faces one street to the north, with property lines 30m to the east and 7.5m to the west. An existing building is located on the same property and will be 20m to the south of the proposed new warehouse. The new warehouse building will have 10% unprotected openings in its south face.

There is a similar type warehouse that has its own 20,000 litre on-site fire protection water supply located to the west. This water supply is determined by the fire department to be reliable and accessible. How much water will be required on site for fire protection of the proposed building?



## SOLUTION - PROBLEM #2

**(1) Determine building classification**

*proposed low hazard warehouse building is Group F-3*

**(2) Check parameters of Item 1(a) to determine whether building requires an on-site water supply.**

*building is a Part 3 building as it exceeds 600 m² in area and has a significant combustible loading, therefore needs on-site water supply*

**(3) Calculate $Q=KVS_{Tot}$**

*(i) determine K*

*- from Table 1, based on building construction and classification the water supply coefficient K=19*

*(ii) calculate the building volume, V= Area x H*

$= (1500 \times 4) = 6000\ m^3$

*(iii) Determine $S_{Tot}$ from Figure 1 by considering each side of the building:*

*- on the east side of the proposed building the distance to the property line exceeds 10 meters so no increase in water volume is necessary.*

*- the proposed building faces a street on the north side with distance to the center of the street 10 meters away. No increase in the water volume will be required due to lack of exposure on this side.*

*- the proposed building faces an existing building on the same property, 20m to the south. The 10% unprotected openings in the south building face of the proposed building results in a "limiting distance" of 2.5m using Table 3.2.3.1.A. of the OBC. Since the midpoint between the two buildings on the same property (10m) is greater than the limiting distance of the south face of the new building, the 10m is deemed the exposure distance. No increase in water volume will therefore be needed from exposure on this side.*

*- the property line to the west is 7.5 meters from the exterior wall, which means a 25% increase in the volume of water to protect the property on that side. However, the neighbour's warehouse has its own reliable 20,000 litre fire protection water supply, so this can be used to reduce the exposure needs. Exposure calculations should be completed to evaluate the neighbouring water supply, therefore,*

$S_{Tot} = 1 +$ total of spatial coefficients

$= 1 + (.25) = 1.25$

*and, $Q = KVS_{Tot}$*

$= 19 \times 6000 \times 1.25 = 142{,}500$ litres

*Of this amount, 28,500 litres (142,500 - 114,000 = 28,500) is required for exposure, of which 20,000 litres is already provided on the exposed property. Therefore an additional 8,500 litres should be added to the on-site water supply to make up the shortfall in exposure protection. Therefore, Q= 122,500 litres (114,000 + 8,500 = 122,500).*

**(4) determine the water supply flow rate**

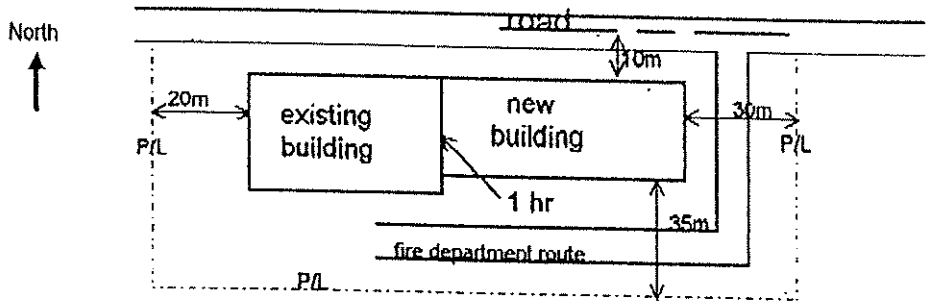
*- from Table 2, since the building area exceeds 600m² and the calculated Q is greater than 108,000 litres but less than 135,000 litres, the required minimum water supply flow is 3600 L/Min. However, in accordance with Item 3(b) it must also be confirmed that 3600 L/Min. can be flowed for a minimum 30 minutes. Since a 34 min. duration is achieved (122,500 ÷ 3600 = 34 min.), this is satisfactory.*

## PROBLEM #3

An existing 400 $m^2$ single storey (with basement) school is being provided with a 400 $m^2$ addition of noncombustible construction. The existing building is of combustible construction with a 45 min. rated roof and basement ceiling (structural supports rated as well), while the new addition is of noncombustible construction as well and meets the requirements of 1997 OBC 3.2.2.25. Both the new and existing buildings are provided with full basements, 2.5 m. in height. The ground floor has a ceiling height of 3.0 m. An attic space is provided in both buildings, each with volume of 800 $m^3$. A 1 hr. fire rated separation is to be provided between the new and existing structures.

No water mains or hydrants are located in the area. A hose standpipe is voluntarily being provided throughout the entire building, with a booster pump. Distances to the property lines are as indicated on the accompanying sketch. An all volunteer fire department with limited equipment is located within 20 min. of the building site.

What size pond is needed on site (assuming no freezing temperatures), to ensure minimum life safety requirements?



## SOLUTION - PROBLEM #3

**(1) Determine building classification**

*- school building is Group A-2*

**(2) Go to Item 4(a) of the water supply guideline. Item 4(b)(iii) indicates that a single storey, noncombustible addition with an assembly occupancy, up to 400m² in building area, with no combustible storage or process and separated from the existing building by a minimum 1 hr. fire separation would not require additional water supplies for fire fighting purposes.**

**(3) The local jurisdictional authority however, may also wish to take into consideration the ability of the local fire department to provide an effective water supply shuttle system to this school by using NFPA 1231 as a guide. If equipment is not available to provide effective amounts of water supply, then an on-site water supply may be the best choice. Note that this is what Item 1(a)(ii) is alluding to.**

**(4) If an on-site water supply is chosen, it may be sized by calculating $Q = KVS_{Tot}$**

*(i) although OBC Part 11 would only size the on-site water supply to the addition, the fire department should determine if this is sufficient for their search and rescue needs.*

*(ii) assuming the entire building volume is selected to determine Q, determine K*

*- from Table 1, based on building construction and classification the water supply the existing building has a coefficient K=18 and the new addition has a coefficient K=16.*

*(iii) calculate the building volume, V=L x W x H*

$V_{Existing} = (400 \times 3) + (400 \times 2.5) \div 800 = 3000\ m^3$

$V_{Addition} = (400 \times 3) + (400 \times 2.5) \div 800 = 3000\ m^3$

*(iv) Determine $S_{Tot}$*

*- From Figure 1, since no property lines are less than 10 m away, all Ssides = 0.0, therefore no addition water volume is needed for exposures. ∴ $S_{Tot}=1.0$*

$Q = KVS_{Tot}$

$= (KVS_{Tot})_{Existing} + (KVS_{Tot})_{Addition}$

$= (3000 \times 18 \times 1.0) + (3000 \times 16 \times 1.0)$

$= 102{,}000$ litres

This is the required pond size, assuming a means to maintain the water level and no freezing concerns. Note that Item 3(d) also allows a reduction in the water supply and flow rate for schools. This reduction may not be considered due to the all volunteer fire department with limited equipment.

**(5) determine the water flow rate**

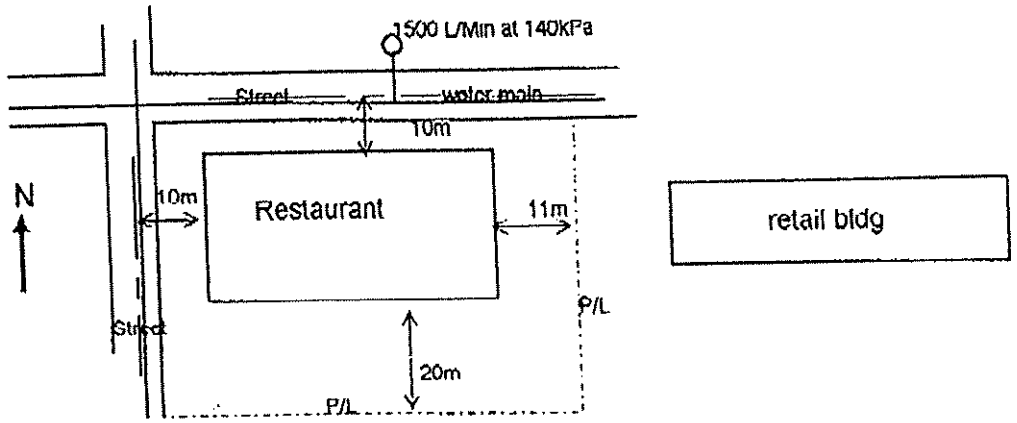
*- from Table 2, since the building area exceeds 600m² and the calculated Q is less than 108,000 litres, the required minimum water supply flow is 2700 L/Min. However, in accordance with Item 3(b) it must also be confirmed that 2700 L/Min. can be flowed for a minimum 30 minutes. Since a 38 min. duration is achieved (102,000 ÷ 2700 = 38), this is satisfactory. Note if the water supply was sized to only the addition then a 54,000 litre pond, allowing a 30 minute duration at a flow rate of 1800 L/Min. would be required. However, at 2700 L/Min., which is a reasonable flow rate for the entire structure, this provides only 20 min. duration.*

## PROBLEM #4

A 300 m² single storey restaurant is to be constructed of noncombustible construction in a town with a marginal water supply due to old mains and poor gridding. The municipal water reservoir is sized for 1.0 million gallons. The building will have a 3.5 m. high ceiling. No hose standpipe or sprinklers are planned.. Is the existing street supply adequate?

Property lines are located 11m to the east and 20m to the south. Street centre line distances are 10m to the north and west.

The fire department routinely arrives at a fire scene in this part of town with a tanker/pumper truck carrying enough water (4500 litres) for two 38 mm hoses adequate for 5 minutes of discharge. The hydrant at the street can provide 1500 L/Min. at 140kPa.



## SOLUTION - PROBLEM #4

### (1) Determine building classification

*-restaurant building is Group A-2 occupancy.*

### (2) Check parameters of Item 1(a) to determine whether building requires an on-site water supply.

*-building falls within Part 3*
*-building area is more than 200m² and is not an F-3 occupancy.*

### (3) Compare existing water supply with required water supply

*- as the building is ≤ 600m², the required water supply flow rate from Table 2 for this size building is 1800 L/Min.*
*-provided public water supply from hydrant at street is 1500 L/Min at 140kPa (adequate volume of supply)*
*-transported water supply by fire department is 4500 litres.*
*-the required water supply shortfall from public supply only is (1800 -1500)=300 L/Min. The transported water supply by the fire department will last 15 minutes if used at a flow rate of 300 L/Min (4500/300=15 min.) to make up shortfall from the public supply.*

### (4) Solutions to make up water supply shortfall

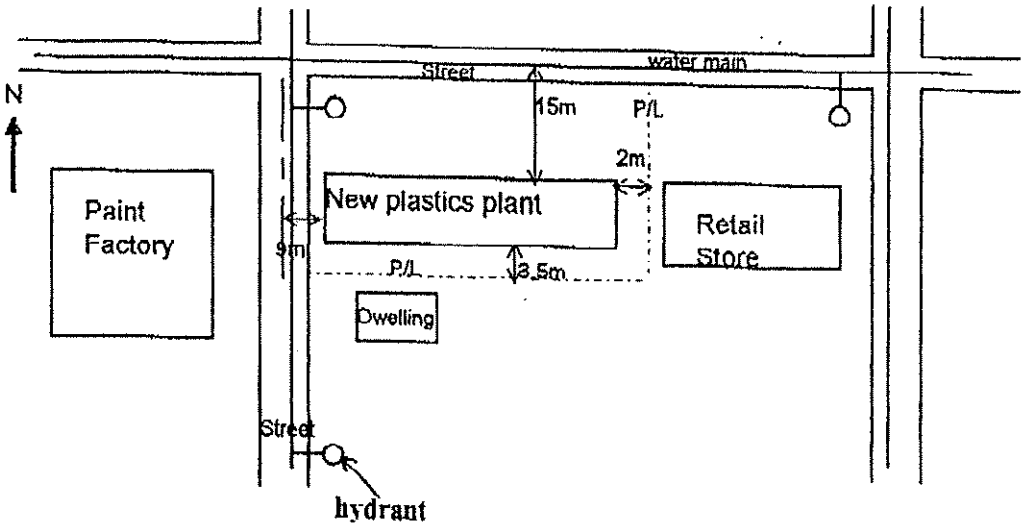
**Option #1** - *as the total water supply that is deemed adequate for this new building is 1800L/Min x 30min.= 54000 litres, and the provided water supply is (1500x30)+ 4500 = 49500 litres, then require an additional on-site water supply of 4500 litres*

**Option #2** - *provide an additional transportable water supply source (i.e. tanker truck) of 4500 L.*

**Option #3** - *the Chief Fire or Building Official may determine that 1650 L/Min is satisfactory based on building occupancy and layout, and the restaurant's fire safety plan. The Chief Fire or Building Official may also determine that "life safety" is no longer a significant concern after 15 minutes in this type of occupancy and the remaining public water supply is satisfactory for exposure concerns.*

## PROBLEM #5

A new 4 storey plastics extrusion plant (F-2 occupancy) is being constructed in a town with a marginal water supply. The flat-roofed building will cover a 500 m² area and be 12.0 m. in overall height. Construction is to be combustible and in conformance with 1997 OBC 3.2.2.70. The roof and floor separations have a fire-resistance rating of 45 min. Exposure includes property lines 2m and 3.5m away and street centre lines 9m and 15m away to the west and north. What is the required water supply from the street mains for this new building?



## SOLUTION - PROBLEM #5

**(1) Determine building classification**

*-Group F-2 occupancy*

**(2) Check parameters of Section (1) to determine whether building requires an on-site water supply.**

*-building is a Part 3 building as it meets dimensional parameters (i.e. more* than 3 stories)

**(3) Calculate $Q=KVS_{Tot}$**

*(i) determine K*

*- from Table 1, based on building construction and classification, the water supply coefficient K=31*

*(ii) calculate the building volume, $V= L \times W \times H$*

$= 500 \times 12$

$= 6000m^3$

*(iii) determine $S_{Tot}$ from Figure 1( consider each side of the building) :*

*- the street center line to the north is more than 10m away thereby providing no exposure concerns.*

*- the street center line to the west is 9m away thereby resulting in an $S_{Side}$ of 0.1*

*- the P/L to the east is 2m away resulting in an $S_{Side}$ of 0.5*

*- the P/L to the south is 3.5m away, resulting in an $S_{Side}$ of 0.5*

*- therefore the resulting total of spatial coefficient values is:*

$S_{Tot} = 1 + ( 0.1 + 0.5 + 0.5 )$

$= 1 + ( 1.1)$

$= 2.1$

*(however as $S_{Tot}$ need not exceed 2.0, assume $S_{Tot} = 2.0$)*

*(iv) therefore, $Q = KVS_{Tot}$*

$= 31 \times 6000 \times 2.0$

$= 372{,}000$ *litres*

*-It should be confirmed that the municipal reservoir has this reserve fire fighting water supply capacity.*

**(4) Determine the water supply flow rate**

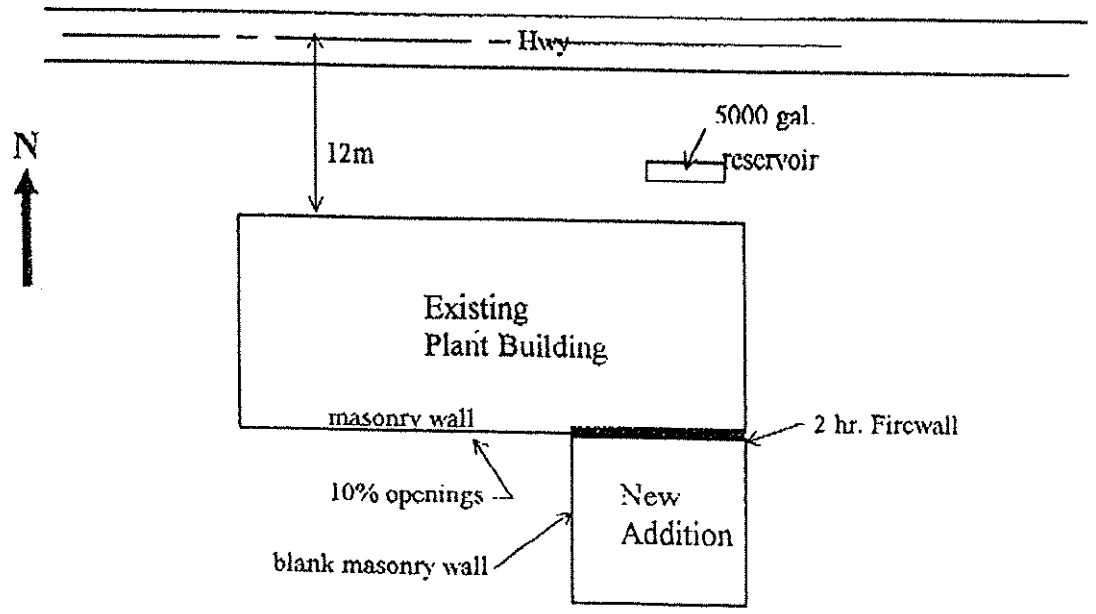
*- from Table 2, this type of building requires a minimum fire protection water supply flow rate of 9000 L/Min at 140kPa. Water flow tests on street hydrants at the building site should confirm this minimum flow.*

## PROBLEM #6

A 200m² single storey flammable liquids storage and paint mixing room is being constructed on the southwest corner of this existing remote 600m², single storey metal parts fabricating and treating plant. The property line is no closer than 60m from the building in the south, east and west directions. The center line of the highway to the north is 12m. An existing 5000 Imp. gal. fire protection water supply is currently provided on-site, with a dry hydrant to provide fire department draft from this reservoir.

The building is located in an area surrounded by agricultural lands used for growing cash crops, and lakes used to provide potable water for the local communities.

The existing building has interior hoses but no sprinklers. The new addition is to be separated from the existing building by a 2 hr. firewall, but is not to be sprinklered. The addition is to be 4m in height and of noncombustible, non-rated construction. The walls of the addition at right-angles to the existing building are blank masonry, while the masonry walls of the existing building at right-angles to the addition has 10% openings. Is the existing water supply sufficient for the addition or the existing building.



