APPENDIX

Product information (PI) report forms
Performance verification (PV) report forms
MECHANICAL

January 1997 (Re-affirmed October 19/1999)
(NOTE: All PI and PV Forms are undergoing extensive reviews)

TITLE	LIST		PI FORMS		PV FORMS	
	Eng	Fr	Eng	Fr	Eng	Fr
Access to Concealed Equipment	YES	YES				
Air Compressor			YES	YES	YES	YES
Air-Cooled Condenser			YES		YES	
Air-Cooled Condensing Unit			YES		YES	
Air-Cooled Fluid Cooler			YES		YES	
Air Duct Flow Report see *TAB Report, Air Ducts*						
Air Flow Measuring Station - Rectangular					YES	
Air Flow Measuring Station - Round					YES	
Air Flow measuring Station			YES			
Air Handling Unit - Factory Packaged			YES		YES	
Blowdown Tank			YES			
Boiler-High Pressure Packaged			YES	YES	YES	YES
Cabinet Unit Heater			YES	YES	YES	YES
Cathodic Protection Systems			YES		YES	
Centrifugal Fan			YES		YES	
Chiller - absorption			NO		NO	
Chiller - Centrifugal			YES	YES	YES	YES
Chiller - reciprocating			NO		NO	
Chiller - screw			NO		NO	
Circulating Pumps - See *Hydronic System Circulating Pumps*						
Coil - Heating / Cooling			YES	YES		

TITLE	LIST		PI FORMS		PV FORMS	
	Eng	Fr	Eng	Fr	Eng	Fr
Coil - Hydronic					YES	YES
Coil - Steam					YES	YES
Control Valve			YES	YES	YES	YES
Cooling Tower			YES		YES	
Dampers - fire and smoke, List of - see *Fire and Smoke Dampers - list of*						
Dampers - Operating - see *Operating Dampers*						
De-aerator-Feedwater Heater			YES		YES	
Deficiency List	YES	YES				
Dehumidifier - Desiccant Type			YES		YES	
Dehumidifier - Refrigerant Type			NO		NO	
Diffusers - see *Grilles, Registers, Diffusers*						
Domestic Water Booster Heater			YES	YES		
Domestic Water Heater			YES			
Drilled Well - see *Well - Drilled*						
Duct (Air) Flow Report					YES	
Duct (Air) Leakage Test Report					YES	
Duct - Rectangular - Pitot-tube Traverse					YES	
Duct - Round - Pitot-tube Traverse					YES	
EMCS					YES	
Expansion Tank - see *Hydronic System Expansion Tank*						
Exhaust Fan - for Lab Fume Hood					YES	
Fan - Centrifugal - see *Centrifugal Fan*						
Fan - Exhaust - for Lab Fume Hood - see *Exhaust Fan for Lab Fume Hood*						
Fan Coil Units			YES		YES	
Filters - Final			YES	YES	YES	YES
Filters - Pre			YES	YES	YES	YES
Filter Gauges			YES	YES		

TITLE	LIST		PI FORMS		PV FORMS	
	Eng	Fr	Eng	Fr	Eng	Fr
Fire and Smoke Dampers - list of	YES	YES				
Fire Extinguishers - list of	YES	YES				
Fire Pump & Jockey Pump			YES		Use NFPA 20	
Fire Pumps, (2) Operating in Parallel					YES	
Fire Pumps, Sprinkler & Standpipe & Hose Systems			NO - Use NFPA 20			
Fire - Sprinkler System Alarm Valves - see *Sprinkler System Alarm Valves - Wet/Dry*						
Gas Pressure Regulator			YES			
Glycol Fill & Mixing Tank			YES			
Grilles, Registers, Diffusers					YES	
Heat Exchangers			YES		YES	
Heat Exchanger - Safety & Relief Valves			YES			
Heat Pumps			YES			
Heat Pumps - Water Source					YES	
Heat Pumps - Hydronic Distribution System					YES	
Heat Pump System - Water Source - TAB Report					YES	
Humidifiers - Direct Steam Injection type			YES		YES	
Humidifiers - Evaporative type			NO	NO	NO	NO
Hydronic system circulating pump			YES		YES	
Hydronic System Circulating Pump - Duplex - Single Pump Operation			NO		YES	
Hydronic System Circulating Pumps - Duplex - Operating in Parallel			NO		YES	
Hydronic System Circulating Pumps - Duplex - Operating in seriesl			NO		NO	
Hydronic System Expansion Tank			YES		YES	
Instrument Calibration Data Report			YES			
Laboratory Pressurization					YES	
Laboratory Pressurization (Integrated System)					YES	