## SOLUTION - PROBLEM #6:

**(1) Determine new building classification**

*-Group F-1 occupancy*

**(2) Check parameters of Section (4) for this addition. Item 4(c) deals with firewalls separating additions from existing buildings. Check parameters of Section (1) to determine whether addition requires an on-site water supply.**

*- the addition has an F-1 occupancy and is therefore a Part 3 building. Because the chemical occupancy of the addition may result in a significant adverse environmental potential to the local aquifer, the addition does not fall within Section 1. Therefore check Section (2) and (3).*

**(3) Addition is not to be sprinklered so Section (2) does not apply.**

**(4) From Section (3) calculate Q for the addition using $Q=KVS_{Tot}$**

*(i) determine K*

*- from Table 1, based on building construction and classification, the water supply coefficient K=37*

*(ii) calculate the building volume, $V= L \times W \times H$*

$= 200 \times 4$

$= 800m^3$

*(iii) determine $S_{Tot}$ from Figure 1( consider each side of the building) :*

*- the P/L to the east, west and south exceeds 13m resulting in $S_{Side}$ values of 0 in each direction.*

*- to the north the limiting distance to the south exposed wall of the existing building from the blank west wall of the addition is determined from 1997 OBC 3.2.3.1.(1). Because of the blank masonry wall the limiting distance is 0.*

*- therefore the resulting total of spatial coefficient values is:*

$S_{Tot}= 1+ ( 0 + 0 + 0 + 0 )$

$= 1.0$

*(iv) therefore, $Q= KVS_{Tot}$*

$= 37 \times 800 \times 1.0$

$= 29,600$ litres

**(4) Determine the water supply flow rate**

*- from Table 2, F-1 occupancy buildings require a minimum fire protection water supply flow rate of 2,700 L/Min. The existing on-site fire protection water supply of 5,000 Imp. gal. (22,750 litres) can provide this flow rate for 8 minutes.*

*- Since a minimum 30 minute duration in water supply is needed, an additional 58,250 litres of on-site water supply is needed for the addition to make up the shortfall (81,000-22,750).*

*- The existing building may also be evaluated to see if water supply requirements would be higher. Owner may decide to provide additional water demand if higher.*

Note: Under the OBC the existing building also has to be evaluated to determine the

# APPENDIX 19

# BLACK & McDONALD – HIGH VOLTAGE MAINTENANCE REPORTS DATED AUGUST 1999, REFERENCE NO. 6621

Black & McDonald

*Technical Field Service Department*

31 Pullman Court, Scarborough, Ontario M1X 1E4. Phone: (416)-298-9977 Fax: (416)-298-2907

August 16, 1999

Toronto Zoo
361A Old Finch Ave.
Scarborough, Ontario
M1B 5K7

**ATTENTION:** **Mr. Dean Evans, Electrical Supervisor**

**Subject:** **1999 High Voltage Maintenance**

**Our Reference #:** **6621**

***Dear Sir:***

During June this year, we completed the ***Preventive Maintenance Program*** on the high voltage power apparatus located at your site. This work was carried out to the specifications outlined in tender proposal #48 (98-10).

The following sections are included in the report:

- **Deficiencies and recommendations**
- **Inspection Sheets**

**Intent**

The intent of this program was to evaluate and report on the condition of the high and low voltage equipment in your main and unit substations. This evaluation would detect any problems in their early stages, indicating potential problems in your system that would eventually lead to equipment failure.

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*Technical Field Service Department*

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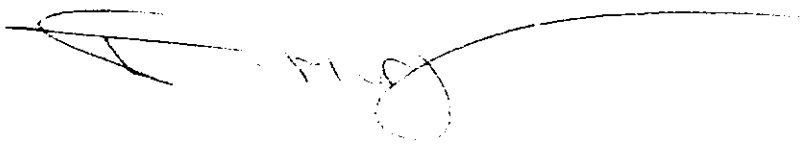
**Findings**

The problem areas together with detailed recommendations can be found in section "A". Detailed information pertaining to any of the deficiencies listed in this section can be reviewed with the individual test sheets compiled in section "B". In-order to avoid any unexpected downtime we would recommend taking the necessary corrective measures listed in section "A".

Should you require any further assistance or information, please do not hesitate to contact our office at your convenience. We thank you for the opportunity to have been of service.

Yours sincerely,

**BLACK & McDONALD LIMITED**



R.P. (Rodger) Morgan

Technical Field Service Division

Black & McDonald

*Technical Field Service Department*

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# "A" DEFICIENCIES & RECOMMENDATIONS

Black & McDonald

*Technical Field Service Department*

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## Deficiencies and Recommendations

## Main Incoming Switchgear

### 1.) Main Feeder "DIP" Pole

**Deficiency:**

The main fuses on this pole were found to be out of co-ordination with the downstream switchgear fuses. Both were sized at an amperage of 150E. Due to the subsequent interruptions caused by cable failures, these have been replaced and the pole-mounted fuses re-sized to 200E.

**Recommendation:**

Review sizing and speed (TCC #) requirements with the supply authority. Ensure stock of these S&C SMU-20 style fuse units for future ready availability.

### 2.) Main 27.6kV Incoming Switch

**Deficiency:**

The Blue/ Cϕ arcing interrupter was found to be defective.

**Recommendation:**

Replace this S&C interrupter unit.

### 3.) Feed to Eurasia Pavilion

**Deficiency:**

The B & C phase interrupters on this switch measure over the readable scale in both positions. They are defective.

**Recommendation:**

Replace these two arcing interrupters.

**4.) All Fused Switch Cells**

**Deficiency:**

Due to the power cable failures and the resulting numerous fuse operations, the spare fuse stock in these feeder cells has been significantly depleted.

**Recommendation:**

Restock the spare fuse inventory.

## North America Pavilion

**5.) Loop Feed to Service Building**

**Deficiency:**

Flash marks were observed on both the left phase barrier and beside the associated lightning arrestor.

**Recommendation:**

Replace the phase barrier and touch up cell as required.

**6.) Paddock Feeders**

**Deficiency:**

Only one spare fuse link is available in the switch/ fuse compartment.

**Recommendation:**

Restock the spare fuse inventory.

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## Entrance/ Administration Building

**7.) Feeder to Village Edge South**

**Deficiency:**

Only one spare fuse link is available in the switch/ fuse compartment.

**Recommendation:**

Restock the spare fuse inventory.

## Africa Pavilion

**8.) Paddock Feeder**

**Deficiency:**

No spare fuse links are present in this feeder cell.

**Recommendation:**

Restock the spare fuse inventory.

**9.) Main Secondary Breaker**

**Deficiency:**

This FPE 75H-2 (s/n. TH-4126-72) 3000 Amp circuit breaker was found to be mechanically problematic. The breaker failed to consistently trip even though the trip bar was fully engaged. The unit was extensively investigated during the maintenance shutdown and repaired to serviceable condition. ***Note that this field repair should only be considered as a temporary fix!***

**Recommendation:**

Because of the nature of the discovered defects, this unit will require thorough stripping and rebuilding/ service. This will require the removal of the circuit breaker from service and may necessitate the installation of temporary generator power as per your needs.

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### 10.) MCC1 Circuit Breaker

**Note:**

Due to the time and personnel involved in investigating of the main circuit breaker, the other smaller breaker designated as "MCC1" was not tested. This unit has been previously reported as problematic and may also need additional servicing.

## Indo-Malaya Pavilion

### 11.) Feeder to Entrance Facilities

**Deficiency:**

The Bϕ cable terminator in this switch cell was found with a top porcelain skirt broken.

**Recommendation:**

The damaged area was sealed with contact cement. No further action is required at the present time.

### 12.) Indo-Malaya Paddock Feeder

**Deficiency:**

The arc interrupter operator (attached to the switchblade) was found to be broken. As a result the interrupter now does not function.

**Recommendation:**

To restore the interrupter's functionality, the entire Load Interrupter switchblade arm will have to be replaced.

**13.) Indo-Malaya Paddock Feeder**

**Deficiency:**

No spare fuse links are present in this cell.

**Recommendation:**

Restock the spare fuse inventory.

**14.) Main Secondary & DP MB Circuit Breakers**

**Deficiency:**

- The front flash barrier is missing on the "Main …" C.B.
- The front flash barriers are cracked on the "DP MB" C.B.
- "DP MB" mechanism was found to be sticking.

**Recommendation:**

- The "DP MB" mechanism was restored to proper operation. No further action is required.
- Replace the flash barriers on both circuit breakers.

## Eurasia Pavilion

**15.) Paddock Feeders (Centre & South)**

**Deficiency:**

The Kirk RE12023 interlock is inoperable due to the switch handle being bent out of position. The switch is still operational.

**Recommendation:**

If full functionality is desired, then the switch handle must be replaced. If this is not a priority, then the switch is presently functional and requires no further action.

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**16.) Paddock Feeders (Centre & South)**

**Deficiency:**

Only one spare fuse link is available in the switch/ fuse compartment.

**Recommendation:**

Restock the spare fuse inventory.

**17.) Eurasia Pavilion Transformer T-1**

**Deficiency:**

The top skirt of the H3 primary bushing was found to be cracked.

Bushing Spec.: Westinghouse T1; DWG. No. 25kV400A; S.O. 544C638G05

**Recommendation:**

The crack was sealed with epoxy. No further action is required at the present time. ***The condition of this bushing should be monitored during subsequent shutdowns.*** Subsequent deterioration will require bushing replacement in this Askarel (PCB)-filled equipment.

## Submersible & Pad-Mount Transformers

**18.) Submersible Transformers (General)**

**Note:**

The majority of the approximately 50 units on site are more than 25 years old. These units are approaching the end of their operational service lives. While no one can accurately predict the exact moment of failure for each unit, recent events have shown that they may fail at any time.

A graduated replacement program should be considered by engineering and procurement staff so as to modernise the existing transformer inventory, and prevent unnecessary downtime caused by failures.

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**19.) Submersible Transformers Oil Levels**

**Deficiency:**

Several of the submersible transformers were observed with the oil level below the manufacturer's recommended fill line. This is likely as a result of there only being a small quantity of oil in the units and them having been sampled on previous occasions.

**Recommendation:**

Purchase a barrel of Voltesso 35 electrical grade insulating oil (or equivalent) to be used to top up the units as needed during future shutdowns. This barrel should be stored in an area where it will be sheltered from elements (moisture, etc.) that can degrade its properties.

**20.) Submersible Vault #1 (Fed from Service Building)**

**Deficiency:**

The "H1B" elbow on this unit (s/n. 871935) was found with burn marks on it.

**Recommendation:**

The elbow and transformer bushing insert should be replaced in the near future

**21.) Submersible Vault #32 (Fed from N. America)**

**Deficiency:**

The manhole gasket on this Red Phase transformer (s/n. 861949) is in poor condition. Improper sealing of the unit can allow the entrance of moisture and degradation of the oil.

**Recommendation:**

Replace this access cover gasket.

## 22.) Interfacial Tension (IFT) Levels

**Deficiency:**

Interfacial tension is a measure of the barrier between the oil and water. A lowering of this level is an indication that oil is beginning to degrade.

A number of the transformers had borderline IFT levels. The worst of these is the Vault #18 unit (s/n. LO721-1), which has a measured level of 18.2 dynes/ cm; the N.E.T.A. standard recommended minimum is 32 dynes/ cm.

**Recommendation:**

The Vault #18 transformer should be sampled again within 6 months both to confirm the initial reading and trend for deterioration.

## 23.) Weston Station

**Note:**

This unit substation was reported to be in poor condition. The station should be shutdown during daylight hours for a thorough evaluation.

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# "B" INSPECTION SHEETS

Black & McDonald

*Technical Field Service Division*
*31 Pullman Court Scarborough, Ontario. M1X 1E4 Phone: (416) 298-9977 Fax: (416) 298-2907*

# *METROPOLITAN TORONTO ZOO*
## *Infrared Inspection Report*

***Prepared For: Dean Evans***
***Date: July 27, 1999***

***Prepared By: Kevin Josephs***
***Our Reference: 6621***

Black & McDonald

*Technical Field Service Division*

*31 Pullman Court Scarborough, Ontario. M1X 1E4 Phone: (416) 298-9977 Fax: (416) 298-2907*

July 27,1999

Metropolitan Toronto Zoo

361A Old Finch Avenue

Scarborough, Ontario

M1B 5K7

**ATTENTION:** Mr. Dean Evans

*Subject:* *Infrared Inspection Report*

*Our Reference:* *6621*

*Dear Sir:*

We have completed your infrared inspection on June 9, 1999. There is list of the areas scanned in this report as well as our findings and recommendations for your review and comment.

Within the report you will find an Infrared Survey Sheet that displays a Thermogram window, below that image there is a **'Profile'** window. This window measures the object's temperature along that line in the form of a line graph.

The deficiencies found during the inspection do not warrant any quotation for parts.

We advise that in our opinion the electrical power apparatus as covered in the report, having been inspected, tested and not yet repaired. Sub-stations located in the Indo & Austraialasia Pavilion appears to be in good condition except what's noted f in the applicable section of this report.

If any questions arise regarding these matters, please feel free to contact the undersigned at any time.

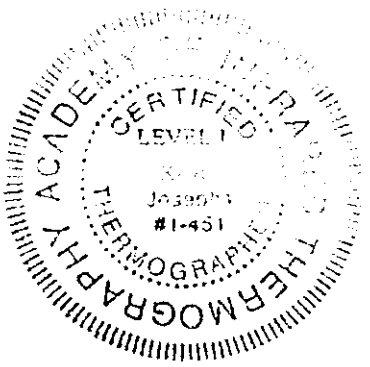
Sincerely,

**BLACK & McDONALD LIMITED**

K. (Kevin) Josephs

Senior Infrared Technologist

Technical Field Service Division



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## *Purpose:*

The purpose of an infrared inspection is to detect heat. Heating is normal in an electrical system since it is caused by the flow of current through a conductor. Therefore, the heat we are searching for is heat, which is abnormal. Unusual heating conditions are caused by several phenomena such as:

- Poor Connections Due To:
  - Looseness
  - Dirt
  - Oxidation
  - Over loading
- Other Conditions Producing Heat Are:
  - Load Imbalances
  - Harmonics

## *Survey Intent:*

It is the intent of this survey to act as a predictive tool in order to detect unforeseen problems in the specified areas of your electrical distribution system. Further, our report will satisfy all requests by your insurance company with respect to the completion of an infrared scanning program.

## *Background:*

Every body emits infrared heat radiation because of its temperature. Infrared Thermovision systems detect the energy and convert it into a visual picture. Infrared radiation is a direct and proportional function of the body temperature and, by utilizing a special feature (Isotherm) on the infrared System, the temperature differentials can be accurately determined.

The isotherm will appear on a visual image as a series of bright green dots, which have a correspondence to a specific temperature reading.

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## *Applications:*

Infrared technology is used industry wide as a preventive maintenance tool. All major power consumers use this type of survey on a regular basis. The cost savings associated with the reduction of preventive maintenance man-hours have proved time and time again to justify the cost of the original survey.

## *Results:*

The results are presented in the form of a video print out of the thermal image as seen by the infrared system operator. A corresponding real life picture of the area in question is also supplied. This allows for easier location of the hot spot, as sometimes it is difficult for the untrained eye to perceive detail from the thermograph.

Technical data relative to the suspect area is also provided. This includes the exact identity of the suspect area and/ or device and/ or component, the load currents, our comments as to the suspected cause and our recommendations pertaining to corrective action.

If the electrical system is operating at 60% of its rated capacity then the following rule of thumb may be used to determine the severity of the condition.

| Temperature Rise | Classification |
|---|---|
| 1 - 10 Degrees Celsius | Minor Problem. Repair At Your Convenience |
| 10 - 35 Degrees Celsius | Intermediate Problem. Repair In The Next Three Months |
| +35 Degrees Celsius | Serious Problem. Make Repairs Immediately |

## *Corrective Action:*

Infrared technology is one of the truly predictive maintenance tools available today. However, it is only as useful as the corrective action taken to remedy problems, which are discovered.

Therefore, when infrared scanning is carried out it should be done during a period of time when the operation of the facility is as high as possible. It should also be carried out in conjunction with and prior to substation maintenance inspections.

In this way detected problem areas can be corrected with a minimum amount of disruption to the normal operation of the facility.

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# *Areas Scanned*

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## *Indo Pavilion*

- *Main Electrical Room*
- *Old Orang Holding*
- *New Orang Holding*
- *Lighting Panel(s) Around Exhibit Area*
- *Gaur Building #1 & #2*
- *MCC Board* ***(Booster Switch & Fan #16 Door Didn't Open)***

## *African Pavilion*

- *Main Electrical Room*
- *Lighting Panel(s) Around Exhibit Area*

## *America's Pavilion Building*

- *Pump Room*
- *Electrical Room*
- *Fan Room*
- *Exhibit Area*

## *Australasia*

- *Main Electrical Room*
- *Boiler Room*
- *Panel(S) Around the Exhibit Area*

## *Education & Main Gift Shop*

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## *Entrance Facilities*

***(Front Office Room Locked)***

## *Animal Hospital Building*

## *North Service Building*

- *Main Floor*
- *Shop Area*
- *Basement*
- *3rd Floor*
- *Main Electrical Room*

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# *Inspection Results and Recommendations*

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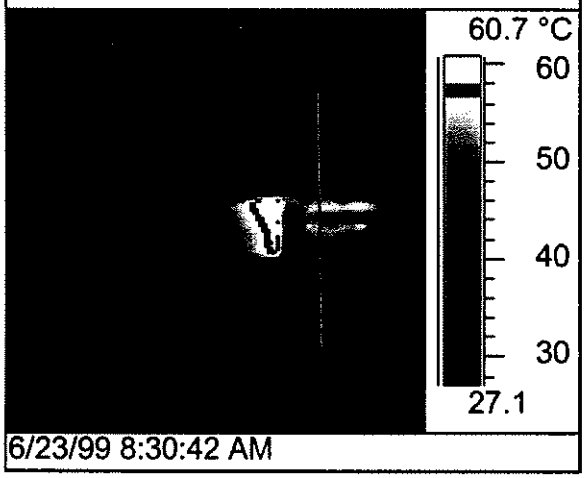
# Infrared Survey Sheet

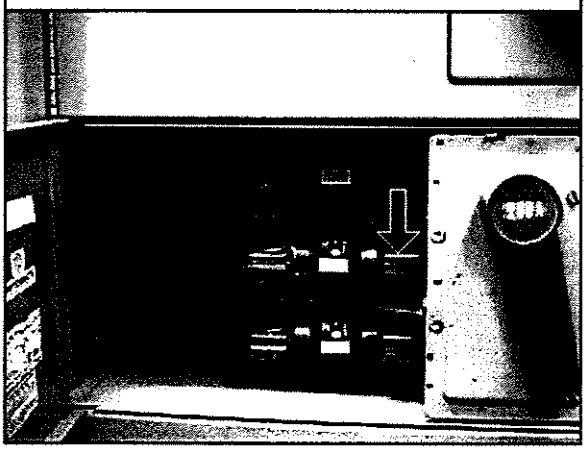
| | |
|---|---|
| **Job No.:** | **6621** |
| **Customer:** | **Metropolitan Toronto Zoo** |
| **Site Location:** | **Toronto, Ontario** |
| **Equipment I.D.:** | **F.P.E. 200A 120/208V Disconnect (Auto Transfer Sw.)** |
| **Equipment Location:** | **Indo Pavilion Main Electrical Room** |
| **Inspection Date:** | **5/2/89 1:18:15 AM** |

IR - I0000100.031



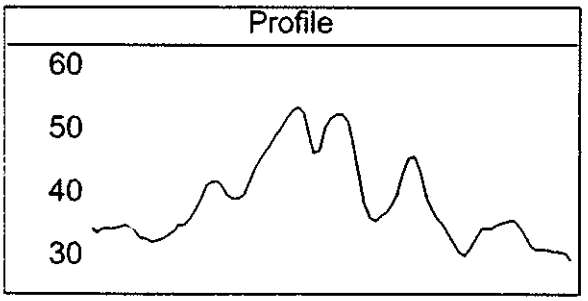

6/23/99 8:30:42 AM

Photo - IMAGE18.BMP



| | |
|---|---|
| **Surface Profile Minimum Temperature:** | **29.7 °C** |
| **Isotherm Area Temperature:** | **58.0 °C** |
| **Surface Profile Maximum Temperature:** | **54.0 °C** |

Profile




Status

| | |
|---|---|
| **SCANNER DATA** | |
| **Scanner Type** | THV470 SWB |
| **Serial Number** | 73010 |
| **Level** | 415 |
| **Sens** | 5 |
| **Aperture** | 0 |
| **Filter** | NOF |
| **Lens** | 20 |
| **IMAGE OBJ. PAR.** | |
| **Emissivity** | 0.84 |
| **Amb. temp.** | 23.7 °C |
| **Atm. temp.** | 24.8 °C |
| **Object dist.** | 1.0 m |
| **Rel Humidity** | 0.50 |
| **Transmission** | 0.99 |

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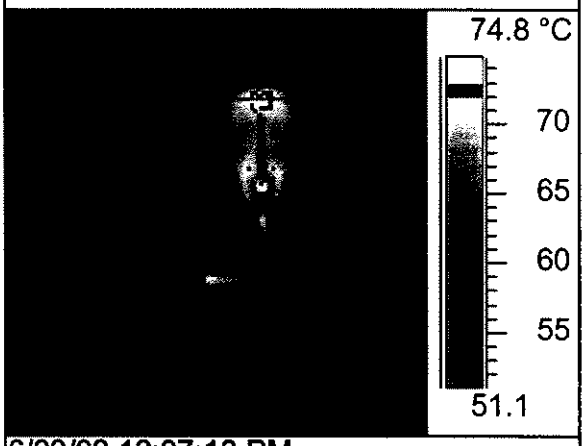
# Infrared Survey Sheet

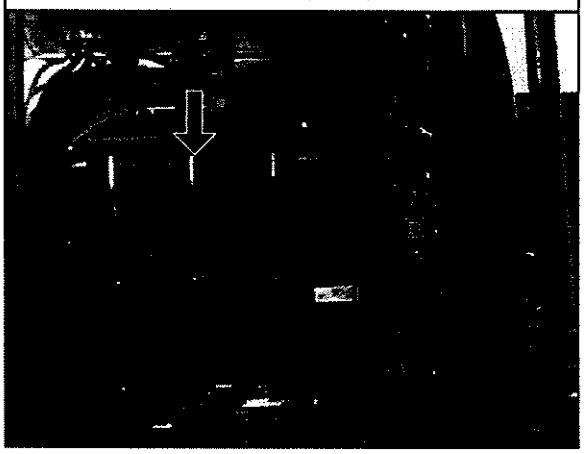
| | |
|---|---|
| **Job No.:** | **6621** |
| **Customer:** | **Metropolitan Toronto Zoo** |
| **Site Location:** | **Toronto, Ontario** |
| **Equipment I.D.:** | **Square 'D' 60A Starter Fan #5 General Supply-EU1001** |
| **Equipment Location:** | **Austrialasia Pavilion** |
| **Inspection Date:** | **5/2/89 5:37:40 AM** |

IR - I0000100.032



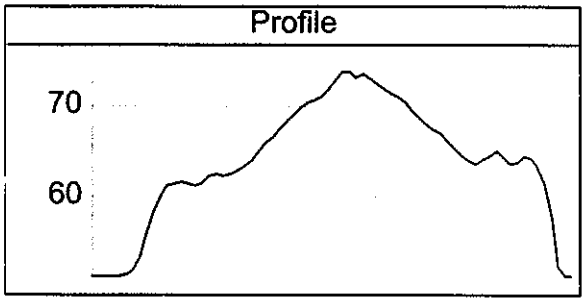

6/23/99 12:07:13 PM

Photo - IMAGE19.BMP



| | |
|---|---|
| **Surface Profile Minimum Temperature:** | **<51.1 °C** |
| **Isotherm Area Temperature:** | **72.9 °C** |
| **Surface Profile Maximum Temperature:** | **73.9 °C** |

Profile




Status

| | |
|---|---|
| **SCANNER DATA** | |
| **Scanner Type** | THV470 SWB |
| **Serial Number** | 73010 |
| **Level** | 584 |
| **Sens** | 5 |
| **Aperture** | 0 |
| **Filter** | NOF |
| **Lens** | 20 |
| **IMAGE OBJ. PAR.** | |
| **Emissivity** | 0.81 |
| **Amb. temp.** | 22.9 °C |
| **Atm. temp.** | 25.2 °C |
| **Object dist.** | 1.0 m |
| **Rel Humidity** | 0.50 |
| **Transmission** | 0.99 |

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*31 Pullman Court Scarborough, Ontario. M1X 1E4 Phone: (416) 298-9977 Fax: (416) 298-2907*

# ***Inspection Recommendations***

*NB. Please refer to individual infrared inspection sheets by the designation given in the PHOTO window*

## *1. F.P.E. 200A 120/208V Disconnect (Auto Transfer Switch) Main Electrical Room (Indo Pavilion)*

***Description:*** *The Centre phase line end fuse clip area recorded a maximum thermal rise of 54.0 ℃, thus creating a temperature rise of 30.3 ℃ above ambient. The load taken at that time was Top $\phi \cong 55$ Amps, Centre $\phi \cong 70$ Amps, and the Bottom $\phi \cong 42$ Amps.*

***Required Action:*** *Checking this area for proper connection and removing any oxidized agents is necessary to correct the anomaly.*

## *2. Square 'D' 60A Starter (Fan #5 General Supply – EU1001 Austrialasia Pavilion*

***Description:*** *The Centre phase blade contact area recorded a maximum thermal rise of 73.9 ℃, thus creating a temperature rise of 51.0 ℃ above ambient. All three phases were balanced at 40 Amps.*

***Required Action:*** *This area needs to disassembled, cleaned and checked for proper connection.*

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# Main Incoming
# Outdoor 27.6kV Switchgear

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Main Outdoor Incoming | | |
| **Substation** | Pole-mounted Supply Fuse | | |

## High Voltage Power Fuse

| **Fuse Holder Nameplate Data** | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 25 | **kVolt** |
| **Type** | SMU-20 Fuse Unit | **Current** | | **Amps** |
| **Style/Cat #** | | **Serial #** | | |

| **Fuse Link Nameplate Data** | | | |
|---|---|---|---|
| **Type** | SMU-20 Fuse Unit | **TCC** | 119-2 |
| **Style/Cat #** | | **Amps** | 150 E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | N/A | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | ? | None seen. Provided by Toronto Hydro |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 458 | 644 | 496 | | | |
| | | | | | | |
| **Results Satisfactory** | These units have subsequently been replaced. | | | | | |

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# TECHNICAL FIELD SERVICE DEPARTMENT

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/KH/TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Main Outdoor Incoming | | |
| **Substation** | Main 27.6 kV | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti Indoor | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34163 | **Serial #** | --- | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | OK | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | OK | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | POOR | Blue O Defective |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK/ Fair | Some internal rust damage |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕB* | *ϕC* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | 50.5 | 28 | 12.3 | | | |
| **Contact Resistance (μΩ)** | 56 | 63 | 55 | | | |
| **Arc Interrupter Res.(Ω)** | 0.6 | 0.7 | High | | | |
| | | | | | | |
| **Results Satisfactory** | Fair – See Recommendations | | | | | |

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# TECHNICAL FIELD SERVICE DEPARTMENT

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | KH/ TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feed to Eurasia Pavilion | | |
| **Substation** | Main Outdoor 27.6 kV | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti Interrupter | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34563R4-T2 | **Serial #** | --- | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | OK | Kirk # RE 12045 |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | OK | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | Cleaned |
| **Moving Contact Surfaces** | OK | Cleaned |
| **Arcing Contact Surfaces** | OK | Cleaned |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | POOR | High Resistance in Closed Position |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕ A* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 51 | 53 | 57 | | | |
| **Arc Interrupter Res.(Ω)** | 1.3 | * | * | | | |
| | | | | | | |
| **Results Satisfactory** | See Recommendations | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | KH/ TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to Eurasia Pavilion | | |
| **Substation** | Main Outdoor 27.6 kV | | |

## High Voltage Power Fuse

| **Fuse Holder Nameplate Data** | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 34.5 | **kVolt** |
| **Type** | SM-5S | **Current** | 300E | **Amps** |
| **Style/Cat #** | 86644R1 | **Serial #** | | |

| **Fuse Link Nameplate Data** | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | 153-4 |
| **Style/Cat #** | 134250R4 | **Amps** | 150E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | Fair | 2 spares in cell during inspection |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 630 | 828 | 636 | | | |

| | |
|---|---|
| **Results Satisfactory** | See Recommendations |

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T.S. HV_Fuse

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# TECHNICAL FIELD SERVICE DEPARTMENT

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/KH/TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to Service Building | | |
| **Substation** | Main Outdoor 27.6 kV Incoming | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34563R4-T2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | OK | Kirk RE 12043 |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | OK | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | Cleaned |
| **Moving Contact Surfaces** | OK | Cleaned |
| **Arcing Contact Surfaces** | OK | Cleaned |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕ A* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 49 | 42 | 47 | | | |
| **Arc Interrupter Res.(Ω)** | 1.3 | 1.0 | 0.5 | | | |

| | |
|---|---|
| **Results Satisfactory** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/KH/TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to Service Building | | |
| **Substation** | Main Outdoor 27.6kV Incoming | | |

## High Voltage Power Fuse

| **Fuse Holder Nameplate Data** | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 34.5 | **kVolt** |
| **Type** | SM-5D | **Current** | 300 | **Amps** |
| **Style/Cat #** | 86644R1 | **Serial #** | | |

| **Fuse Link Nameplate Data** | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | 153-4 |
| **Style/Cat #** | 134250R4 | **Amps** | 150E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | Poor | One only during inspection |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 688 | 627 | 623 | | | |
| | | | | | | |
| **Results Satisfactory** | Spares Required. | | | | | |

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# North America Pavilion

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | JRK |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Loop Feeder to African Pavilion | | |
| **Substation** | North American Pavilion | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34063R2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *$\phi A$* | *$\phi B$* | *$\phi C$* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 90 | 82 | 92 | | | |
| **Arc Interrupter Res.(Ω)** | 0.4 | 0.4 | 0.4 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | JRK |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Loop Feed to Service Building | | |
| **Substation** | North American Pavilion | | |

## High Voltage Air/Load Break Switch

| Nameplate Data | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34063R2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | Fair Poor | Flash Marks Present on Barrier, etc. |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕ A* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 90 | 81 | 80 | | | |
| **Arc Interrupter Res.(Ω)** | 0.4 | 0.3 | 0.5 | | | |
| | | | | | | |
| **Results Satisfactory** | *See Recommendations* | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | JRK |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Paddock Feeders | | |
| **Substation** | North American Pavilion | | |

## High Voltage Air/Load Break Switch

| **Nameplate Data** | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34563R4-T2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | OK | Kirk RE12053 |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | Fair | Surfaces pitted |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *$\phi A$* | *$\phi B$* | *$\phi C$* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | 92 | 112 | 153 | 272 | 280 | 300 |
| **Contact Resistance (μΩ)** | 79 | 82 | 77 | | | |
| **Arc Interrupter Res.(Ω)** | 0.4 | 0.4 | 0.3 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | JRK |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Paddock Feeders | | |
| **Substation** | North American Pavilion | | |

## High Voltage Power Fuse

| **Fuse Holder Nameplate Data** | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27.6 | **kVolt** |
| **Type** | SM-5 | **Current** | 300E | **Amps** |
| **Style/Cat #** | | **Serial #** | | |

| **Fuse Link Nameplate Data** | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | 119-4 |
| **Style/Cat #** | 264125-R4 | **Amps** | 80E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | Fair | One Spare Present in Cell |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 1005 | 1100 | 1060 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | JRK |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | American Pavilion Trans. #5 | | |
| **Substation** | North American Pavilion | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27.6 | **kVolts** |
| **Type** | Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34563R4-T2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕ A* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 37 | 37 | 40 | | | |
| **Arc Interrupter Res.(Ω)** | | | | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/ TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | North American Pavilion Trans. #5 | | |
| **Substation** | North American Pavilion | | |

## High Voltage Power Fuse

**Fuse Holder Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27.6 | **kVolt** |
| **Type** | SM-5 | **Current** | 300 | **Amps** |
| **Style/Cat #** | 86644R1 | **Serial #** | | |

**Fuse Link Nameplate Data**

| | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | 153-4 |
| **Style/Cat #** | 134025R4 | **Amps** | 15E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | OK | 3 Spares in Cell |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | >999 | >999 | >999 | >999 | >999 | >999 |
| **Contact Resistance (μΩ)** | 6190 | 6260 | 6050 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | T5 | | |
| **Substation** | North American Pavilion | | |

## Power Transformer -Electrical

**Nameplate Data**

| | | | | | |
|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Vector Group** | Y-Y | |
| **Type** | LNAN | | **Serial #.** | 827695 | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Askarel 200 | **Gal** |
| **Rating** | 300/ 336 | **kVA** | **Total Weight** | 7020 | **lbs.** |
| **Impedance** | 5.4 | **%** | **Primary Voltage** | 27.6/ 16 | **kVolt** |
| **Phase** | 3 | **ϕ** | **Secondary Voltage** | 208/ 120 | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 150/ 45 | **kVolt** |

**Insulation Tests**

| **Insulation Resistance @ 5k / 1k VDC** | **Prim. With Sec. Grounded** | **Sec. With Prim. Grounded** | **Prim. & Sec. To Ground** |
|---|---|---|---|
| **MΩ** | 31.6 | 31.0 | |
| **Corrected to 20 °C.** | | | |

| | **CH-L + G** | **CH-G** | **CH-L** | **CL-G** | **CL-H + G** |
|---|---|---|---|---|---|
| **Cap (pF)** | | 280 | | 9154 | |
| **Corr. 20 °C** | | | | | |
| **Dis. Fact.(%)** | | 5.70 | | 6.56 | |
| **Corr. 20 °C.** | | | | | |

**Turns Ratio Tests**

| **Tap** | **Primary Volts** | **Calculated Ratio** | **X0-X1 H0-H1** | **X0-X2 H0-H2** | **X0-X3 H0-H3** |
|---|---|---|---|---|---|
| **1** | | | | | |
| **2** | | | | | |
| **3** | 27,600 | 0.754 | 0.746 | 0.746 | 0.746 |
| **4** | | | | | |
| **5** | | | | | |

| | |
|---|---|
| **Tap Position Found & Left** | 3 (27,600V) |
| **Results Satisfactory** | OK |

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# TECHNICAL FIELD SERVICE DEPARTMENT

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Sample Date** | June 14, 1999 |
| **File Number** | 6621 | **Sampled By** | RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | T5 | | |
| **Substation** | North American Pavilion | | |

## Oil Analysis

**Transformer Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | Westinghouse | **Primary Volts** | 27.6/ 16 | **kVolts** |
| **Type** | LNAN | **Rating** | 300/ 336 | **kVA** |
| **Serial No.** | 827695 | **Liquid Volume** | 200 | **Gals.** |

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | |
|---|---|---|---|---|
| | | | | 1999 |
| Dielectric Breakdown | D877 | 30 kV | | 46.7 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | | 0.008 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | | N/A |
| Specific Gravity | D1298 | 0.84 - 0.91 (Oil) | | 1.520 |
| Colour | D1500 | ≤3.5 | | 0.5 |
| Visual Condition | D1524 | Clear | | Clear |
| Water Content | D1533 | 30 ppm (<69kV) | | |
| Power Factor | D924 | 1.0 % Max @ 25 °C | | |
| PCB Content | D4059 | 50 ppm Max. | | |
| Inhibitor | D2668 | ≥0.20% | | |
| Furans | D5837 | <100 ppb | | |
| Hydrogen (H2) | | | | |
| Oxygen & Argon | | | | |
| Nitrogen (N2) | | | | |
| Methane (CH4) | | | | |
| Carbon Monoxide (CO) | | | | |
| Carbon Dioxide (CO2) | | | | |
| Ethylene (C2H4) | | | | |
| Ethane (C2H6) | | | | |
| Acetylene (C2 H2) | | | | |
| Total Gas Content | | | | |

**Comments**

| | |
|---|---|
| **Chemical Properties** | OK |
| **PCB Content** | PCB fluid |
| **Dissolved Gas Content** | --- |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/ JRK |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | T5 | | |
| **Substation** | North American Pavilion | | |

## Power Transformer -Mechanical

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Breather & Silica Gel** | N/A | |
| **Explosion Vent Gaskets** | N/A | |
| **Pressure Relief Device** | OK | |
| **Conservator Tank Gaskets** | N/A | |
| **Inspection Cover Gaskets** | OK | |
| **Main Cover Gaskets** | N/A | |
| **Primary Bushing Gaskets** | OK | |
| **Primary Bushing Porcelain** | OK | |
| **Primary Bushing Connections** | OK | |
| **Secondary Bushing Gaskets** | OK | |
| **Secondary Bushing Porcelain** | OK | |
| **Secondary Bushing Connections** | OK | |
| **Secondary Throat Gaskets** | OK | |
| **Radiator** | OK | |
| **Pressure Gauge** | OK | |
| **Gas Relay** | N/A | |
| **Oil Level** | OK | |
| **Oil Leaks** | OK | |
| **Tank Valves** | OK | |
| **Oil Temperature Gauge** | OK | |
| **Oil Temperature Run/Max** | 35 \| 40°c | |
| **Winding Temperature Gauge** | N/A | |
| **Winding Temperature Run/Max** | | |
| **Tap Changer** | | Unit Locked: Inoperable |
| **Paint Condition** | OK | |
| **Pad** | OK | |
| **Grounding** | OK | |
| **Fan Operation** | N/A | |
| **Control Wiring** | N/A | |
| | | |
| **Results Satisfactory** | **OK** | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | T5 Secondary | | |
| **Substation** | North American Pavilion | | |