TITLE	LIST		PI FORMS		PV FORMS	
	Eng	Fr	Eng	Fr	Eng	Fr
Laboratory Fume Hood					YES	
Lab Fume Hood Scrubber System			YES		YES	
Lab Fume Hood Exhaust Fan - see *Exhaust Fan for Lab Fume Hood*						
Laboratory Services					YES	
Lubrication Schedule - List of	YES					
Maintenance Materials Required by Contract Documents, List of	YES					
Mixing Chamber (Plenum)					YES	
Oil Storage Tanks			YES			
Operating Dampers			YES		YES	
Plumbing Specialties			YES			
Potable Water Distribution System					YES	
Pressure Booster System					YES	
Pumps - see *Hydronic System Circulating Pumps*						
Pure Water Systems (Preliminary only)			YES		YES	
Refrigeration Compressors			YES		YES	
Relief Valves - see *Safety & Relief Valves*						
Safety & Relief Valves			YES			
[Sanitary] [Storm Water] Lift Station			NO		YES	
Service Contracts, List of	YES					
Sewage Pump - see *[Sanitary] [Storm Water] Lift Station*						
Site Test Requirements, Summary of	YES					
Smoke Dampers - see *Fire and Smoke Dampers*						
Snow Melting System - Glycol					YES	
Spare Parts List	YES	YES				
Special Tools Req'd by Contract Doc'ts, List of	YES					

TITLE	LIST		PI FORMS		PV FORMS	
	Eng	Fr	Eng	Fr	Eng	Fr
Sprinkler System Alarm Valve - Dry Pipe			YES	YES	use NFPA 13	
Sprinkler System Alarm Valve - Wet Pipe			YES	YES	use NFPA 13	
Stairwell Pressurization System (SPS)					YES	
Steam Traps, List of	YES	YES				
Strainers, List of	YES					
Sump Pump - see *[Sanitary] [Storm Water] Lift Station*						
TAB Reports - Air Ducts					YES	
TAB Report - Water-source Heat Pump System					YES	
TAB of Hydronic Coil, Control Valve, CBV			YES		YES	
Tests & Warranties, List of	YES					
Unit Heaters			YES		YES	
Variable Air Volume (VAV) Boxes	NO	NO			YES	YES
VAV System - Diversity Test					YES	
Water Treatment Systems			YES		YES	
Well - Drilled					YES	
Well pumps			NO		NO	

END OF MECHANICAL INDEX

Product information (PI) report forms
Performance verification (PV) report forms
ELECTRICAL

January 1997 (Re-affirmed October 19/1999)
(NOTE: All PI and PV Forms are undergoing extensive reviews)

TITLE		LIST		PI FORMS		PV FORMS	
		Eng	Fr	Eng	Fr	Eng	Fr
Air Circuit Breaker	476	NO		NO		YES	
Capacitors for Power Factor Correction	410	NO		NO		YES	
Clock Systems	730	NO		NO		YES	
Diesel Generators	622	NO		NO		YES	
Disconnect Switch - Fused and Un-fused	440	NO		NO		YES	
Distribution Panelboard (includes Lighting or Receptacle Panelboard)	471	NO		NO		YES	
Distribution Transformer	461	NO		NO		YES	
Emergency Handset Communication System	762	NO		NO		YES	
Feeder Cables	122	NO		NO		YES	
Fire Alarm Systems	720	NO		NO		YES	
Generator Switchboard	625	NO		NO		YES	
Ground Fault Relay	495	NO		NO		YES	
Hands-Free Intercom Systems	771	NO		NO		YES	
Main Switchboard Enclosure	426	NO		NO		YES	
Motor Starter	811	NO		NO		YES	
Motor Control Centre Enclosure	820	NO		NO		YES	
Potential Transformers & Current Transformers (includes Switchboard Digital Metering Unit)	431	NO		NO		YES	