## Bus Duct

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | Square D | **Voltage** | 600 | **Volts** |
| **Type** | I-Line | **Current** | 1000 | **Amps** |
| **Style** | 3 Phase, 4 Wire | **B.I.L.** | | **kVolts** |
| **Cat #** | AF-510-23-FES | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Bus Insulation** | OK | |
| **Type of Bus Insulation** | OK | |
| **Support Insulators** | OK | |
| **Interior Clean** | OK | Visible Sections Only |
| **Interior Dry** | OK | Visible Sections Only |
| **Bus Duct Enclosure** | OK | |
| **Bus Duct Enclosure Ventilated** | N/A | |
| **Bus Joints Clean & Dry** | OK | |
| **Bus Joints Torqued** | OK | |
| **Gaskets at Joints** | OK | |
| **Grounding** | OK | |
| **Enclosure Paint Condition** | OK | |
| **Support Structure** | OK | |

**Electrical Tests**

| *Test Description* | *$\phi A$* | *$\phi B$* | *$\phi C$* | *N* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | 1120 | 1260 | 900 | --- | 2520 | 2320 | 2200 |

| | |
|---|---|
| **Comments** | |
| **Results Satisfactory** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | RPM |
| **Location** | 361A Old Finch Ave., Scar., Ontario | | |
| **Equipment I.D.** | Main Secondary C.B. | | |
| **Substation** | North American Pavilion | | |

## Low Voltage Air Circuit Breaker

### Nameplate Data

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | ITE | **Voltage** | 600 | **Volts** |
| **Type** | K1600 | **Frame Rating** | 1600 | **Amps** |
| **Serial #** | 98012 | **Int. Rating** | 65 | **kAmps** |
| **Relay Type** | OD4 Dashpots Only | **Sensors Ratio** | | **Amps** |
| **Rating Plug.** | | **Limiter Rating** | N/A | **Amps** |

### Relay Calibration Results

| | Settings | | $\phi A$ | | $\phi B$ | | $\phi C$ | |
|---|---|---|---|---|---|---|---|---|
| | **P/U** | **T.D** | **P/U** | **T.D.** | **P/U** | **T.D.** | **P/U** | **T.D.** |
| **Long Time** | 1000A | Inst. | | | | | | |
| **Short Time** | | | | | | | | |
| **Instantaneous** | | | | | | | | |
| | | | **P/U** | **T.D.** | | | | |
| **Ground Fault** | | | | | | | | |

### Mechanical Inspections

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Main & Arcing Contacts** | OK | |
| **Arc Chutes** | OK | |
| **Phase Barriers** | OK | |
| **Bus & Grounding Stabs** | OK | |
| **Interlocks** | OK | Rack Out Only |
| **Manual Operation** | OK | |
| **Electrical Operation** | N/A | |

### Electrical Tests

| *Test Description* | $\phi A$ | $\phi B$ | $\phi C$ | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | >999 | >999 | >999 | >999 | >999 | >999 |
| **Contact Resistance (μΩ)** | 25 | 31 | 27 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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*Technical Field Service Department*

31 Pullman Court, Scarborough, Ontario M1X 1E4. Phone: (416)-298-9977 Fax: (416)-298-2907

# Africa Pavilion

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to Indo-Malaya Pavilion | | |
| **Substation** | Africa Pavilion | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti Indoor | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34063 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕ A* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | 780 | 540 | 755 | 3420 | 3280 | 4080 |
| **Contact Resistance (μΩ)** | 55 | 57 | 65 | | | |
| **Arc Interrupter Res.(Ω)** | 0.7 | 0.5 | 0.9 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to North America Pavilion | | |
| **Substation** | Africa Pavilion | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34063 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *$\phi A$* | *$\phi B$* | *$\phi C$* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | 780 | 540 | 755 | 3420 | 3280 | 4080 |
| **Contact Resistance (μΩ)** | 38 | 36 | 36 | | | |
| **Arc Interrupter Res.(Ω)** | 0.7 | 1.4 | 0.8 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Africa Paddock Feeder | | |
| **Substation** | Africa Pavilion | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | SM Alduti Indoor | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34563R4-T2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | OK | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕB* | *ϕC* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | 780 | 540 | 755 | 3420 | 3280 | 4080 |
| **Contact Resistance (μΩ)** | 50 | 50 | 48 | | | |
| **Arc Interrupter Res.(Ω)** | 0.6 | 0.5 | 0.5 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Paddock Feeders | | |
| **Substation** | Africa Pavilion | | |

## High Voltage Power Fuse

| **Fuse Holder Nameplate Data** | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27.6 | **kVolt** |
| **Type** | SM-5 | **Current** | 300E | **Amps** |
| **Style/Cat #** | 86644R1 | **Serial #** | | |

| **Fuse Link Nameplate Data** | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | |
| **Style/Cat #** | | **Amps** | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | POOR | No Spares in Cell |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕB* | *ϕC* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 1030 | 960 | 1030 | | | |
| | | | | | | |
| **Results Satisfactory** | Fair. Spares Required. | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH/ RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | McDonald Savannah (Africa Paddock Fed) | | |

## Pad-Mounted Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Cam Tran | | **Year Built** | 1997 | | |
| **Type** | ONAN | | **Serial #** | 97DC231201 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 1436 | **Litres** |
| **Rating** | 500 | **kVA** | **Total Weight** | 3492 | | **Kg** |
| **Impedance** | 5.4 | **%** | **Primary Voltage** | 27.6/ 16 | | **KVolt** |
| **Phase(s)** | 3 | **ϕ** | **Secondary Voltage** | 208/ 120 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | >505,000 | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 44.4 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.027 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 40.1 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.867 |
| **Colour** | **D1500** | **≤3.5 Max.** | <0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| Comments: | |
| **Results Satisfactory:** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Padmount to Africa Sub. 3 phases; to T10 3 phases | | |

## Pad-Mounted Distribution Transformer

**Transformer Nameplate Data**

| | | | | | |
|---|---|---|---|---|---|
| **Manufacturer** | CARTE | | **Year Built** | 1996 | |
| **Type** | ONAN | | **Serial #** | 2B301-001 | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil 1023 | **Litres** |
| **Rating** | 225 | **kVA** | **Total Weight** | 2227 | **Lbs.** |
| **Impedance** | 4.34 | **%** | **Primary Voltage** | 27.6/ 16 | **kVolt** |
| **Phase(s)** | 3 | **ϕ** | **Secondary Voltage** | 208/ 120 | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | **kVolt** |
| **Insulation Resistance (MΩ)** | 435,000 | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 32.0 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.013 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 38.6 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.889 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| Comments: | |
| **Results Satisfactory:** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | African Pavilion Trans. T-6 | | |
| **Substation** | African Pavilion | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27.6 | **kVolts** |
| **Type** | SM Alduti Indoor | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34563R4-T2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕ A* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | 780 | 540 | 755 | 3420 | 3280 | 4080 |
| **Contact Resistance (μΩ)** | 38 | 36 | 36 | | | |
| **Arc Interrupter Res.(Ω)** | 0.7 | 1.4 | 0.8 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH/ AN |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | African Pavilion Transformer T-6 | | |
| **Substation** | African Pavilion | | |

## High Voltage Power Fuse

| **Fuse Holder Nameplate Data** | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27.6 | **kVolt** |
| **Type** | SM-5 | **Current** | 300 | **Amps** |
| **Style/Cat #** | 86641R1 | **Serial #** | | |

| **Fuse Link Nameplate Data** | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | 153-4 |
| **Style/Cat #** | 134060R4 | **Amps** | 40E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | OK | 3 Spares in Cell |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | >999 | >999 | >999 | >999 | >999 | >999 |
| **Contact Resistance (μΩ)** | 1760 | 1733 | 1760 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | T-6 | | |
| **Substation** | African Pavilion | | |

## Power Transformer -Electrical

**Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Vector Group** | Y-Y | | |
| **Type** | LNAN | | **Serial #.** | 795154 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Askarel | 350 | **Gal** |
| **Rating** | 750/ 850 | **kVA** | **Total Weight** | 11,900 | | **lbs.** |
| **Impedance** | 6.0 | **%** | **Primary Voltage** | 27.6/ 16 | | **kVolt** |
| **Phase** | 3 | **ϕ** | **Secondary Voltage** | 208/ 120 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 150/ 45 | | **kVolt** |

**Insulation Tests**

| **Insulation Resistance @ 5k / 1k VDC** | **Prim. With Sec. Grounded** | **Sec. With Prim. Grounded** | **Prim. & Sec. To Ground** |
|---|---|---|---|
| **MΩ** | 27.2 | 27.8 | |
| **Corrected to 20 °C.** | 76.2 | 77.8 | |

| | **CH-L + G** | **CH-G** | **CH-L** | **CL-G** | **CL-H + G** |
|---|---|---|---|---|---|
| **Cap (pF)** | | | | | |
| **Corr. 20 °C** | | | | | |
| **Dis. Fact.(%)** | | | | | |
| **Corr. 20 °C.** | | | | | |

**Turns Ratio Tests**

| **Tap** | **Primary Volts** | **Calculated Ratio** | **X0-X1 H0-H1** | **X0-X2 H0-H2** | **X0-X3 H0-H3** |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | 27,600 | 0.754 | 0.747 | 0.747 | 0.747 |
| 4 | | | | | |
| 5 | | | | | |

| | |
|---|---|
| **Tap Position Found & Left** | 3 (27,600V) |
| **Results Satisfactory** | OK |

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# TECHNICAL FIELD SERVICE DEPARTMENT

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Sample Date** | June 17, 1999 |
| **File Number** | 6621 | **Sampled By** | RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | T-6 | | |
| **Substation** | Africa Pavilion | | |

## Oil Analysis

**Transformer Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | Westinghouse | **Primary Volts** | 27.6/ 16 | **kVolts** |
| **Type** | LNAN | **Rating** | 750/ 850 | **kVA** |
| **Serial No.** | 795154 | **Liquid Volume** | 350 | **Gals.** |

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | |
|---|---|---|---|---|
| | | | | 1999 |
| Dielectric Breakdown | D877 | 30 kV | | 46.9 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | | 0.004 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | | N/A |
| Specific Gravity | D1298 | 0.84 - 0.91 (Oil) | | 1.520 |
| Colour | D1500 | ≤3.5 | | 0.5 |
| Visual Condition | D1524 | Clear | | Clear |
| Water Content | D1533 | 30 ppm (<69kV) | | |
| Power Factor | D924 | 1.0 % Max @ 25 °C | | |
| PCB Content | D4059 | 50 ppm Max. | | |
| Inhibitor | D2668 | ≥0.20% | | |
| Furans | D5837 | <100 ppb | | |
| Hydrogen (H2) | | | | |
| Oxygen & Argon | | | | |
| Nitrogen (N2) | | | | |
| Methane (CH4) | | | | |
| Carbon Monoxide (CO) | | | | |
| Carbon Dioxide (CO2) | | | | |
| Ethylene (C2H4) | | | | |
| Ethane (C2H6) | | | | |
| Acetylene (C2 H2) | | | | |
| Total Gas Content | | | | |

**Comments**

| | |
|---|---|
| **Chemical Properties** | OK |
| **PCB Content** | PCB fluid |
| **Dissolved Gas Content** | --- |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH/ RPM/ TL |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | T-6 | | |
| **Substation** | African Pavilion | | |

## Power Transformer -Mechanical

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Breather & Silica Gel** | N/A | |
| **Explosion Vent Gaskets** | N/A | |
| **Pressure Relief Device** | OK | |
| **Conservator Tank Gaskets** | N/A | |
| **Inspection Cover Gaskets** | OK | |
| **Main Cover Gaskets** | N/A | |
| **Primary Bushing Gaskets** | OK | |
| **Primary Bushing Porcelain** | OK | |
| **Primary Bushing Connections** | OK | |
| **Secondary Bushing Gaskets** | OK | |
| **Secondary Bushing Porcelain** | OK | |
| **Secondary Bushing Connections** | OK | |
| **Secondary Throat Gaskets** | OK | |
| **Radiator** | OK | |
| **Pressure Gauge** | OK | -7 PSI Vacuum |
| **Gas Relay** | N/A | |
| **Oil Level** | OK | |
| **Oil Leaks** | OK | None visible |
| **Tank Valves** | OK | |
| **Oil Temperature Gauge** | OK | |
| **Oil Temperature Run/Max** | 35 / 45°C | |
| **Winding Temperature Gauge** | N/A | |
| **Winding Temperature Run/Max** | / | |
| **Tap Changer** | | Unit Locked: Inoperable |
| **Paint Condition** | OK | |
| **Pad** | OK | |
| **Grounding** | OK | |
| **Fan Operation** | N/A | |
| **Control Wiring** | N/A | |
| | | |
| **Results Satisfactory** | **OK** | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH/ TL |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | T-6 Secondary | | |
| **Substation** | African Pavilion | | |

## Bus Duct

### Nameplate Data

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | Square D | **Voltage** | 120/ 208 | **Volts** |
| **Type** | Power Clad | **Current** | 3000 | **Amps** |
| **Style** | 3 Phase, 4 Wire | **B.I.L.** | | **kVolts** |
| **Cat #** | AF-510-23-FES | **Serial #** | | |

### Mechanical Inspections

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Bus Insulation** | OK | |
| **Type of Bus Insulation** | OK | |
| **Support Insulators** | OK | |
| **Interior Clean** | OK | Visible Sections Only |
| **Interior Dry** | OK | Visible Sections Only |
| **Bus Duct Enclosure** | OK | |
| **Bus Duct Enclosure Ventilated** | N/A | |
| **Bus Joints Clean & Dry** | OK | |
| **Bus Joints Torqued** | OK | |
| **Gaskets at Joints** | OK | |
| **Grounding** | OK | |
| **Enclosure Paint Condition** | OK | |
| **Support Structure** | OK | |

### Electrical Tests

| *Test Description* | *$\phi A$* | *$\phi B$* | *$\phi C$* | *N* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | 1170 | 1570 | 1920 | --- | 1080 | 1980 | 3180 |

| | |
|---|---|
| **Comments** | |
| **Results Satisfactory** | OK |

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**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/ TL/ KH |
| **Location** | 361A Old Finch Ave., Scar., Ontario | | |
| **Equipment I.D.** | Main Secondary C.B. | | |
| **Substation** | African Pavilion | | |

## Low Voltage Air Circuit Breaker

### Nameplate Data

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | FPE | **Voltage** | 600 | **Volts** |
| **Type** | 75H-2 | **Frame Rating** | 3000 | **Amps** |
| **Serial #** | TH-4126-72 | **Int. Rating** | 75 | **kAmps** |
| **Relay Type** | Carriere FB600E | **Sensors Ratio** | 3000:1 | **Amps** |
| **Rating Plug.** | --- | **Limiter Rating** | N/A | **Amps** |

### Relay Calibration Results

| | Settings | | $\phi A$ | | $\phi B$ | | $\phi C$ | |
|---|---|---|---|---|---|---|---|---|
| | **P/U** | **T.D** | **P/U** | **T.D.** | **P/U** | **T.D.** | **P/U** | **T.D.** |
| **Long Time** | 0.85x | 7.5 | | 6.021 | | 5.896 | | |
| **Short Time** | 7x | 0.4 | | 0.477 | | 0.476 | | 0.471 |
| **Instantaneous** | 10x | | | 0.094 | | 0.103 | | 0.111 |
| | | | **P/U** | **T.D.** | | | | |
| **Ground Fault** | 1200 | 0.066 | | | | | | |

### Mechanical Inspections

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Main & Arcing Contacts** | OK | |
| **Arc Chutes** | OK | |
| **Phase Barriers** | OK | |
| **Bus & Grounding Stabs** | OK | |
| **Interlocks** | OK | |
| **Manual Operation** | POOR | See Deficiencies |
| **Electrical Operation** | | |

### Electrical Tests

| *Test Description* | $\phi A$ | $\phi B$ | $\phi C$ | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | >999 | >999 | >999 | >999 | >999 | >999 |
| **Contact Resistance (μΩ)** | 40/ 70 | 49/ 50 | 49/ 48 | | | |
| | | | | | | |
| **Results Satisfactory** | *NO. See Deficiencies.* | | | | | |

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*Technical Field Service Department*

31 Pullman Court, Scarborough, Ontario M1X 1E4. Phone: (416)-298-9977 Fax: (416)-298-2907

# Entrance/ Administration Building

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | AS, AN |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to Eurasia Pavilion | | |
| **Substation** | Entrance/ Administration Building | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27.6 | **kVolts** |
| **Type** | Alduti Indoor | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | CDT-2765378 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | OK | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *$\phi A$* | *$\phi B$* | *$\phi C$* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | >505 | >505 | >505 | >505 | >505 | >505 |
| **Contact Resistance (μΩ)** | 58 | 61 | 65 | | | |
| **Arc Interrupter Res.(Ω)** | 2.0 | 0.4 | 1.9 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | AS, AN |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to Indo-Malaya Pavilion | | |
| **Substation** | Entrance/ Administration Building | | |

## High Voltage Air/Load Break Switch

### Nameplate Data

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27.6 | **kVolts** |
| **Type** | Alduti Indoor | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34163 | **Serial #** | | |

### Mechanical Inspections

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | OK | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

### Electrical Tests

| *Test Description* | *ϕ A* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | >505 | >505 | >505 | >505 | >505 | >505 |
| **Contact Resistance (μΩ)** | 77 | 83 | 86 | | | |
| **Arc Interrupter Res.(Ω)** | 0.43 | 0.40 | 0.40 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | AS, AN |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to Village Edge South | | |
| **Substation** | Entrance/ Administration Building | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27.6 | **kVolts** |
| **Type** | SM Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34563-R4-T2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | OK | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *$\phi A$* | *$\phi B$* | *$\phi C$* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | >505 | >505 | >505 | >505 | >505 | >505 |
| **Contact Resistance (μΩ)** | 28 | 28 | 35 | | | |
| **Arc Interrupter Res.(Ω)** | 0.3 | 0.3 | 0.5 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | AS, AN |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to Village Edge South | | |
| **Substation** | Entrance/ Administration Building | | |

## High Voltage Power Fuse

**Fuse Holder Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 34.5 | **kVolt** |
| **Type** | SM-5S | **Current** | 300E | **Amps** |
| **Style/Cat #** | 86644R1 | **Serial #** | | |

**Fuse Link Nameplate Data**

| | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | 153-4 |
| **Style/Cat #** | 134125R4 | **Amps** | 80E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | Fair | One only in cell door |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | >505 | >505 | >505 | >505 | >505 | >505 |
| **Contact Resistance (μΩ)** | 780 | 802 | 802 | | | |
| | | | | | | |
| **Results Satisfactory** | OK. Spare Links Required. | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | AS, AN |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Entrance Facilities Transformer T-7 | | |
| **Substation** | Entrance/ Administration Building | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27.6 | **kVolts** |
| **Type** | SM Alduti Indoor | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34563R4-T2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | OK | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕ A* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | >505 | >505 | >505 | >505 | >505 | >505 |
| **Contact Resistance (μΩ)** | 71 | 72 | 75 | | | |
| **Arc Interrupter Res.(Ω)** | 0.4 | 0.2 | 0.2 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | AS, AN |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Entrance Facilities Transformer T-7 | | |
| **Substation** | Entrance/ Administration Building | | |