TITLE		LIST		PI FORMS		PV FORMS	
		Eng	Fr	Eng	Fr	Eng	Fr
Programmable Lighting Control System	591	NO		NO		YES	
Public Address Communication System	770	NO		NO		YES	
Security Radio Communication Systems	764	NO		NO		YES	
Switchboard and/or Panelboard - Moulded Case Circuit Breaker	477	NO		NO		YES	
Telecommunications Systems	763	NO		NO		YES	
Uninterruptible Power Systems	610	NO		NO		YES	
Very Early Warning Detection System	721	NO		NO		YES	
Voltage Regulators	611	NO		NO		YES	

END OF ELECTICAL INDEX

END
CP.10 REPORT FORMS AND SCHEMATICS

EQUIPMENT DATA:

Manufacturer	
Type	
Model Number	
Serial Number	

LOCATION DATA:

Building	
Area	
Floor	
room	

NAMEPLATE DATA:

	Specified	Shop Drawings	Installed	Verified
GPM				
Head Pressure				
Voltage/Phase				
Amperage				
RPM				
HP				

SUPPORT DOCUMENTS:

Manufacturer's report	Y / N / NA	Comments:	
Manufacturer's certificates	Y / N / NA	Comments:	
Pump & Fans Curves attached	Y / N / NA	Comments:	

STATIC COMMISSIONING:

Comments

SIGN-OFFS:

Independant Commissioning Agent : _____ Date: _____

Design Builder Design Team : _____ Date: _____

Department/Representative : _____ Date: _____

Component Verification Form		*Section:* XX XX XX
System: **Chilled Water**	*Equipment:* **PUMP**	*Tag:* **HWP-01**
Prepared By:		

2 System Performance Verification

Project Name: XXXXXXXXX Page X of X
Project No: XXXX

Air Handling AHU-1 Test M-1
(note: unique test ID mechanical test M-1)

1. Test Purpose

.1 The intent is to test the integration of all HVAC, EMCS and the specialized greenhouse control system components through a series of test procedures designed to exercise the control system as it would be used in normal and abnormal operating conditions.
.2 To ensure system operation is as per contract documents.
.3 Make adjustments to system components as required to suit the design intent and operational requirements.
.4 “C” denotes Contractor. “DR” denotes Departmental Representative (Design Consultant)

2. System Design and Operation Narrative

Note: Describes the design philosophy of the system and narrates the operation and operational control parameters.

AHU-1 and its corresponding return air fan RF-1 maintain the pressurization of the second floor at approximately 20Pa by modulation of the fans by VSD-1 (supply fan) and VSD-2. (return fan)…..

3. Test Pre-Requisites

.1 Mechanical:

		C	DR
.1	All component verifications are complete and approved	[ ]	[ ]
.2	Air system balancing is complete and approved	[ ]	[ ]
.3	Heating operational and verified	[ ]	[ ]
.4	Cooling is operational and verified	[ ]	[ ]
.5	Humidification is operational and verified	[ ]	[ ]
.6	Hydronic balance is complete and approved	[ ]	[ ]

.2 Controls:

		C	DR
.1	All component verifications are complete and approved	[ ]	[ ]
.2	All control device calibrations and physical point verifications are complete and approved.	[ ]	[ ]
.3	All manual overrides and jumpers have been removed to allow for automatic/normal operation	[ ]	[ ]
.4	Final control program is loaded and operational	[ ]	[ ]
.5	All hardwired interlocks and safeties (if any) are operational	[ ]	[ ]
.6	All software interlocks and safeties (if any) are operational	[ ]	[ ]
.7	Trend logs for Building EMCS and specialized greenhouse control systems are defined	[ ]	[ ]

and fully operational for: Physical points, setpoints and process variables to establish system performance. The trends are to be archived for the duration of this test and period of 15 days prior to Interim acceptance and there after. This to confirm the system performance meets the design intent.

3. Modes of Operation are Set-up and Functioning

.1 System Modes:

		C	DR
.1	Off mode – system shuts down	[ ]	[ ]
.2	Occupied mode – System starts up	[ ]	[ ]
.3	Unoccupied mode – system air volumes go to minimum position	[ ]	[ ]

.2 Operating Modes:

		C	DR
.1	Heating mode – heating coils and pumps enabled	[ ]	[ ]
.2	Evap cooling mode – humidifier valves enabled	[ ]	[ ]
.3	Cooling mode – cooling coil enabled	[ ]	[ ]
.4	Humidification mode – humidifier valves enabled	[ ]	[ ]

4. System Start/Stop Sequencing

.1 System equipment status at shut down

		C	DR
.1	Supply fan is of and variable speed drive is set to minimum position	[ ]	[ ]
.2	The relief fan is off and variable speed drive is set to minimum position	[ ]	[ ]

.3	Outside air damper is closed	[ ]	[ ]
.4	Relief air damper is closed	[ ]	[ ]
.5	Chilled water cooling coil valve is closed	[ ]	[ ]
.6	The heat recovery loop 3 way valve shall be closed to the return line from the relief air recovery coil	[ ]	[ ]
.7	The heating coil exchanger valve is closed	[ ]	[ ]
.8	The heating coil duty and standby pumps are off	[ ]	[ ]
.9	The heat recovery pump is off	[ ]	[ ]
.10	The evap cooler valves are closed, control loops are disabled	[ ]	[ ]
.11	Exhaust fan EF-41 is disabled	[ ]	[ ]
.12	Dust collector DC-1 disabled	[ ]	[ ]

.2 System equipment start-up sequence

		C	DR
.1	If outdoor temperature is less than the supply air temperature setpoint, the heating coil duty pump shall star and the heating coil heat exchanger valve shall open to 100%	[ ]	[ ]
.2	If the duty heating coil pump fails to start the standby pump starts	[ ]	[ ]
.3	After a time delay the relief air damper shall open time delay set at __5__ min.	[ ]	[ ]
.4	The relief air fan shall start when the relief damper is fully open. (Hardwire interlock) On fan start-up ramp the fan to 10% speed	[ ]	[ ]

.5 When relief fan is proven to be running the outside air damper opens	[ ]	[ ]
.6 When the outside air damper is fully open the supply fan starts. (Hardwire interlock) On fan start-up ramp the fan to 10% speed	[ ]	[ ]
.7 If the outside air temperature is below 13 Deg. C, start the heat recovery loop pump	[ ]	[ ]
.8 Enable the control loops	[ ]	[ ]

5. Operating Sequences

	C	DR
.1 System to run continuously when commanded through the EMCS	[ ]	[ ]
.2 Supply fan speed is varied to satisfy supply duct static pressure of 250 Pa	[ ]	[ ]
.3 Relief fan speed is varied to satisfy relief duct static pressure of 250 Pa	[ ]	[ ]
.4 Heat recovery loop valve, heating coil valve, evaporative cooling and cooling coil valve modulate in sequence to satisfy the supply air temperature setpoint of 12 Deg. C.	[ ]	[ ]
.5 Heating		
.1 Modulate heat recovery loop valve to satisfy the heat recovery coil leaving air temperature setpoint of 12 Deg. C	[ ]	[ ]
.2 Modulation of the heat recovery loop valve shall not allow the exhaust air temperature to drop below 5 Deg. C	[ ]	[ ]
.3 Modulate the heating coil heat	[ ]	[ ]

	exchanger valve to satisfy the heating coil leaving air setpoint temperature of 12 Deg C		
.4	The heating coil valve and cooling coil valve shall not be open at the same time	[ ]	[ ]
.5	Alternative heating coil duty and standby pumps every 200 hours	[ ]	[ ]
.6 Cooling			
		C	DR
.1	First stage of cooling is the evaporative cooler	[ ]	[ ]
.2	Open 2 evaporative cooler 2 position valves as required to satisfy the supply air temperature setpoint of 12 Deg. C	[ ]	[ ]
.3	Humidity limitations override temperature requirements	[ ]	[ ]
.4	When the evaporative cooler can no longer satisfy supply air temperature setpoint, close the evaporative cooler valves	[ ]	[ ]
.5	Cooling coil valve modulates to satisfy the supply air temperature setpoint with all evaporative cooler valves closed	[ ]	[ ]
		C	DR
.7 Operate the 2 @ 2 position evaporative cooler valves as required to satisfy the relief air humidity setpoint		[ ]	[ ]
.8 Setpoint schedule is as follows: OAT > 15 Deg. C ; 45% RH -20 < OAT < 15 Deg. C ; 25% RH OAT < -20 DEG. ; C 20%		[ ]	[ ]
.9 Supply air temperature setpoint		[ ]	[ ]

reduces if all reheat coil valves are closed

.10 Supply air temperature setpoint increases if all reheat coil valves are open [ ] [ ]

.11 Exhaust fan EF-41 is enabled when system is in occupied mode [ ] [ ]