## High Voltage Power Fuse

| **Fuse Holder Nameplate Data** | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 34.5 | **kVolt** |
| **Type** | SM-5S | **Current** | 300E | **Amps** |
| **Style/Cat #** | 86644R1 | **Serial #** | | |

| **Fuse Link Nameplate Data** | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | 153-4 |
| **Style/Cat #** | 86644R1 | **Amps** | 15E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | OK | In Cell Door |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | >505 | >505 | >505 | >505 | >505 | >505 |
| **Contact Resistance (μΩ)** | 5276 | 5318 | 5400 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | AS |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Entrance Facilities Transformer T-7 | | |
| **Substation** | Entrance/ Administration Building | | |

## Power Transformer –Electrical

**Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Vector Group** | Wye Wye | | |
| **Type** | LNAN | | **Serial #.** | 827694 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Askarel | 200 | **Gal** |
| **Rating** | 225 | **kVA** | **Total Weight** | 6450 | | **lbs.** |
| **Impedance** | 5.9 | **%** | **Primary Voltage** | 27.6 Y | | **kVolt** |
| **Phase** | 3 | **ϕ** | **Secondary Voltage** | 120/ 208 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 150 | | **kVolt** |

**Insulation Tests**

| **Insulation Resistance @ 5k / 1k VDC** | **Prim. With Sec. Grounded** | **Sec. With Prim. Grounded** | **Prim. & Sec. To Ground** |
|---|---|---|---|
| **MΩ** | 30 | 30 | |
| **Corrected to 20 °C.** | | | |

| | **CH-L + G** | **CH-G** | **CH-L** | **CL-G** | **CL-H + G** |
|---|---|---|---|---|---|
| **Cap (pF)** | | | | | |
| **Corr. 20 °C** | | | | | |
| **Dis. Fact.(%)** | | | | | |
| **Corr. 20 °C.** | | | | | |

**Turns Ratio Tests**

| **Tap** | **Primary Volts** | **Calculated Ratio** | **X0-X1 H0-H1** | **X0-X2 H0-H2** | **X0-X3 H0-H3** |
|---|---|---|---|---|---|
| **1** | | | | | |
| **2** | | | | | |
| **3** | 27,600 | 0.753 | 0.748 | 0.748 | 0.748 |
| **4** | | | | | |
| **5** | | | | | |

| | |
|---|---|
| **Tap Position Found & Left** | 3 (27,600V) |
| **Results Satisfactory** | OK |

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# TECHNICAL FIELD SERVICE DEPARTMENT

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Sample Date** | June 15, 1999 |
| **File Number** | 6621 | **Sampled By** | TL |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Entrance Facilities Transformer T-7 | | |
| **Substation** | Entrance/ Administration Building | | |

## Oil Analysis

**Transformer Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | Westinghouse | **Primary Volts** | 27.6/ 16 | **kVolts** |
| **Type** | LNAN | **Rating** | 225 | **kVA** |
| **Serial No.** | 827694 | **Liquid Volume** | 200 | **Gals.** |

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | |
|---|---|---|---|---|
| | | | 1999 | |
| Dielectric Breakdown | D877 | 30 kV | | 49.4 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | | 0.004 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | | N/A |
| Specific Gravity | D1298 | 0.84 - 0.91 | | 1.420 |
| Colour | D1500 | ≤3.5 | | 0.5 |
| Visual Condition | D1524 | Clear | | Clear |
| Water Content | D1533 | 30 ppm (<69kV) | | |
| Power Factor | D924 | 1.0 % Max @ 25 °C | | |
| PCB Content | D4059 | 50 ppm Max. | | |
| Inhibitor | D2668 | ≥0.20% | | |
| Furans | D5837 | <100 ppb | | |
| Hydrogen (H2) | | | | |
| Oxygen & Argon | | | | |
| Nitrogen (N2) | | | | |
| Methane (CH4) | | | | |
| Carbon Monoxide (CO) | | | | |
| Carbon Dioxide (CO2) | | | | |
| Ethylene (C2H4) | | | | |
| Ethane (C2H6) | | | | |
| Acetylene (C2 H2) | | | | |
| Total Gas Content | | | | |

**Comments**

| | |
|---|---|
| **Chemical Properties** | OK |
| **PCB Content** | PCB Insulating Fluid |
| **Dissolved Gas Content** | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | AS, AN |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Entrance Facilities Transformer T-8 | | |
| **Substation** | Entrance/ Administration Building | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27.6 | **kVolts** |
| **Type** | SM Alduti Indoor | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34563R4-T2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | OK | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕ A* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | >505 | >505 | >505 | >505 | >505 | >505 |
| **Contact Resistance (μΩ)** | 43 | 49 | 43 | | | |
| **Arc Interrupter Res.(Ω)** | 0.3 | 0.3 | 0.4 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | AS, AN |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Entrance Facilities Transformer T-8 | | |
| **Substation** | Entrance/ Administration Building | | |

## High Voltage Power Fuse

| **Fuse Holder Nameplate Data** | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 34.5 | **kVolt** |
| **Type** | SM-5S | **Current** | 300E | **Amps** |
| **Style/Cat #** | 86644R1 | **Serial #** | | |

| **Fuse Link Nameplate Data** | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | 153-4 |
| **Style/Cat #** | 13440R4 | **Amps** | 25E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | OK | In cell door |

**Electrical Tests**

| *Test Description* | *φA* | *φ B* | *φ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | >505 | >505 | >505 | >505 | >505 | >505 |
| **Contact Resistance (μΩ)** | 2439 | 2412 | 2451 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | AS |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Entrance Facilities Transformer T-8 | | |
| **Substation** | Entrance/ Administration Building | | |

## Power Transformer –Electrical

**Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Vector Group** | Wye Wye | | |
| **Type** | LNAN | | **Serial #.** | 850912 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Askarel | 240 | **Gal** |
| **Rating** | 500 | **kVA** | **Total Weight** | 8500 | | **lbs.** |
| **Impedance** | 6.7 | **%** | **Primary Voltage** | 27.6 Y | | **kVolt** |
| **Phase** | 3 | **ϕ** | **Secondary Voltage** | 600 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 150 | | **kVolt** |

**Insulation Tests**

| **Insulation Resistance @ 5k / 1k VDC** | **Prim. With Sec. Grounded** | **Sec. With Prim. Grounded** | **Prim. & Sec. To Ground** |
|---|---|---|---|
| **MΩ** | 32 | 32 | |
| **Corrected to 20 °C.** | | | |

| | **CH-L + G** | **CH-G** | **CH-L** | **CL-G** | **CL-H + G** |
|---|---|---|---|---|---|
| **Cap (pF)** | | | | | |
| **Corr. 20 °C** | | | | | |
| **Dis. Fact.(%)** | | | | | |
| **Corr. 20 °C.** | | | | | |

**Turns Ratio Tests**

| **Tap** | **Primary Volts** | **Calculated Ratio** | **X0-X1 H0-H1** | **X0-X2 H0-H2** | **X0-X3 H0-H3** |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | 27,600 | 2.173 | 2.178 | 2.178 | 2.178 |
| 4 | | | | | |
| 5 | | | | | |

| | |
|---|---|
| **Tap Position Found & Left** | 3 (27,600V) |
| **Results Satisfactory** | OK |

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# TECHNICAL FIELD SERVICE DEPARTMENT

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Sample Date** | June 15, 1999 |
| **File Number** | 6621 | **Sampled By** | TL |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Entrance Facilities Transformer T-8 | | |
| **Substation** | Entrance/ Administration Building | | |

## Oil Analysis

**Transformer Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | Westinghouse | **Primary Volts** | 27.6/ 16 | **kVolts** |
| **Type** | LNAN | **Rating** | 225 | **kVA** |
| **Serial No.** | 850912 | **Liquid Volume** | 240 | **Gals.** |

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | |
|---|---|---|---|---|
| | | | | 99 |
| Dielectric Breakdown | D877 | 30 kV | | 49.0 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | | 0.004 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | | N/A |
| Specific Gravity | D1298 | 0.84 - 0.91 | | 1.520 |
| Colour | D1500 | ≤3.5 | | 0.5 |
| Visual Condition | D1524 | Clear | | Clear |
| Water Content | D1533 | 30 ppm (<69kV) | | |
| Power Factor | D924 | 1.0 % Max @ 25 °C | | |
| PCB Content | D4059 | 50 ppm Max. | | |
| Inhibitor | D2668 | ≥0.20% | | |
| Furans | D5837 | <100 ppb | | |
| Hydrogen (H2) | | | | |
| Oxygen & Argon | | | | |
| Nitrogen (N2) | | | | |
| Methane (CH4) | | | | |
| Carbon Monoxide (CO) | | | | |
| Carbon Dioxide (CO2) | | | | |
| Ethylene (C2H4) | | | | |
| Ethane (C2H6) | | | | |
| Acetylene (C2 H2) | | | | |
| Total Gas Content | | | | |

**Comments**

| | |
|---|---|
| **Chemical Properties** | OK |
| **PCB Content** | PCB Insulating Fluid |
| **Dissolved Gas Content** | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | | | |
| **Substation** | Zoological | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 29 | **kVolts** |
| **Type** | Alduti Rupter Indoor | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | CDT-2768678 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | OK | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *$\phi A$* | *$\phi B$* | *$\phi C$* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 60 | 58 | 56 | | | |
| **Arc Interrupter Res.(Ω)** | 1.3 | 1.1 | 1.5 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | | | |
| **Substation** | Zoological | | |

## High Voltage Power Fuse

**Fuse Holder Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 34.5 | **kVolt** |
| **Type** | SM-5 | **Current** | 600 | **Amps** |
| **Style/Cat #** | 86644R2 | **Serial #** | | |

**Fuse Link Nameplate Data**

| | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | 153-4 |
| **Style/Cat #** | 134025R4 | **Amps** | 15E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | OK | 3 Spares in Cell |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | >999 | >999 | >999 | >999 | >999 | >999 |
| **Contact Resistance (μΩ)** | 5130 | 4865 | 5065 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | KH/ TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Zoological | | |

## Pad-Mounted Distribution Transformer

**Transformer Nameplate Data**

| | | | | | |
|---|---|---|---|---|---|
| **Manufacturer** | CARTE | | **Year Built** | 1985 | |
| **Type** | ONAN | | **Serial #** | NO790-1 | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil 872 | **Litres** |
| **Rating** | 300 | **kVA** | **Total Weight** | 1909 | **Kg** |
| **Impedance** | 4.58 | **%** | **Primary Voltage** | 27.6/ 16 | **KVolt** |
| **Phase(s)** | 3 | **ϕ** | **Secondary Voltage** | 208/ 120 | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 150 | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | **1999** |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 36.3 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.014 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 31.3 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.859 |
| **Colour** | **D1500** | **≤3.5 Max.** | <0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| Comments: | |
| **Results Satisfactory:** | OK |

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*Technical Field Service Department*

31 Pullman Court, Scarborough, Ontario M1X 1E4. Phone: (416)-298-9977 Fax: (416)-298-2907

# Service Building

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | JC/ EJ |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to Main Switchgear | | |
| **Substation** | Service Building | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34063 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | OK | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *$\phi A$* | *$\phi B$* | *$\phi C$* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 58 | 59 | 57 | | | |
| **Arc Interrupter Res.(Ω)** | 0.3 | 0.3 | 0.3 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | JC/ EJ |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to North America Pavilion | | |
| **Substation** | Service Building | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34063 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | OK | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕ A* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 56 | 55 | 57 | | | |
| **Arc Interrupter Res.(Ω)** | 0.5 | 0.6 | 0.5 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | JC/ EJ |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Paddock Feeder WEST/ EAST | | |
| **Substation** | Service Building | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34563R4-T5 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | OK | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | OK | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *WEST* | *EAST* | | | | |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 57 | 60 | --- | | | |
| **Arc Interrupter Res.(Ω)** | 0.6 | 0.7 | --- | | | |
| | | | | | | |
| **Results Satisfactory** | OK. Single phase feeds x2 | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | JC/ EJ |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Paddock Feeder WEST/ EAST | | |
| **Substation** | Service Building | | |

## High Voltage Power Fuse

**Fuse Holder Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 34.5 | **kVolt** |
| **Type** | SM-5S | **Current** | 300 | **Amps** |
| **Style/Cat #** | | **Serial #** | | |

**Fuse Link Nameplate Data**

| | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | 153-4 |
| **Style/Cat #** | 134125R4 | **Amps** | 80E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | OK | |

**Electrical Tests**

| *Test Description* | *WEST* | *EAST* | | | | |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | >505 | >505 | --- | --- | --- | --- |
| **Contact Resistance (μΩ)** | 830 | 859 | --- | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | JC/ EJ |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to Service Building | | |
| **Substation** | Service Building | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34563R4-T2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | OK | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕ A* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 51 | 50 | 46 | | | |
| **Arc Interrupter Res.(Ω)** | 0.3 | 0.3 | 0.3 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | JC/ EJ |
| **Location** | 361A Old Finch Ave., Scar., Ontario | | |
| **Equipment I.D.** | Feeder to Service Building X-Former #4 | | |
| **Substation** | Service Building | | |

## High Voltage Power Fuse

**Fuse Holder Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 34.5 | **kVolt** |
| **Type** | SM-5S | **Current** | 300E | **Amps** |
| **Style/Cat #** | 86644R1 | **Serial #** | | |

**Fuse Link Nameplate Data**

| | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | 153-4 |
| **Style/Cat #** | 134100R4 | **Amps** | 65E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | OK | |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | >505 | >505 | >505 | >505 | >505 | >505 |
| **Contact Resistance (μΩ)** | 1136 | 1044 | 1021 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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T.S. HV_Fuse

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | JC/ EJ |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | T1 27.6kV-600V 3ϕ 4W From HV Board | | |
| **Substation** | Service Building | | |

## Power Transformer -Electrical

**Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Hammond | | **Vector Group** | Wye Wye | | |
| **Type** | ANN/ AFN | | **Serial #.** | DB93F | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Dry | Type | **Gal** |
| **Rating** | 1500/ 2000 | **kVA** | **Total Weight** | 16500 | | **lbs.** |
| **Impedance** | 5.7 | **%** | **Primary Voltage** | 27.6/ 15.935 | | **kVolt** |
| **Phase** | 3 | **ϕ** | **Secondary Voltage** | 600/ 347 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 150 | | **kVolt** |

**Insulation Tests**

| **Insulation Resistance @ 5k / 1k VDC** | **Prim. With Sec. Grounded** | **Sec. With Prim. Grounded** | **Prim. & Sec. To Ground** |
|---|---|---|---|
| **MΩ** | 10,000 | 10,000 | 10,000 |
| **Corrected to 20 °C.** | | | |

| | **CH-L + G** | **CH-G** | **CH-L** | **CL-G** | **CL-H + G** |
|---|---|---|---|---|---|
| **Cap (pF)** | | | | | |
| **Corr. 20 °C** | | | | | |
| **Dis. Fact.(%)** | | | | | |
| **Corr. 20 °C.** | | | | | |

**Turns Ratio Tests**

| **Tap** | **Primary Volts** | **Calculated Ratio** | **X0-X2 H1-H2** | **X0-X3 H2-H3** | **X0-X1 H3-H1** |
|---|---|---|---|---|---|
| 1 | 28,980 | | | | |
| 2 | 28,290 | | | | |
| 3 | 27,600 | 2.177 | 2.174 | 2.174 | 2.174 |
| 4 | 26,910 | | | | |
| 5 | 26,220 | | | | |

| | |
|---|---|
| **Tap Position Found & Left** | 3-4 (27,600V) |
| **Results Satisfactory** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | JC/ EJ |
| **Location** | 361A Old Finch Ave., Scar., Ontario | | |
| **Equipment I.D.** | Secondary Breaker from T1 | | |
| **Substation** | Service Building | | |

## Low Voltage Air Circuit Breaker

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | FPE | **Voltage** | 600 | **Volts** |
| **Type** | 75H-3 | **Frame Rating** | 3000 | **Amps** |
| **Serial #** | BH-45339-93 | **Int. Rating** | 65 | **kAmps** |
| **Relay Type** | USR | **Sensors Ratio** | | **Amps** |
| **Rating Plug.** | | **Limiter Rating** | N/A | **Amps** |

**Relay Calibration Results**

| | Settings | | $\phi A$ | | $\phi B$ | | $\phi C$ | |
|---|---|---|---|---|---|---|---|---|
| | **P/U** | **T.D** | **P/U** | **T.D.** | **P/U** | **T.D.** | **P/U** | **T.D.** |
| **Long Time** | 2x | 1.1x | | | | | | |
| **Short Time** | 3X | 0.3 | | | | | | |
| **Instantaneous** | OFF | | | | | | | |
| | | | **P/U** | **T.D.** | | | | |
| **Ground Fault** | 0.6 | 0.45 | | | | | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Main & Arcing Contacts** | OK | |
| **Arc Chutes** | OK | |
| **Phase Barriers** | OK | |
| **Bus & Grounding Stabs** | OK | |
| **Interlocks** | 0K | |
| **Manual Operation** | OK | |
| **Electrical Operation** | N/A | |

**Electrical Tests**

| *Test Description* | $\phi A$ | $\phi B$ | $\phi C$ | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | >999 | >999 | >999 | >999 | >999 | >999 |
| **Contact Resistance (μΩ)** | 26 | 25 | 25 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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*Technical Field Service Department*

31 Pullman Court, Scarborough, Ontario M1X 1E4. Phone: (416)-298-9977 Fax: (416)-298-2907

# Eurasia Pavilion

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to Main Switchgear | | |
| **Substation** | Eurasia Pavilion | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34063R2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *$\phi A$* | *$\phi B$* | *$\phi C$* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | 236 | 232 | 278 | >505 | >505 | >505 |
| **Contact Resistance (μΩ)** | 48 | 52 | 61 | | | |
| **Arc Interrupter Res.(Ω)** | 1.2 | 1.3 | 1.6 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/ AN |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to Entrance Facilities | | |
| **Substation** | Eurasia Pavilion | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34063R2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *$\phi A$* | *$\phi B$* | *$\phi C$* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | 236 | 232 | 278 | >505 | >505 | >505 |
| **Contact Resistance (μΩ)** | 39 | 42 | 40 | | | |
| **Arc Interrupter Res.(Ω)** | 3.1 | 2.0 | 3.6 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/ AN |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Paddock Feeders (Centre & South) | | |
| **Substation** | Eurasia Pavilion | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | SM-Alduti-Indoor | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34363R4-T5 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | POOR | Kirk RE12023 & RE12019 |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕ A* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 60 | --- | 58 | | | |
| **Arc Interrupter Res.(Ω)** | 1.9 | --- | 0.6 | | | |
| | | | | | | |
| **Results Satisfactory** | *See Deficiencies.* | | | | | |