.12 Exhaust fan EF-41 is disabled when system is in unoccupied mode or off mode [ ] [ ]

.13 Dust collector DC-1 is enabled when system is in occupied mode [ ] [ ]

.14 Dust collector DC-1 is disabled when system is in unoccupied mode or off mode [ ] [ ]

7. Alarms and Status

.1 Supply fan failure causes:

	C	DR
.1 Alarm at OWS	[ ]	[ ]
.2 Close supply and relief dampers	[ ]	[ ]
.3 Relief fan shall stop when relief damper closes	[ ]	[ ]
.4 Return system to off position	[ ]	[ ]

.2 Relief fan failure causes:

	C	DR
.1 Alarm at OWS	[ ]	[ ]
.2 Close supply and relief dampers	[ ]	[ ]
.3 Relief fan shall stop when relief damper closes	[ ]	[ ]
.4 Return system to off position	[ ]	[ ]

.3 Heating coil duty pump failure causes:

	C	DR
.1 Alarm at OWS	[ ]	[ ]

.2 Standby pump starts	[ ]	[ ]

.4 Heating coil standby pump failure causes:

	C	DR
.1 Alarm at OWS	[ ]	[ ]

.5 Heat recovery loop pump failure causes:

	C	DR
.1 Alarm at OWS	[ ]	[ ]

.6 Low supply air temperature causes:

	C	DR
.1 Hardwire interlock will close dampers and turn of fans	[ ]	[ ]
.2 Turn heating coil pump on and drive heating coil heat exchanger valves fully open	[ ]	[ ]
.3 Turn heat recovery pump on and drive heat recover valve fully open	[ ]	[ ]
.4 Drive chilled water coil valve fully closed	[ ]	[ ]
.5 Setpoint temperature is 5 Deg. C	[ ]	[ ]

.7 high supply duct static pressure causes:

	C	DR
.1 Hardwire interlock closes dampers and turn fans off	[ ]	[ ]
.2 Return system to off position	[ ]	[ ]
.3 Setpoint pressure is 1000 Pa	[ ]	[ ]

.8 High relief air duct static pressure causes:

	C	DR
.1 Hardwire interlock closes dampers and turn fans off	[ ]	[ ]
.2 Return system to off position	[ ]	[ ]

.3 Setpoint pressure is 1000 Pa	[ ]	[ ]
.9 Failure of supply air temperature sensor in cooling mode causes:	C	DBCA
.1 Modulate cooling coil valve of maintain return air temperature of 22 Deg. C	[ ]	[ ]
.10 Failure of supply air temperature sensor in heating mode causes:	C	DR
.1 Modulate preheat and recovery coil to satisfy heat recovery coil leaving air temperature setpoint	[ ]	[ ]
.11 Failure of heating coil leaving air temperature sensor causes:	C	DR
.1 Drive heat recovery valve fully open and modulate heating coil heat exchanger valve to satisfy the supply air temperature setpoint	[ ]	[ ]
.12 Failure of supply duct static pressure sensor causes:	C	DR
.1 If one sensor fails, vary fan speed to satisfy remaining sensor	[ ]	[ ]
.2 If both sensors fail, keep supply fan speed at last commanded position.	[ ]	[ ]
.13 Failure of relief duct static pressure sensor causes:	C	DR
.1 If one sensor fails, vary fan speed to satisfy remaining sensor	[ ]	[ ]
.2 If both sensors fail keep supply fan speed at least commanded position	[ ]	[ ]
.14 Failure of return air relative humidity sensor causes:	C	DR

.1 Alarm at OWS	[ ]	[ ]
.2 Evaporative cooler valves remain at last position	[ ]	[ ]
.15 Failure of supply air relative humidity sensor causes:	C	DR
.1 Alarm at OWS	[ ]	[ ]
.2 Evaporative cooler valves remain at last position	[ ]	[ ]
	C	DR
.16 An alarm is generated at the OWS if EF-41 fails to start 3 min. after start command	[ ]	[ ]
.17 An alarm is generated at the OWS if any supply or exhaust air terminal unit air volume is more than 10% above or below setpoint	[ ]	[ ]

7. Test Sign Off

Contractor:

Firm: _____

Signature: _____

Witnessed By Department Representative (Consultant)

Firm: _____

Signature: _____

Witnessed By: (PWGSC/OWNER)

Firm: _____

Signature: _____

COMMENTS:

_____

_____

_____

_____

_____

_____

Integrated Life Safety System Test: IST1

Date:XXXX

Note: This is a generic test. It can be used as a guide to develop a project specific test. The project specific test will be developed jointly by the Architectural, Mechanical and Electrical consultants. It is intended to commission and verify the interaction of the building Life Safety Systems including their interactions with other building systems through a sequence of operation in accordance with the design intent. It will include the following modes:

Mode 1: Fire Alarm + Normal Power

A fire alarm is initiated via a pull station. The response of the fire alarm, designed interactions with other life safety systems and interactions with other building systems will be identified in this test procedure as sequences and are to be verified when executing this test.. The fire alarm should not be reset and remain in alarm with the pull station still operated during the transition of normal to emergency power and mode 2.

Mode 2: Fire Alarm + Emergency Power

The utility power is switched off. The transition from normal power to emergency power and the operation and interactions of Life Safety Systems and other building systems when on emergency power will be identified in this test procedure as sequences in accordance with the design. These sequences are to be verified when executing this test. Fire Alarm Audible Levels can be measured and verified at this time.

Mode 3: Emergency Power

The Fire Alarm pull station and fire alarm panel is reset. Verification of designed functionality of the building systems under emergency power would occur in this mode via sequences identified in this test procedure. These sequences are to be verified when executing this test.Emergency Egress lighting levels can be measured and verified at this time.

Mode 4: Building electrical system blackout + Fire Alarm

A fire alarm is initiated via a pull station. The Emergency generator is shut down (preferably by simulated failure) Security system functionality is verified with reference to design intent with respect to egress from the building and access to key areas in the building.

Mode 5: Emergency Power + Fire Alarm

A fire alarm is initiated via a pull station. The response of the fire alarm, designed interactions with other life safety systems and interactions with other building systems will be identified in this test as sequences and be verified during this test.. The fire alarm should not be reset and remain in alarm with the pull station still operated during the transition and restoration of normal power in mode 5.

Mode 6: Revert to Normal Power

The Utility power is restored. Transition from emergency power to normal power occurs and the operation of Life Safety Systems and other building systems through this transition will be identified in this test as sequences and verified according to the design.

1. Test Purpose

.1 To test the Integrated functionality between Life Safety Systems including interactions with other building systems through a series of checks and procedures and verify it is according to the design intent.

.2 To ensure system operation is as per contract documents.

.3 Make adjustments to systems as required to suit the design intent and operational requirements.

.4 AC@ denotes contractor sign off.
AE@ denotes engineers verification

2. System Design and operation narrative

Note: Describes briefly the design philosophy of the systems, the operation of Life Safety Systems, their interactions, and their interactions with other building systems.

3. Test Pre-Requisites

.1 Mechanical (Note: list life safety systems and other systems which interact to provide life support, facilitate emergency egress and maintain the client's critical operations. Confirm these systems have been commissioned, results approved and deficiencies which would impact this test are resolved)

		C	E
.1	AHU-1 System Test is complete and approved		
.2	AHU-2 System Test is complete and approved		
.3	AHU-3 System Test is complete and approved		
.4	SEF-1 Atrium exhaust fan System Test is complete and approved		
.5	AC-1 LAN room air conditioning System Test is complete and approved		
.6	SP-1 Stairwell pressurization fan System Test is complete and approved		
.7	SP-2 Stairwell pressurization fan System Test is complete and approved		
.8	Fire Protection System is Tested and verified		
.9	CHE-1 Chiller room Exhaust Fan System Test is complete and approved		
.10			

.

.2 Electrical (Note: list life safety systems and other systems which interact to provide life support, facilitate emergency egress and maintain the client's critical operations. Confirm these systems have been commissioned, results approved and deficiencies which would impact this test are resolved)

		C	E
.1	Fire Alarm System has been verified and approved		
.2	Emergency Power System Test is complete and approved		
.3	Elevator 1 and 2 have been tested and verified		
.4	Security System has been tested and verified		
.5	Lighting control system has been tested and verified		
.6	Motor Control Centers have been tested and verified		
.7	Emergency Generator Day Tank TK-1 has a max of 1 hour of fuel available		

Integrated Life Safety System Test: IST1

.3 Controls:

		C	E
.1	All manual overrides and jumpers have been removed to allow for normal/automatic operation.		
.2	Final control program is loaded and operational		
.3	All hardwired interlocks and safeties are operational		
.4	All software interlocks and safeties are operational		
.5	All Systems are operating in occupied mode		