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T.S. HV_ABS

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/ AN |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Paddock Feeders (Centre & South) | | |
| **Substation** | Eurasia Pavilion | | |

## High Voltage Power Fuse

| **Fuse Holder Nameplate Data** | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 34.5 | **kVolt** |
| **Type** | SM-5S | **Current** | 300E | **Amps** |
| **Style/Cat #** | | **Serial #** | | |

| **Fuse Link Nameplate Data** | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | 153-4 |
| **Style/Cat #** | 134125R | **Amps** | 80E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | Fair | Only One Spare Present in Cell |

**Electrical Tests**

| *Test Description* | *φA* | *φ B* | *φ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 966 | --- | 1286 | | | |
| | | | | | | |
| **Results Satisfactory** | Fair. See Recommendations. | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Eurasia Pavilion Transformer –T1 | | |
| **Substation** | Eurasia Pavilion | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27.6 | **kVolts** |
| **Type** | SM-Alduti-Indoor | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34563R4-T2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕB* | *ϕC* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | 236 | 232 | 278 | >505 | >505 | >505 |
| **Contact Resistance (μΩ)** | 41 | 42 | 44 | | | |
| **Arc Interrupter Res.(Ω)** | 0.9 | 1.2 | 0.4 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/ AN |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Eurasia Pavilion Trans. #1 | | |
| **Substation** | Eurasia Pavilion | | |

## High Voltage Power Fuse

**Fuse Holder Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 34.5 | **kVolt** |
| **Type** | SM-5S | **Current** | 300E | **Amps** |
| **Style/Cat #** | 86644R1 | **Serial #** | | |

**Fuse Link Nameplate Data**

| | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | 153-4 |
| **Style/Cat #** | 134025R4 | **Amps** | 15E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | OK | 3 Spares in Cell |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | >999 | >999 | >999 | >999 | >999 | >999 |
| **Contact Resistance (μΩ)** | 6020 | 5940 | 6080 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/ TL |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Eurasia Pav. Trans. T-1 | | |
| **Substation** | Eurasia Pavilion | | |

## Power Transformer –Electrical

**Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Vector Group** | Y-Y | | |
| **Type** | LNAN | | **Serial #.** | 849380 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Askarel | 200 | **Gal** |
| **Rating** | 225/ 252 | **kVA** | **Total Weight** | 6450 | | **lbs.** |
| **Impedance** | 5.9 | **%** | **Primary Voltage** | 27.6/ 16 | | **kVolt** |
| **Phase** | 3 | **ϕ** | **Secondary Voltage** | 208/ 120 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 150/ 45 | | **kVolt** |

**Insulation Tests**

| **Insulation Resistance @ 5k / 500 VDC** | **Prim. With Sec. Grounded** | **Sec. With Prim. Grounded** | **Prim. & Sec. To Ground** |
|---|---|---|---|
| **MΩ** | 40.0 | 34.2 | |
| **Corrected to 20 °C.** | 112.0 | 95.8 | |

| | **CH-L + G** | **CH-G** | **CH-L** | **CL-G** | **CL-H + G** |
|---|---|---|---|---|---|
| **Cap (pF)** | | | | | |
| **Corr. 20 °C** | | | | | |
| **Dis. Fact.(%)** | | | | | |
| **Corr. 20 °C.** | | | | | |

**Turns Ratio Tests**

| **Tap** | **Primary Volts** | **Calculated Ratio** | **X0-X1 H0-H1** | **X0-X2 H0-H2** | **X0-X3 H0-H3** |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | 27,600 | 0.754 | 0.746 | 0.746 | 0.746 |
| 4 | | | | | |
| 5 | | | | | |

| | |
|---|---|
| **Tap Position Found & Left** | 3 (27,600V) |
| **Results Satisfactory** | OK |

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T.S. P_Trans_Elect

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# TECHNICAL FIELD SERVICE DEPARTMENT

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Sample Date** | June 18, 1999 |
| **File Number** | 6621 | **Sampled By** | TL |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | T-1 | | |
| **Substation** | Eurasia Pavilion | | |

## Oil Analysis

**Transformer Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | Westinghouse | **Primary Volts** | 27.6/ 16 | **kVolts** |
| **Type** | LNAN | **Rating** | 225/ 252 | **kVA** |
| **Serial No.** | 849380 | **Liquid Volume** | 200 | **Gals.** |

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | |
|---|---|---|---|---|
| | | | | 1999 |
| Dielectric Breakdown | D877 | 30 kV | | 48.8 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | | 0.008 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | | N/A |
| Specific Gravity | D1298 | 0.84 - 0.91 (Oil) | | 1.520 |
| Colour | D1500 | ≤3.5 | | 0.5 |
| Visual Condition | D1524 | Clear | | Clear |
| Water Content | D1533 | 30 ppm (<69kV) | | |
| Power Factor | D924 | 1.0 % Max @ 25 °C | | |
| PCB Content | D4059 | 50 ppm Max. | | |
| Inhibitor | D2668 | ≥0.20% | | |
| Furans | D5837 | <100 ppb | | |
| Hydrogen (H2) | | | | |
| Oxygen & Argon | | | | |
| Nitrogen (N2) | | | | |
| Methane (CH4) | | | | |
| Carbon Monoxide (CO) | | | | |
| Carbon Dioxide (CO2) | | | | |
| Ethylene (C2H4) | | | | |
| Ethane (C2H6) | | | | |
| Acetylene (C2 H2) | | | | |
| Total Gas Content | | | | |

**Comments**

| | |
|---|---|
| **Chemical Properties** | OK |
| **PCB Content** | PCB fluid |
| **Dissolved Gas Content** | --- |

T.S.

T.S. Oil_Analysis

Black & McDonald

# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | TL |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Eurasia Pavilion Transformer T-1 | | |
| **Substation** | Eurasia Pavilion | | |

## Power Transformer -Mechanical

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Breather & Silica Gel** | N/A | |
| **Explosion Vent Gaskets** | N/A | |
| **Pressure Relief Device** | OK | |
| **Conservator Tank Gaskets** | N/A | |
| **Inspection Cover Gaskets** | OK | |
| **Main Cover Gaskets** | N/A | |
| **Primary Bushing Gaskets** | OK | |
| **Primary Bushing Porcelain** | POOR | H3 top skirt split/ cracked |
| **Primary Bushing Connections** | OK | |
| **Secondary Bushing Gaskets** | OK | |
| **Secondary Bushing Porcelain** | OK | |
| **Secondary Bushing Connections** | OK | |
| **Secondary Throat Gaskets** | OK | |
| **Radiator** | OK | |
| **Pressure Gauge** | OK | -0.8 PSI Vacuum |
| **Gas Relay** | N/A | |
| **Oil Level** | OK | |
| **Oil Leaks** | OK | None Visible |
| **Tank Valves** | OK | |
| **Oil Temperature Gauge** | OK | |
| **Oil Temperature Run/Max** | 34 \| 41°C | |
| **Winding Temperature Gauge** | N/A | |
| **Winding Temperature Run/Max** | \| | |
| **Tap Changer** | | Unit Locked: Inoperable |
| **Paint Condition** | OK | |
| **Pad** | OK | |
| **Grounding** | OK | One-point grounding |
| **Fan Operation** | N/A | |
| **Control Wiring** | N/A | |
| | | |
| **Results Satisfactory** | **Fair.** ***See Deficiencies.*** | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | TL |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | T-1 Secondary | | |
| **Substation** | Eurasia Pavilion | | |

## Bus Duct

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | Square D | **Voltage** | 600 | **Volts** |
| **Type** | I-Line | **Current** | 800 | **Amps** |
| **Style** | 3 Phase, 4 Wire | **B.I.L.** | | **kVolts** |
| **Cat #** | AF-510-23-FES | **Serial #** | T1 | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Bus Insulation** | OK | |
| **Type of Bus Insulation** | OK | |
| **Support Insulators** | OK | |
| **Interior Clean** | OK | Visible Sections Only |
| **Interior Dry** | OK | Visible Sections Only |
| **Bus Duct Enclosure** | OK | |
| **Bus Duct Enclosure Ventilated** | N/A | |
| **Bus Joints Clean & Dry** | OK | |
| **Bus Joints Torqued** | OK | |
| **Gaskets at Joints** | OK | |
| **Grounding** | OK | |
| **Enclosure Paint Condition** | OK | |
| **Support Structure** | OK | |

**Electrical Tests**

| *Test Description* | *$\phi A$* | *$\phi B$* | *$\phi C$* | *N* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | 2060 | 1990 | 2250 | — | 4780 | 4980 | 5500 |

| | |
|---|---|
| **Comments** | |
| **Results Satisfactory** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | RPM |
| **Location** | 361A Old Finch Ave., Scar., Ontario | | |
| **Equipment I.D.** | Main Secondary C.B. | | |
| **Substation** | Eurasia Pavilion | | |

## Low Voltage Air Circuit Breaker

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | ITE | **Voltage** | 600 | **Volts** |
| **Type** | K-1600 | **Frame Rating** | 1600 | **Amps** |
| **Serial #** | 98013 | **Int. Rating** | 65 | **kAmps** |
| **Relay Type** | OD4 Dashpots Only | **Sensors Ratio** | 800 | **Amps** |
| **Rating Plug.** | | **Limiter Rating** | N/A | **Amps** |

**Relay Calibration Results**

| | Settings | | $\phi A$ | | $\phi B$ | | $\phi C$ | |
|---|---|---|---|---|---|---|---|---|
| | **P/U** | **T.D** | **P/U** | **T.D.** | **P/U** | **T.D.** | **P/U** | **T.D.** |
| **Long Time** | 800A | Inst. | | | | | | |
| **Short Time** | 3200A | | | | | | | |
| **Instantaneous** | | | | | | | | |
| | | | **P/U** | **T.D.** | | | | |
| **Ground Fault** | --- | | | | | | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Main & Arcing Contacts** | OK | |
| **Arc Chutes** | OK | |
| **Phase Barriers** | OK | |
| **Bus & Grounding Stabs** | OK | |
| **Interlocks** | OK | Rack Out Only |
| **Manual Operation** | OK | |
| **Electrical Operation** | N/A | |

**Electrical Tests**

| *Test Description* | $\phi A$ | $\phi B$ | $\phi C$ | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | >999 | >999 | >999 | >999 | >999 | >999 |
| **Contact Resistance (μΩ)** | 58 | 64 | 52 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Weston Station Transformer | | |

## Padmounted Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Federal Pioneer | | **Year Built** | 1976 | | |
| **Type** | ONAN | | **Serial #** | A11808-1 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 260 | **Gal** |
| **Rating** | 225 | **kVA** | **Total Weight** | 4650 | | **lbs.** |
| **Impedance** | | **%** | **Primary Voltage** | 27.6/ 16 | | **kVolt** |
| **Phase(s)** | 3 | **ϕ** | **Secondary Voltage** | 208/ 120 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | **1999** |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 37.4 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.014 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 27.1 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.853 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | • IFT of the oil is marginal.<br>• ***This station's switchgear was reported to be in POOR condition*** |
| **Results Satisfactory:** | *FAIR/ Poor* |

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*Technical Field Service Department*

31 Pullman Court, Scarborough, Ontario M1X 1E4. Phone: (416)-298-9977 Fax: (416)-298-2907

# Indo-Malaya Pavilion

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Loop Feeder to Entrance Facilities | | |
| **Substation** | Indo-Malaya Pavilion | | |

## High Voltage Air/Load Break Switch

### Nameplate Data

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34063 | **Serial #** | | |

### Mechanical Inspections

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | Fair | Bϕ terminator skirt broken off. |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

### Electrical Tests

| *Test Description* | *ϕ A* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (GΩ)** | 438 | >505 | >505 | >505 | >505 | >505 |
| **Contact Resistance (μΩ)** | 55 | 47 | 52 | | | |
| **Arc Interrupter Res.(Ω)** | 0.9 | 0.6 | 0.7 | | | |
| | | | | | | |
| **Results Satisfactory** | OK/ Fair. *See Deficiencies.* | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Feeder to Africa Pavilion | | |
| **Substation** | Indo-Malaya Pavilion | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34063 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕ A* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 62 | 56 | 52 | | | |
| **Arc Interrupter Res.(Ω)** | 0.6 | 0.7 | 0.5 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Indo-Malaya Paddock Feeder | | |
| **Substation** | Indo-Malaya Pavilion | | |

## High Voltage Air/Load Break Switch

### Nameplate Data

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27.6 | **kVolts** |
| **Type** | SM-Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34563R4-T5 | **Serial #** | | |

### Mechanical Inspections

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | OK | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | OK | |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | Poor | Operator is defective |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

### Electrical Tests

| *Test Description* | *$\phi A$* | *$\phi B$* | *$\phi C$* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | --- | --- | 62 | | | |
| **Arc Interrupter Res.(Ω)** | --- | --- | * | | | |
| | | | | | | |
| **Results Satisfactory** | Fair. See Deficiencies. | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Indo-Malaya Paddock Feeder | | |
| **Substation** | Indo-Malaya Pavilion | | |

## High Voltage Power Fuse

**Fuse Holder Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 34.5 | **kVolt** |
| **Type** | SM-5 | **Current** | 300 | **Amps** |
| **Style/Cat #** | 86644R1 | **Serial #** | | |

**Fuse Link Nameplate Data**

| | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | |
| **Style/Cat #** | | **Amps** | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | Poor | No Spares in Cell |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕ B* | *ϕ C* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | | | 1015 | | | |

| | |
|---|---|
| **Results Satisfactory** | Fair. Spare links required. |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Indo-Malaya Transformer T2 | | |
| **Substation** | Indo-Malaya Pavilion | | |

## High Voltage Air/Load Break Switch

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27 | **kVolts** |
| **Type** | SM - Alduti | **Current** | 600 | **Amps** |
| **Style #** | | **B.I.L.** | 150 | **kVolts** |
| **Cat #** | 34563R4-T2 | **Serial #** | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Key Interlock** | N/A | |
| **Operating Mechanism** | OK | |
| **Operating Handle Grounding** | N/A | |
| **Grounding Mat** | N/A | |
| **Stationary Contact Surfaces** | OK | |
| **Moving Contact Surfaces** | OK | |
| **Arcing Contact Surfaces** | Fair | Surfaces pitted |
| **Contact Alignment** | OK | |
| **Arcing Interrupter** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕB* | *ϕC* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 50 | 46 | 48 | | | |
| **Arc Interrupter Res.(Ω)** | 1.0 | 0.5 | 0.8 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Indo-Malaya Transformer T2 | | |
| **Substation** | Indo-Malaya Pavilion | | |

## High Voltage Power Fuse

**Fuse Holder Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | S&C | **Voltage** | 27.6 | **kVolt** |
| **Type** | SM-5S | **Current** | 300E | **Amps** |
| **Style/Cat #** | | **Serial #** | | |

**Fuse Link Nameplate Data**

| | | | |
|---|---|---|---|
| **Type** | SM-5 | **TCC** | 153-4 |
| **Style/Cat #** | 134040R4 | **Amps** | 25E |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Operating Mechanism** | OK | |
| **Contact Surfaces** | OK | |
| **Contact Penetration** | OK | |
| **Contact Alignment** | OK | |
| **Fuse Barrel** | OK | |
| **Connector Condition** | OK | |
| **Insulator Condition** | OK | |
| **Phase Barrier Condition** | OK | |
| **Support Structure Condition** | OK | |
| **Spare Fuses** | OK | 3 Spares in Cell |

**Electrical Tests**

| *Test Description* | *ϕA* | *ϕB* | *ϕC* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Contact Resistance (μΩ)** | 3024 | 3055 | 3148 | | | |
| | | | | | | |
| **Results Satisfactory** | OK | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | TL |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Indo-Malaya Pavilion Trans. T-2 | | |
| **Substation** | Indo-Malaya Pavilion | | |

## Power Transformer -Electrical

**Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Vector Group** | Y-Y | | |
| **Type** | LNAN | | **Serial #.** | 795156 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Askarel | 220 | **Gal** |
| **Rating** | 500/ 560 | **kVA** | **Total Weight** | 8500 | | **lbs.** |
| **Impedance** | 7.1 | **%** | **Primary Voltage** | 27.6/ 16 | | **kVolt** |
| **Phase** | 3 | **ϕ** | **Secondary Voltage** | 208/ 120 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 150/ 45 | | **kVolt** |

**Insulation Tests**

| **Insulation Resistance @ 5k / 1k VDC** | **Prim. With Sec. Grounded** | **Sec. With Prim. Grounded** | **Prim. & Sec. To Ground** |
|---|---|---|---|
| **MΩ** | 28.0 | 24.2 | |
| **Corrected to 20 °C.** | 78.4 | 67.8 | |

| | **CH-L + G** | **CH-G** | **CH-L** | **CL-G** | **CL-H + G** |
|---|---|---|---|---|---|
| **Cap (pF)** | | | | | |
| **Corr. 20 °C** | | | | | |
| **Dis. Fact.(%)** | | | | | |
| **Corr. 20 °C.** | | | | | |

**Turns Ratio Tests**

| **Tap** | **Primary Volts** | **Calculated Ratio** | **X0-X1 H0-H1** | **X0-X2 H0-H2** | **X0-X3 H0-H3** |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | 27,600 | 0.754 | 0.746 | 0.746 | 0.746 |
| 4 | | | | | |
| 5 | | | | | |

| | |
|---|---|
| **Tap Position Found & Left** | 3 (27,600V) |
| **Results Satisfactory** | OK |

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# TECHNICAL FIELD SERVICE DEPARTMENT

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Sample Date** | June 17, 1999 |
| **File Number** | 6621 | **Sampled By** | TL |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | T-2 | | |
| **Substation** | Indo-Malaya Pavilion | | |

## Oil Analysis

**Transformer Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | Westinghouse | **Primary Volts** | 27.6/ 16 | **kVolts** |
| **Type** | LNAN | **Rating** | 500/ 560 | **kVA** |
| **Serial No.** | 795156 | **Liquid Volume** | 220 | **Gals.** |

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | |
|---|---|---|---|---|
| | | | | 1999 |
| Dielectric Breakdown | D877 | 30 kV | | 48.1 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | | 0.012 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | | N/A |
| Specific Gravity | D1298 | 0.84 - 0.91 (Oil) | | 1.420 |
| Colour | D1500 | ≤3.5 | | 0.5 |
| Visual Condition | D1524 | Clear | | Clear |
| Water Content | D1533 | 30 ppm (<69kV) | | |
| Power Factor | D924 | 1.0 % Max @ 25 °C | | |
| PCB Content | D4059 | 50 ppm Max. | | |
| Inhibitor | D2668 | ≥0.20% | | |
| Furans | D5837 | <100 ppb | | |
| Hydrogen (H2) | | | | |
| Oxygen & Argon | | | | |
| Nitrogen (N2) | | | | |
| Methane (CH4) | | | | |
| Carbon Monoxide (CO) | | | | |
| Carbon Dioxide (CO2) | | | | |
| Ethylene (C2H4) | | | | |
| Ethane (C2H6) | | | | |
| Acetylene (C2 H2) | | | | |
| Total Gas Content | | | | |