.4 EMCS Trends: (Note:Set Up trends in the EMCS as support documentation, provide in hard copy & electronic format)

Set up the following trend logs the day prior to the test

		C	E
.1	Fire Alarm status		
.2	Emergency Generator Status		
.3	AHU-1 Occupied /Unoccupied status		
.4	AHU-2 Occupied /Unoccupied status		
.5	AHU-3 Occupied /Unoccupied status		
.6	AC-1 LAN room air conditioning unit status		
.7	HP-1 Heating water pump 1 status		
.8	HP-2 Heating water Pump 2 Status		
.9	B-1 Heating Boiler status		
.10	B-2 Heating Boiler Status		
.11	SEF-1 Atrium exhaust fan status		
.12	SP-1 Stairwell pressurization fan status		
.13	SP-2 Stairwell pressurization fan status		
.14	CHE-1 Chiller room Exhaust Fan status		

4. Mode 1: Fire Alarm + Normal Power

		C	E
.1	The building systems are in the occupied mode (proceed only if this is true)		
.2	Initiate a Fire Alarm manual pull station: Date Time Loc		
.3	Fire Alarm Panel in main lobby indicates the point in alarm and is in first stage alarm		
.4	Fire Alarm Five minute timer is started		
.5	EMCS logs fire alarm in alarm review summary as Fire Alarm first stage Alarm		
.6	All horns are operating at 20 strokes / minute		
.7	AHU-1,2 & 3 , EF-1, 2 & 3, AC-1 LAN room all shut down,		
.8	SP-1 & 2 Stairwell pressurization fans start		
.9	CHEF-1 Chiller room Exhaust Fan continues to run		
.10	SEF-1 Atrium exhaust fan starts		
.11	Smoke dampers SD-1,SD-2,SD-3,SD-4 close		
.12	Doors with magnetic hold open devices FD-1, FD-2, FD-3, FD-4, FD-5 close		
.13	Elevators 1 & 2 home to main floor (no alternative floor sequence)		
.14	Fire Alarm Second Stage general Alarm occurs after five minutes		
.15	EMCS logs fire alarm in alarm review summary as Fire Alarm second stage Alarm		
.16	All Fire Alarm Horns sound at 120 strokes / minute, strobes are flashing		
.17			
.18			

5. Mode 2: Fire Alarm + Emergency Power

		C	E
.1	Open the Main Utility Breaker MB-1 Date: Time:		
.2	Fire Alarm continues to operate in stage 2 alarm, audible and strobes continue to operate		
.3	EMCS work station and panels remain powered via central UPS		
.4	Emergency Generator starts, runs up to rated speed & voltage, Transfer switch operates.		
.5	Transition from normal to emergency time was less than 10 seconds: Transfer time: secs		
.6	Generator combustion air damper CA-1 opens		
.7	Generator room Intake and relief damper operate correctly		
.8	AHU-4 modulates to maintain generator room temperature set point of 21 deg C		
.9	Emergency Generator room battery pack emergency lighting operates through power transfer		
.10	Mechanical Penthouse battery pack emergency lighting operates through power transfer		
.11	Main Electrical Switch room battery pack emergency lighting operates through power transfer		
.12	Main Fire Alarm Panel monitor indicates the emergency Generator is running		
.13	SP-1 & 2 Stairwell pressurization fans re-start following the 10 sec power interruption		
.14	CHEF-1 Chiller room Exhaust Fan re-starts following the 10 sec power interruption		
.15	SEF-1 Atrium exhaust fan re-starts following the 10 sec power interruption		
.16	Smoke dampers SD-1,SD-2,SD-3,SD-4 remain closed		
.17	Doors with magnetic hold open devices FD-1, FD-2, FD-3, FD-4, FD-5 remain released		
.18	Elevators 1 & 2 remain homed to main floor		
.19	Verify Emergency Exit signage continues to operate		
.20	Verify by measurement that fire alarm audible levels meet NBC requirements		
.21	Central UPS maintained connected loads throughout the normal to emergency power transfer		
.22			
.23			
.24			
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.26			