**Comments**

| | |
|---|---|
| **Chemical Properties** | OK |
| **PCB Content** | PCB fluid |
| **Dissolved Gas Content** | --- |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | TL |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | T-2 | | |
| **Substation** | Indo-Malaya Pavilion | | |

## Power Transformer -Mechanical

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Breather & Silica Gel** | N/A | |
| **Explosion Vent Gaskets** | N/A | |
| **Pressure Relief Device** | OK | |
| **Conservator Tank Gaskets** | N/A | |
| **Inspection Cover Gaskets** | OK | |
| **Main Cover Gaskets** | N/A | Welded Top |
| **Primary Bushing Gaskets** | OK | |
| **Primary Bushing Porcelain** | OK | |
| **Primary Bushing Connections** | OK | |
| **Secondary Bushing Gaskets** | OK | |
| **Secondary Bushing Porcelain** | OK | |
| **Secondary Bushing Connections** | OK | |
| **Secondary Throat Gaskets** | OK | |
| **Radiator** | OK | |
| **Pressure Gauge** | OK | -0.5 lb. Vacuum |
| **Gas Relay** | N/A | |
| **Oil Level** | OK | |
| **Oil Leaks** | OK | None Present |
| **Tank Valves** | OK | |
| **Oil Temperature Gauge** | OK | |
| **Oil Temperature Run/Max** | 37 \| 40°c | |
| **Winding Temperature Gauge** | N/A | |
| **Winding Temperature Run/Max** | \| | |
| **Tap Changer** | | Unit Locked: Inoperable |
| **Paint Condition** | OK | |
| **Pad** | OK | |
| **Grounding** | OK | One-point grounding |
| **Fan Operation** | N/A | |
| **Control Wiring** | N/A | |
| | | |
| **Results Satisfactory** | **OK** | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | TL |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | T-2 Secondary | | |
| **Substation** | Indo-Malaya Pavilion | | |

## Bus Duct

### Nameplate Data

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | FPE | **Voltage** | 120/208 | **Volts** |
| **Type** | Power Clad | **Current** | 1600 | **Amps** |
| **Style** | 3 Phase, 4 Wire | **B.I.L.** | | **kVolts** |
| **Cat #** | 08-01599 | **Serial #** | | |

### Mechanical Inspections

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Bus Insulation** | OK | |
| **Type of Bus Insulation** | OK | |
| **Support Insulators** | OK | |
| **Interior Clean** | OK | Visible Sections Only |
| **Interior Dry** | OK | Visible Sections Only |
| **Bus Duct Enclosure** | OK | |
| **Bus Duct Enclosure Ventilated** | N/A | |
| **Bus Joints Clean & Dry** | OK | |
| **Bus Joints Torqued** | OK | |
| **Gaskets at Joints** | OK | |
| **Grounding** | OK | |
| **Enclosure Paint Condition** | OK | |
| **Support Structure** | OK | |

### Electrical Tests

| *Test Description* | *$\phi A$* | *$\phi B$* | *$\phi C$* | *N* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | 1260 | 1140 | 1090 | --- | 1980 | 2160 | 3280 |

| | |
|---|---|
| **Comments** | |
| **Results Satisfactory** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | RPM |
| **Location** | 361A Old Finch Ave., Scar., Ontario | | |
| **Equipment I.D.** | Main Secondary C.B. | | |
| **Substation** | Indo-Malaya Pavilion | | |

## Low Voltage Air Circuit Breaker

**Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | FPE | **Voltage** | 600 | **Volts** |
| **Type** | 50H-2 | **Frame Rating** | 1600 | **Amps** |
| **Serial #** | TH-4123.72 | **Int. Rating** | 50 | **kAmps** |
| **Relay Type** | Carriere FB600E | **Sensors Ratio** | 1600:1 | **Amps** |
| **Rating Plug.** | --- | **Limiter Rating** | N/A | **Amps** |

**Relay Calibration Results**

| | Settings | | $\phi A$ | | $\phi B$ | | $\phi C$ | |
|---|---|---|---|---|---|---|---|---|
| | **P/U** | **T.D** | **P/U** | **T.D.** | **P/U** | **T.D.** | **P/U** | **T.D.** |
| **Long Time** | 0.9x | 7.5 | | 5.809 | | 5.881 | | 5.963 |
| **Short Time** | 6x | 0.40 | | 0.451 | | 0.445 | | 0.450 |
| **Instantaneous** | 10x | | | 0.055 | | 0.065 | | 0.064 |
| | | | **P/U** | **T.D.** | | | | |
| **Ground Fault** | 0.4x | 0.4 | | 0.415 | | | | |

**Mechanical Inspections**

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Main & Arcing Contacts** | OK | |
| **Arc Chutes** | OK | |
| **Phase Barriers** | Fair/ Poor | Front Barrier Missing |
| **Bus & Grounding Stabs** | OK | |
| **Interlocks** | OK | Rack Out Only |
| **Manual Operation** | OK | |
| **Electrical Operation** | N/A | |

**Electrical Tests**

| *Test Description* | $\phi A$ | $\phi B$ | $\phi C$ | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | >999 | >999 | >999 | >999 | >999 | >999 |
| **Contact Resistance (μΩ)** | 14 | 17 | 22 | | | |
| | | | | | | |
| **Results Satisfactory** | OK/ Fair | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | RPM |
| **Location** | 361A Old Finch Ave., Scar., Ontario | | |
| **Equipment I.D.** | DP MB | | |
| **Substation** | Indo-Malaya Pavilion | | |

## Low Voltage Air Circuit Breaker

### Nameplate Data

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | FPE | **Voltage** | 600 | **Volts** |
| **Type** | 50H-2 | **Frame Rating** | 1600 | **Amps** |
| **Serial #** | TH-4124/72 | **Int. Rating** | 50 | **kAmps** |
| **Relay Type** | Carriere FB600E | **Sensors Ratio** | 1600:1 | **Amps** |
| **Rating Plug.** | --- | **Limiter Rating** | N/A | **Amps** |

### Relay Calibration Results

| | Settings | | $\phi A$ | | $\phi B$ | | $\phi C$ | |
|---|---|---|---|---|---|---|---|---|
| | **P/U** | **T.D** | **P/U** | **T.D.** | **P/U** | **T.D.** | **P/U** | **T.D.** |
| **Long Time** | 0.65x | 7.5 | | 5.945 | | 6.204 | | 6.110 |
| **Short Time** | 4x | 0.25 | | 0.282 | | 0.300 | | 0.284 |
| **Instantaneous** | 6x | | | 0.124 | | 0.104 | | 0.108 |
| | | | **P/U** | **T.D.** | | | | |
| **Ground Fault** | 0.4x | 0.4 | | 0.26 | | | | |

### Mechanical Inspections

| *Description of Inspection* | *Status* | *Comments* |
|---|---|---|
| **Main & Arcing Contacts** | OK | |
| **Arc Chutes** | OK | |
| **Phase Barriers** | Fair | Front Barriers Cracked |
| **Bus & Grounding Stabs** | OK | |
| **Interlocks** | OK | Rack Out Only |
| **Manual Operation** | Poor (as found) | Mechanism restored to operation |
| **Electrical Operation** | N/A | |

### Electrical Tests

| *Test Description* | $\phi A$ | $\phi B$ | $\phi C$ | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | >999 | >999 | >999 | >999 | >999 | >999 |
| **Contact Resistance (μΩ)** | 32 | 24 | 28 | | | |
| | | | | | | |
| **Results Satisfactory** | Fair as found. | | | | | |

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# Cable Tests

# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14-18, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/ KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Loop Feed Underground Power Cables | | |
| **Substation** | Various | | |

## Power Cable Inspection

**Cable Nameplate Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | | **Voltage** | 28 | **kVolts** |
| **Insulation Type** | XLPE | **Ambient Temp.** | | **OC** |
| **Conductor Type** | Copper (CU) | **Humidity** | | **%** |

**Electrical Test**

| | Insulation Resistance (MΩ) | | | | | |
|---|---|---|---|---|---|---|
| **Feeder Identification** | **ϕA** | **ϕB** | **ϕC** | **A/B** | **B/C** | **C/A** |
| Incoming Outdoor 27.6kV Feeder | 68,000 | 7,700 | 725 | 18,100 | 4,900 | 34,000 |
| Main Switchgear to Eurasia Pavilion | 750 | 790 | 785 | 3,960 | 4,080 | 3,920 |
| Main Switchgear to Service Building | 805 | 800 | 680 | 4,180 | 3,700 | 3,760 |
| Service Bld. to N. America Pavilion | 680 | 710 | 660 | 3,400 | 3,400 | 3,200 |
| N. America to Africa Pavilion | 670 | 715 | 680 | 3,500 | 3,600 | 3,380 |
| Africa to Indo-Malaya Pavilion | 665 | 555 | 665 | 3,000 | 3,000 | 3,340 |
| Ent./ Admin. to Eurasia Pavilion (with Lightning Arrestors connected) | 386 | 396 | 402 | 2,040 | 2,100 | 2,040 |
| Ent./ Admin. to Indo-Malaya Pavilion | 760 | 810 | 760 | 4,080 | 3,980 | 3,940 |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| | |
|---|---|
| **Results Satisfactory** | |

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T.S. Power_Cable

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 28, 1999 |
| **File Number** | 6693 | **Tested By** | RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Loop Feed to Indo-Malaya Pavilion *(tested after ϕB splice repair)* | | |
| **Substation** | Africa Pavilion | | |

## Cable High-Potential Test

### Cable Nameplate Data

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | | **Voltage** | 28 | **kVolts** |
| **Insulation Type** | XLPE | **Conductor Size** | 3/0 | **MCM** |
| **Conductor Type** | Copper (CU) | **Temp. & Hum.** | 28 | OC |

### Electrical Test

| **Test Voltage @ 25 kVdc.** | **Leakage Current** | | |
|---|---|---|---|
| **Voltage Increments** | **ϕ A** | **ϕ B** | **ϕ C** |
| 5 kV | 17 | 14 | 13 |
| 10 kV | 35 | 33 | 39 |
| 15 kV | 55 | 47 | 27 |
| 20 kV | 45 | 50 | 32 |
| 25 kV | 64 | 68 | 46 |
| **Time at Test Voltage** | | | |
| **30 Seconds** | 46 | 48 | 27 |
| **1 Minute** | 43 | 46 | 25 |
| **2 Minutes** | 39 | 44 | 23 |
| **3 Minutes** | 36 | 43 | 20 |
| **4 Minutes** | 35 | 42 | 18 |
| **5 Minutes** | 34 | 41 | 17 |
| **6 Minutes** | | | |
| **7 Minutes** | | | |
| **8 Minutes** | | | |
| **9 Minutes** | | | |
| **10 Minutes** | | | |
| **11 Minutes** | | | |
| **12 Minutes** | | | |
| **13 Minutes** | | | |
| **14 Minutes** | | | |
| **15 Minutes** | | | |

| *Test Description* | *ϕA* | *ϕB* | *ϕC* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | 675 | 436 | 1270 | 1210 | 1530 | 1880 |
| **Results Satisfactory** | ϕC in best condition of 3 cables tested. | | | | | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 25, 1999 |
| **File Number** | 6693 | **Tested By** | RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Loop Feed to North America Pavilion *(tested after ϕB splice repair)* | | |
| **Substation** | Africa Pavilion | | |

## Cable High-Potential Test

### Cable Nameplate Data

| | | | | | |
|---|---|---|---|---|---|
| **Manufacturer** | Pirelli | **Voltage** | 28 | | **kVolts** |
| **Insulation Type** | XLPE | **Conductor Size** | 3/0 | | **MCM** |
| **Conductor Type** | Copper (CU) | **Temp. & Hum.** | | 28 | **OC** |

### Electrical Test

| **Test Voltage @ 25 kVdc.** | **Leakage Current** | | |
|---|---|---|---|
| **Voltage Increments** | **ϕ A** | **ϕ B** | **ϕ C** |
| 4 kV | 63 | 87 | 35 |
| 8 kV | 80 | 79 | 43 |
| 12 kV | 141 | 98 | 57 |
| 16 kV | 149 | 142 | 63 |
| 20 kV | 157 | 124 | 105 |
| **Time at Test Voltage** | | | |
| **30 Seconds** | 0.8 | 48 | 8 |
| **1 Minute** | 0.7 | 46 | 0 |
| **2 Minutes** | 0.7 | 44 | 0 |
| **3 Minutes** | 0.8 | 43 | 0 |
| **4 Minutes** | 0.9 | 42 | 0 |
| **5 Minutes** | 0.7 | 41 | 0 |
| **6 Minutes** | | | |
| **7 Minutes** | | | |
| **8 Minutes** | | | |
| **9 Minutes** | | | |
| **10 Minutes** | | | |
| **11 Minutes** | | | |
| **12 Minutes** | | | |
| **13 Minutes** | | | |
| **14 Minutes** | | | |
| **15 Minutes** | | | |

| *Test Description* | *ϕA* | *ϕB* | *ϕC* | *A/B* | *B/C* | *C/A* |
|---|---|---|---|---|---|---|
| **Insulation Resistance (MΩ)** | | | | | | |
| **Results Satisfactory** | ϕC in best condition of 3 cables tested. | | | | | |

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T.S. HV_Hypot

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# SUBMERSIBLE
# Distribution Transformers

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | KH/RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #1 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #** | 971935 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 465 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 36.5 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.014 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 32.9 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.848 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | • H1B elbow burnt.<br>• Elbow & transformer bushing insert should be replaced. |
| **Results Satisfactory:** | *POOR* |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | AS/TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #2 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | McGraw Edison | | **Year Built** | | | |
| **Type** | ONAN | | **Serial #** | 336007-2 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 255 | **Lit** |
| **Rating** | 100 | **kVA** | **Total Weight** | 522 | | **Kg** |
| **Impedance** | 1.7 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | **1999** |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 39.5 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.007 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 29.5 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.860 |
| **Colour** | **D1500** | **≤3.5 Max.** | 1.0 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | -Red phase connection found loose at the tank.<br>-IFT is borderline. Monitor for deterioration. |
| **Results Satisfactory:** | OK/ Fair |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #6 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #** | 861979 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 465 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| Dielectric Breakdown | D877 | 30 kV Min. | 35.8 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | 0.014 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | 31.8 |
| Specific Gravity | D1298 | 0.84 - 0.91 | 0.849 |
| Colour | D1500 | ≤3.5 Max. | 0.5 |
| Visual Condition | D1524 | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | |
| **Results Satisfactory:** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/JRK/TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #7 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #'s** | **Red Ø: 861975**<br>**White Ø: 861980**<br>**Blue Ø: 871930** | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 465 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | | |
|---|---|---|---|---|---|
| | | | Red | White | Blue |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 45.1 | 37.7 | 49.4 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.028 | 0.021 | 0.014 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 31.9 | 31.4 | 31.7 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.849 | 0.849 | 0.849 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 | 0.5 | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | • Below marginal oil levels on all units. |
| **Results Satisfactory:** | Fair. |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/TL |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #8 | | |

## Submersible Distribution Transformer

### Transformer Nameplate Data

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #'s** | **Red Ø: 871939**<br>**White Ø: 871938**<br>**Blue Ø: WO383007** | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 27 | **Gal** |
| **Rating** | 50 | **kVA** | **Total Weight** | 770 | | **Lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **KVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **KVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

### Laboratory Tests

| Type of Test | ASTM No. | Acceptable Limits | Test Results | | |
|---|---|---|---|---|---|
| | | | **Red** | **White** | **Blue** |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 42.5 | 43.1 | 43.0 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.007 | 0.021 | 0.020 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 30.9 | 31.4 | 26.6 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.850 | 0.853 | 0.859 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 | 1.0 | <0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | -Red phase oil level is marginal.<br>-Blue phase vault initially inaccessible. The water level in this vault does cover the transformer at times.<br>-Blue phase IFT is borderline.<br>-White phase vault ground to lid is off. |
| **Results Satisfactory:** | OK/ Fair |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #11 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #** | 861953 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 34 | **Gal** |
| **Rating** | 75 | **kVA** | **Total Weight** | 1080 | | **lbs.** |
| **Impedance** | 20 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 47.5 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.034 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 34.8 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.848 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | • No lock on lid<br>• Both hinges broken |
| **Results Satisfactory:** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault 11A | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Carte | | **Year Built** | 1988 | | |
| **Type** | ONAN | | **Serial #** | Q1431-28 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 186 | **Lit** |
| **Rating** | 75 | **kVA** | **Total Weight** | 451 | | **Kg** |
| **Impedance** | 2.29 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 46.7 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.013 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 35.2 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.876 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | • No lock on vault |
| **Results Satisfactory:** | OK |

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T.S. P_Trans_Elect

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/JRK/TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #12 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1974 | | |
| **Type** | ONAN | | **Serial #'s** | **Red Ø: 861968**<br>**White Ø:861963**<br>**Blue Ø: 861987** | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 27 | **Gal** |
| **Rating** | 50 | **kVA** | **Total Weight** | 770 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | | |
|---|---|---|---|---|---|
| | | | **Red** | **White** | **Blue** |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 38.4 | 42.8 | 37.1 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.028 | 0.014 | 0.014 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 30.1 | 30.0 | 30.4 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.850 | 0.851 | 0.849 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 | 0.5 | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | - Oil levels marginal. |
| **Results Satisfactory:** | OK |

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## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #13 – Old Elephant House | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #'s** | **Red Ø: 861950**<br>**White Ø: 861-954**<br>**Blue Ø: 861951** | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 34 | **Gal** |
| **Rating** | 75 | **kVA** | **Total Weight** | 1080 | | **lbs.** |
| **Impedance** | 2.0 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | | | **125lt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | | |
|---|---|---|---|---|---|
| | | | **Red** | **White** | **Blue** |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 47.4 | 38.7 | 42.7 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.028 | 0.028 | 0.041 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 32.7 | 32.4 | 30.6 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.484 | 0.847 | 0.853 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 | 0.5 | 1.0 |
| **Visual Condition** | **D1524** | **Clear** | Clear | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | - Blue phase oil level below manufacturer's indication line. |
| **Results Satisfactory:** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #13A | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1982 | | |
| **Type** | ONAN | | **Serial #'s** | **Red Ø: LG37989**<br>**White Ø: LG37991**<br>**Blue Ø: LG37990** | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 70 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 240 | | **lbs.** |
| **Impedance** | 1.8 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | | |
|---|---|---|---|---|---|
| | | | Red | White | Blue |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 44.4 | 47.6 | 41.8 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.014 | 0.021 | 0.027 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 30.0 | 25.7 | 29.5 |
| **Specific Gravity** | **D1298** | **0.84 – 0.91** | 0.856 | 0.853 | 0.856 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 | 0.5 | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | • The oil levels of these units were noted as marginal during the inspection.<br>• Note the marginal White ϕ IFT.<br>• The White phase unit subsequently failed and was replaced. (See following Oil test sheet for new unit lab results) |
| **Results Satisfactory:** | OK/ Fair |

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# TECHNICAL FIELD SERVICE DEPARTMENT

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Sample Date** | June 28, 1999 |
| **File Number** | 6621 | **Sampled By** | JRK |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #13A Pachyderm Centre/ White phase | | |
| **Substation** | Outside Elephant Paddock (Fed from Africa Pavilion) | | |

## Oil Analysis

**Transformer Data**

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | Cam Tran Co. | **Primary Volts** | 27.6/ 16 | **kVolts** |
| **Type** | ONAN Submersible | **Rating** | 100 | **kVA** |
| **Serial No.** | 99C0846101 | **Liquid Volume** | 194 | **Litres** |

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| Dielectric Breakdown | D877 | 30 kV | 42.1 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | 0.027 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | 37.7 |
| Specific Gravity | D1298 | 0.84 - 0.91 | 0.818 |
| Colour | D1500 | ≤3.5 | <0.5 |
| Visual Condition | D1524 | Clear | Clear |
| Water Content | D1533 | 30 ppm (<69kV) | |
| Power Factor | D924 | 1.0 % Max @ 25 °C | 0.014% |
| PCB Content | D4059 | 50 ppm Max. | |
| Inhibitor | D2668 | ≥0.20% | |
| Furans | D5837 | <100 ppb | |
| Hydrogen (H2) | | | |
| Oxygen & Argon | | | |
| Nitrogen (N2) | | | |
| Methane (CH4) | | | |
| Carbon Monoxide (CO) | | | |
| Carbon Dioxide (CO2) | | | |
| Ethylene (C2H4) | | | |
| Ethane (C2H6) | | | |
| Acetylene (C2 H2) | | | |
| Total Gas Content | | | |

**Comments**

| | |
|---|---|
| Chemical Properties | OK |
| PCB Content | N/A |
| Dissolved Gas Content | --- |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #14 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #** | 861970 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 465 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 44.1 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.028 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 33.4 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.848 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | |
| **Results Satisfactory:** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH/TL/AN |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #16 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | |
|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | |
| **Type** | ONAN | | **Serial #'s** | **Red Ø: 861969**<br>**White Ø: 861978**<br>**Blue Ø: 861977** | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil / 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 465 | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | | |
|---|---|---|---|---|---|
| | | | Red | White | Blue |
| Dielectric Breakdown | D877 | 30 kV Min. | 43.9 | 37.9 | 46.2 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | 0.028 | 0.014 | 0.021 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | 31.9 | 32.1 | 32.8 |
| Specific Gravity | D1298 | 0.84 - 0.91 | 0.849 | 0.849 | 0.849 |
| Colour | D1500 | ≤3.5 Max. | 0.5 | 0.5 | 0.5 |
| Visual Condition | D1524 | Clear | Clear | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | |
| **Results Satisfactory:** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #16 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1974 | | |
| **Type** | ONAN | | **Serial #** | 861966 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 27 | **Gal** |
| **Rating** | 50 | **kVA** | **Total Weight** | 770 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| Dielectric Breakdown | D877 | 30 kV Min. | 44.8 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | 0.034 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | 30.2 |
| Specific Gravity | D1298 | 0.84 - 0.91 | 0.850 |
| Colour | D1500 | ≤3.5 Max. | 0.5 |
| Visual Condition | D1524 | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | IFT is borderline |
| **Results Satisfactory:** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | TL/RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #16A | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghosue | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #** | 861974 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 465 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| Dielectric Breakdown | D877 | 30 kV Min. | 41.9 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | 0.028 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | 32.3 |
| Specific Gravity | D1298 | 0.84 - 0.91 | 0.849 |
| Colour | D1500 | ≤3.5 Max. | 0.5 |
| Visual Condition | D1524 | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | • Oil level is acceptable |
| **Results Satisfactory:** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | TL/RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #18 – Admin/Entrance Fed | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Carte | | **Year Built** | 1983 | | |
| **Type** | ONAN | | **Serial #** | L0721-1 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 35 | **Gal** |
| **Rating** | 75 | **kVA** | **Total Weight** | 889 | | **lbs.** |
| **Impedance** | 2.4 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 38.2 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.034 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 18.2 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.857 |
| **Colour** | **D1500** | **≤3.5 Max.** | 1.0 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | IFT is marginal |
| **Results Satisfactory:** | Fair |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | TL/RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #20 – Eurasia Fed | | |

## Submersible Distribution Transformer

### Transformer Nameplate Data

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #** | 861944 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 38 | **Gal** |
| **Rating** | 100 | **kVA** | **Total Weight** | 1300 | | **lbs.** |
| **Impedance** | 1.8 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

### Laboratory Tests

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| Dielectric Breakdown | D877 | 30 kV Min. | 43.3 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | 0.014 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | 36.1 |
| Specific Gravity | D1298 | 0.84 - 0.91 | 0.847 |
| Colour | D1500 | ≤3.5 Max. | 0.5 |
| Visual Condition | D1524 | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | |
| **Results Satisfactory:** | |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #21 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #** | 861981 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 465 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | **1999** |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 30.7 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.014 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 33.3 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.849 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | • Had to pump water out of vault<br>• Dielectric of oil is borderline |
| **Results Satisfactory:** | OK |

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**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #22 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #** | 861973 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 463 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 42.4 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.041 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 33.8 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.848 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | • Over one foot of water pumped out of vault. |
| **Results Satisfactory:** | OK |

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## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | JC |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #23 | | |

## Submersible Distribution Transformer

### Transformer Nameplate Data

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | | | |
| **Type** | ONAN | | **Serial #** | 871931 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 465 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

### Laboratory Tests

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 36.1 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.021 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 30.6 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.849 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | |
| **Results Satisfactory:** | OK |

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**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | TL/ RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #24 – Eurasia Fed | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1974 | | |
| **Type** | ONAN | | **Serial #** | 861964 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 27 | **Gal** |
| **Rating** | 50 | **kVA** | **Total Weight** | 770 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | **1999** |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 49.4 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.021 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 31.2 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.850 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | • Slight mark/ burn on H1B elbow.<br>• Some secondary cables were found cut off. These ends were taped off by our personnel. |
| **Results Satisfactory:** | OK (as left) |

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## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | KH/RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #26 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | |
|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1974 | |
| **Type** | ONAN | | **Serial #** | 861962 | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil 27 | **Gal** |
| **Rating** | 50 | **kVA** | **Total Weight** | 770 | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| Dielectric Breakdown | D877 | 30 kV Min. | 40.4 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | 0.014 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | 31.1 |
| Specific Gravity | D1298 | 0.84 - 0.91 | 0.848 |
| Colour | D1500 | ≤3.5 Max. | 0.5 |
| Visual Condition | D1524 | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | - Corrosion present on untaped Neutral bus/ bushing.<br>- Sand present in vault via primary cable duct. |
| **Results Satisfactory:** | OK |

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## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | KH/ RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #27 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #** | 871926 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 465 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 35.8 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.014 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 32.5 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.848 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | • Elbows taped by our personnel.<br>• Vault lid has no securing nuts holding grate. |
| **Results Satisfactory:** | OK |

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## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 15, 1999 |
| **File Number** | 6621 | **Tested By** | AS/TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #28 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #** | 871934 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 465 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 40.8 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.014 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 30.7 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.848 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | |
| **Results Satisfactory:** | OK |

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**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | JC |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault # 29 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | | | |
| **Type** | ONAN | | **Serial #** | 861972 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 465 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| Dielectric Breakdown | D877 | 30 kV Min. | 39.3 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | 0.021 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | 30.9 |
| Specific Gravity | D1298 | 0.84 - 0.91 | 0.848 |
| Colour | D1500 | ≤3.5 Max. | 0.5 |
| Visual Condition | D1524 | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | |
| **Results Satisfactory:** | OK |

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# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 18, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #30 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #'s** | **Red Ø: 861976**<br>**White Ø: 871932**<br>**Blue Ø: 871933** | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 465 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | | |
|---|---|---|---|---|---|
| | | | **Red** | **White** | **Blue** |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 43.0 | 34.1 | 39.1 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.007 | 0.014 | 0.021 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 33.1 | 29.6 | 31.8 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.849 | 0.849 | 0.848 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 | 0.5 | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | |
| **Results Satisfactory:** | OK |

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**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 16, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #31 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #'s** | **Red Ø: 861940**<br>**White Ø: 861941**<br>**Blue Ø: 861943** | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 38 | **Gal** |
| **Rating** | 100 | **kVA** | **Total Weight** | 1300 | | **lbs.** |
| **Impedance** | 1.8 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | | |
|---|---|---|---|---|---|
| | | | Red | White | Blue |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 40.2 | 37.0 | 38.1 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.021 | 0.007 | 0.007 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 31.6 | 31.1 | 32.3 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.850 | 0.848 | 0.848 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 | 0.5 | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | |
| **Results Satisfactory:** | OK |

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**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | JRK/RPM/TA |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #32 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #'s** | **Red Ø: 861949**<br>**White Ø: 961955**<br>**Blue Ø: 861952** | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 34 | **Gal** |
| **Rating** | 75 | **kVA** | **Total Weight** | 1080 | | **lbs.** |
| **Impedance** | 2 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | | |
|---|---|---|---|---|---|
| | | | Red | White | Blue |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 38.5 | 40.7 | 42.8 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.028 | 0.028 | 0.028 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 32.8 | 31.4 | 33.5 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.848 | 0.847 | 0.847 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 | 0.5 | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | • Red & Blue phases' oil level marginal.<br>• Red ϕ manhole gasket should be replaced. |
| **Results Satisfactory:** | OK/ Fair |

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## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 17, 1999 |
| **File Number** | 6621 | **Tested By** | KH |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #33 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #** | 871937 | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 463 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results |
|---|---|---|---|
| | | | 1999 |
| Dielectric Breakdown | D877 | 30 kV Min. | 37.7 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | 0.021 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | 36.9 |
| Specific Gravity | D1298 | 0.84 - 0.91 | 0.848 |
| Colour | D1500 | ≤3.5 Max. | 0.5 |
| Visual Condition | D1524 | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | Vault fills over top with water |
| **Results Satisfactory:** | OK |

T.S.

T.S. P_Trans_Elect

Black & McDonald

# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | RPM |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #34 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | | |
| **Type** | ONAN | | **Serial #'s** | **Red Ø: 861971**<br>**White Ø: 871927**<br>**Blue Ø: 871936** | | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil | 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 465 | | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | | |
|---|---|---|---|---|---|
| | | | Red | White | Blue |
| **Dielectric Breakdown** | **D877** | **30 kV Min.** | 37.7 | 48.9 | 42.2 |
| **Neutralization Number** | **D974** | **0.05 Max. Mg Koh/G** | 0.028 | 0.014 | 0.014 |
| **Interfacial Tension** | **D971** | **32 Dynes/ Cm Min.** | 32.2 | 32.3 | 33.0 |
| **Specific Gravity** | **D1298** | **0.84 - 0.91** | 0.849 | 0.848 | 0.848 |
| **Colour** | **D1500** | **≤3.5 Max.** | 0.5 | 0.5 | 0.5 |
| **Visual Condition** | **D1524** | **Clear** | Clear | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | • Blue & White phases' oil levels are marginal. Blue is lower.<br>• Signs of "corona" on White ϕ elbow. Water apparently dropping from above.<br>• Red ϕ vault ground broken off grate. This has been repaired by our personnel. |
| **Results Satisfactory:** | FAIR |

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Black & McDonald

# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Toronto Zoo | **Date** | June 14, 1999 |
| **File Number** | 6621 | **Tested By** | RPM/JRK |
| **Location** | 361A Old Finch Ave., Scarborough, Ontario | | |
| **Equipment I.D.** | Vault #35 | | |

## Submersible Distribution Transformer

**Transformer Nameplate Data**

| | | | | | |
|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Year Built** | 1973 | |
| **Type** | ONAN | | **Serial #'s** | **Red Ø: 971929**<br>**White Ø: 871928**<br>**Blue Ø: 871925** | |
| **Neutral** | Solid | | **Liquid Type/Vol** | Oil 16 | **Gal** |
| **Rating** | 25 | **kVA** | **Total Weight** | 465 | **lbs.** |
| **Impedance** | 1.9 | **%** | **Primary Voltage** | 16 | **kVolt** |
| **Phase(s)** | 1 | **ϕ** | **Secondary Voltage** | 120/ 240 | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | **kVolt** |
| **Insulation Resistance (MΩ)** | | | | | |

## Oil Analysis

**Laboratory Tests**

| Type of Test | ASTM No. | Acceptable Limits | Test Results | | |
|---|---|---|---|---|---|
| | | | Red | White | Blue |
| Dielectric Breakdown | D877 | 30 kV Min. | 41.8 | 42.8 | 38.0 |
| Neutralization Number | D974 | 0.05 Max. Mg Koh/G | 0.021 | 0.021 | 0.021 |
| Interfacial Tension | D971 | 32 Dynes/ Cm Min. | 32.4 | 32.7 | 31.7 |
| Specific Gravity | D1298 | 0.84 - 0.91 | 0.848 | 0.848 | 0.848 |
| Colour | D1500 | ≤3.5 Max. | 0.5 | 0.5 | 0.5 |
| 0isual Condition | D1524 | Clear | Clear | Clear | Clear |

## Observations & Comments

| | |
|---|---|
| **Comments:** | • Red Ø – oil level is low<br>• Blue Ø – oil is marginal |
| **Results Satisfactory:** | Fair |

T.S.

# APPENDIX 20

# BLACK & McDONALD – SUBMERSIBLE TRANSFORMER FAILURE/REPLACEMENT REPORT DATED AUGUST 1999, REFERENCE NO. 6637

Black & McDonald

*Technical Field Service Division*
31 Pullman Court, Scarborough, Ontario M1X 1E4. Phone: (416)-298-9977 Fax: (416)-298-2907

June 8, 1999

Metro Toronto Zoo
361A Old Finch Ave.
Scarborough, Ontario
M1B 5K7

**Attention:** **Mr. Dean Evans**
**Maintenance/ Facilities Supervisor**
**Subject:** **Submersible Transformer Failure / Replacement Report**
**Our Reference:** **6638**

Dear Sir:

Further to the power interruption that occurred on May 18th, please find the results of our investigation enclosed herein.

## *Initial Observations & Action:*

- A single phase feed 27.6kV S&C fuse was found to have operated in the Eurasia Pavilion substation. The affected feed supplied three (3) submersible transformer vaults.
- The blown link was replaced and tested.
- The associated lightning arrestor was also tested at 5kVDC and found to be acceptable for continued use.
- The feed was re-energised and the new fuse did not operate.
- The 3 individual submersible vaults were subsequently inspected.
- The transformer adjacent to the "Bird Barn" was found to not be supplying power.
- After confirming that voltage was indeed present at the cable termination point to the transformer, the feed was isolated and the transformer tested.

## *Transformer Test Results:*

- Insulation resistance ("Megger") testing of the transformer 240V secondary winding resulted in a less than acceptable reading ≅ 3.5MΩ. Industry standards require a minimum value of 100MΩ for this type of unit.
- Dissipation factor readings measured beyond the readable scale of the test set.
- High capacitance readings on the secondary winding confirmed this as the point of failure.
- Sampling of the transformer oil immediately gave evidence of internal failure by the oil's black/ yellow colour (due to carbonisation).
- The dielectric breakdown of the oil was laboratory tested at 18.6kV – a clear failure by any accepted standard.

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## *Remedial Action Taken:*

- As a result of the clear failure of the existing submersible transformer, it was removed from service.
- A new, compatible unit was sourced, supplied, tested, and installed.
- The failed transformer was removed from site and is being evaluated for repair or replacement.
- The old unit has been confirmed as being PCB-free.

I trust that this report will meet your requirements. We thank you for this service opportunity and invite any questions you may have. If there are any further concerns, please do not hesitate to contact the undersigned or Fred Tanguay (Tech. Service Manager) at any time.

Regards,
**BLACK & McDONALD LIMITED**

R.P. (Rodger) Morgan
Utility Technical Field Services

Black & McDonald

# TECHNICAL FIELD SERVICE DIVISION

**Special Projects Group**

## Client Information

| | | | |
|---|---|---|---|
| **Customer** | Metro Toronto Zoo | **Date** | May 18, 1999 |
| **File Number** | 6638 | **Tested By** | R. Morgan |
| **Location** | Scarborough, Ontario | | |
| **Equipment I.D.** | Submersible Transformer (Old Unit) | | |
| **Substation** | Bird Barn Submersible Vault | | |

## Power Transformer -Electrical

**Nameplate Data**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Manufacturer** | Westinghouse | | **Vector Group** | 240/ 120 Centre Tapped | | | |
| **Type** | ONAN | | **Serial #.** | 861942 | | | |
| **Neutral** | Solid Ground | | **Liquid Type/Vol** | Oil | 38 | | **Gal** |
| **Rating** | 100 | **kVA** | **Total Weight** | 1,300 | | | **lbs.** |
| **Impedance** | 1.8 | **%** | **Primary Voltage** | 16 | | | **kVolt** |
| **Phase** | 1 | **ϕ** | **Secondary Voltage** | 240/ 120 | | | **Volt** |
| **Frequency** | 60 | **Hz** | **BIL** | 125 | | | **kVolt** |

**Insulation Tests**

| **Insulation Resistance @ 5k / 500 VDC** | **Prim. With Sec. Grounded** | **Sec. With Prim. Grounded** | **Prim. & Sec. To Ground** |
|---|---|---|---|
| **MΩ** | 87,000 | 3.46 | 65,500 |
| **Corrected to 20 °C.** | | | |

| | **CH-L + G** | **CH-G** | **CH-L** | **CL-G** | **CL-H + G** |
|---|---|---|---|---|---|
| **Cap (pF)** | 122 | 117 | 4 | 3006 | 3000 |
| **Corr. 20 °C** | | | | | |
| **Dis. Fact.(%)** | 11.22 | 13.00 | -- | >39.99 | >39.99 |
| **Corr. 20 °C.** | | | | | |

**Turns Ratio Tests**

| **Tap** | **Primary Volts** | **Calculated Ratio** | **X0-X2 H1-H2** | **X0-X3 H2-H3** | **X0-X1 H3-H1** |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |

| | |
|---|---|
| **Tap Position Found & Left** | |
| **Results Satisfactory** | NO |

T.S.