6. Mode 3: Emergency Power

		C	E
.1	Reset Fire Alarm Pull Station and Fire Alarm Panel		
.2	SP-1 & 2 Stairwell pressurization fans stop		
.3	CHEF-1 Chiller room Exhaust Fan continues to run		
.4	SEF-1 Atrium exhaust fan stops		
.5	Smoke dampers SD-1,SD-2,SD-3,SD-4 open		
.6	AC1- LAN room air conditioner starts		
.7	Confirm Elevator 1 is fully operable on emergency power		
.8	Initiate water flow on 3rd floor stand pipe, packaged fire pump starts and delivers specified flow		
.9	Measure Emergency egress lighting levels and confirm they meet NBC		
.10	HP-1 Heating water pump operates and maintains pressure set point		
.11	HP-2 Heating water Pump, confirm fail over of this pump when HP-1 stops		
.12	B-1 & B-2 Boilers are operational & modulate maintain heating water temperature set point		
.13	Emergency Generator TK1-LL Day Tank low level initiates fuel transfer		
.14	FTP-1 or 2 Fuel Transfer Pumps Transfer fuel to TK-1 day tank until TK1-HL met		
.15	Emergency generator runs for 2 hours within specified operating parameters (attach log)		
	.		

7. Mode 4: Building electrical system blackout + Fire Alarm

		C	E
.1	Initiate a Fire Alarm manual pull station: Date Time Loc		
.2	Shutdown Emergency Generator		
.3	Fire Alarm Panel in main lobby indicates the point in alarm and is in first stage alarm		
.4	Fire Alarm Five minute timer is started		
.5	EMCS logs fire alarm in alarm review screen as Fire Alarm first stage Alarm		
.6	All horns are operating at 20 strokes / minute		
.7	Fire Alarm Second Stage general Alarm occurs after five minutes		
.8	EMCS logs fire alarm in alarm review screen as Fire Alarm second stage Alarm		
.9	All Fire Alarm Horns sound at 120 strokes / minute, strobes are flashing		
.10	Security system remains operative for egress from the building		
.11	Security system allows access to penthouse and generator spaces		
.12			
.13			
.14			
.15			
.16			
.17			

8. Mode 5: Emergency Power + Fire Alarm

		C	E
.1	Send elevator 1 to the 3rd floor		
.2	Initiate a Fire Alarm manual pull station: Date Time Loc		
.3	Fire Alarm Panel in main lobby indicates the point in alarm and is in first stage alarm		
.4	Fire Alarm Five minute timer is started		
.5	EMCS logs fire alarm in alarm review screen as Fire Alarm first stage Alarm		
.6	All horns are operating at 20 strokes / minute		
.7	AC-1 LAN room shuts down,		
.8	SP-1 & 2 Stairwell pressurization fans start		
.9	CHEF-1 Chiller room Exhaust Fan continues to run		
.10	SEF-1 Atrium exhaust fan starts		
.11	Smoke dampers SD-1,SD-2,SD-3,SD-4 close		
.12	Doors with magnetic hold open devices FD-1, FD-2, FD-3, FD-4, FD-5 close		
.13	Elevator 1 homes to Main floor (no alternative floor sequence)		
.14	Fire Alarm Second Stage general Alarm occurs after five minutes		
.15	EMCS logs fire alarm in alarm review screen as Fire Alarm second stage Alarm		
.16	All Fire Alarm Horns sound at 120 strokes / minute, strobes are flashing		
.17			

9. Mode 6: Revert to Normal Power

		C	E
.1	Close Main Utility Breaker MB-1		
.2	Emergency Power Transfer switch returns facility to normal power in 5 minutes .		
.3	UPS prevents connected loads from experiencing a power interruption		
.4	Emergency Generator runs (cools) for 5 minutes then shuts down		
.5	Fire alarm remains in stage 2 general alarm and operates normally during the transition from emergency to normal power		
.6	Reset Fire Alarm Pull Station and Fire Alarm Panel		
.7	SP-1 & 2 Stairwell pressurization fans stop		
.8	CHEF-1 Chiller room Exhaust Fan continues to run		
.9	SEF-1 Atrium exhaust fan stops		
.10	Smoke dampers SD-1,SD-2,SD-3,SD-4 open		
.11	AC1- LAN room air conditioner starts		
.12			

7. Test Sign Off:

Testing Personnel: (Contractor)

Firm: _____

Signature : _____

Witnessed By: (Owner)

Signature : _____

Witnessed and approved By: (Engineer)

Firm: _____

Signature : February 14, 2003

COMMENTS:

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