Sub-slab Depressurization System Report

Central Hudson Gas & Electric

610 Little Britain Road
Town of Newburgh
Orange County, New York

January 2009

THE Chazen COMPANIES
Engineers / Surveyors
Planners
Environmental Scientists
Landscape Architects

Prepared for:

Central Hudson Gas & Electric .
610 Little Britain Road
Newburgh, NY 12250

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Prepared by:

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1.0 INTRODUCTION

1.1 Introduction

The Chazen Companies (TCC) as a subcontractor to Quality Environmental Solutions & Technologies, Inc (QuES&T) of Wappingers Falls, NY tested and constructed a Sub-Slab Depressurization System (SSDS) at the Central Hudson Gas & Electric (CHG&E) site located at 610 Little Britain Road in Newburgh, New York (Figure 1). Work began with installation and testing of the capture radius of a single Extraction Well (EW-1), followed by the scaled addition of seven additional EWs projected on the basis of EW-1 test results to provide sub-slab depressurization throughout the building. Work occurred between October and December of 2008. This report outlines the test period and describes operation equipment currently installed on the site.

1.2 Existing Building Use

The CHG&E facility contains office and conference room areas and garages. Offices are concentrated in the southern half of the building, used by full-time employees. The offices are often empty since many of the CHG&E personnel have offsite service task responsibilities. The western and northern sections of the building contain garages for CHG&E maintenance vehicles. The total building area is approximately 40,750 square feet.

1.3 Past Site Investigation and Regulatory Involvement

The project team was awarded this short duration contract during September 2008. Environmental reports prepared by others summarized sub-slab and indoor air quality (IAQ) data collected throughout the building. Data prepared by Precision Environmental Services, Inc of Ballston Spa, NY identified sub-slab concentrations of various chlorinated compounds, with the most common being 1,1-Trichloroethane (TCA) and Trichloroethene (TCE). The welding shop garage, vehicle repair shop, and side bay areas contained the highest sub-slab TCE concentrations of 14,200 ug/m^3, 9,570 ug/m^3 and 5,060 ug/m^3, respectively. CHG&E personnel report that IAQ data have not detected TCE or other chlorinated solvents in indoor air, suggesting that the floor slab provides a generally intact vapor barrier between sub-slab atmospheres and the indoor air space.

It is TCC's understanding that this work was not required by New York State Department of Health (NYSDOH) and/or New York State Department of Environmental Conservation (NYSDEC) regional offices. No SSDS work plan was therefore required for pre-construction regulatory review. The work described here nonetheless conforms generally to accepted pilot test and construction protocols published within NYSDEC's Soil Vapor Intrusion (SVI) guidance policy.

2.0 TEST EXTRACTION WELL INSTALLATION AND PILOT TEST

2.1 Test Well EW-1 Construction

The project team installed test well EW-1 in a utility closet located in the approximate center of the building (Figure 2). Figure 4 depicts a typical SSDS well detail. EW-1 was constructed during October 2008 using approximately 30-inch long perforated four-inch diameter Schedule 40 PVC pipe. Slots were hand-cut every 0.5 inches on two sides of the pipe (Photo 3). The aperture of the screen slots measure approximately 0.1 inches.

The attached photo-set depicts the process used to install extraction well EW-1. All EWs installed later were constructed using the same general methods.

To insert the extraction screen, the concrete slab was cut and removed using a combination of common hand tools, a diamond grinder and two percussion hammers. Once the concrete was completely removed, an excavation up to 36 inches deep and 16-inches wide was advanced by hand. The screen was installed vertically.

In the EW-1 location, soils beneath the slab were brown silt and silty sand with some gravel and cobbles up to six inches in diameter. No sub-slab gravel footing was identified. The annulus perimeter and remaining excavation was back-filled with a one-inch diameter gravel sub-base and capped with a replacement concrete floor. The PVC screen was reduced to two-inch diameter piping, which was piped to the room's eastern wall. The two inch vacuum pipe was extended above grade for pilot testing. The excavation and slab penetration were repaired at grade with six inches of high strength concrete installed several days prior to the EW-1 pilot test.

2.2 EW-1 Pilot Test

A four hour pilot test of sub-slab airflows beneath the CHG&E building was conducted. The goals of the pilot test included a determination of the following:

- the radius of influence (ROI) from the EW-1 test. This ROI became the basis for extrapolating the final number of EWs recommended throughout the building.

- an appropriate blower unit for the EW, or the recommendation for manifolded blower units if a site-wide SSDS system is necessary.

The pilot test was conducted on test well EW-1 on October 25, 2008. The project team performed the test using a combination air-compressor and Vaccon Air-flow ST Series silencer to apply a vacuum on the test well. A range of air-pressure options were used to simulate various vacuum settings and blower horsepower ratings. On the basis of the distribution of sub-slab monitoring responses, EW-1 responded most favorably to a vacuum setting of 3 inches mercury, generating 40 cubic feet minute (CFM) of airflow.

A network of 23 temporary sub-slab monitoring points (MP) were installed on the day of the EW-1 pilot test in locations shown on Figure 2. The MPs were used to record sub-slab pressure responses during the EW-1 pilot test. MPs were installed according to guidelines recommended in the *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH, October, 2006) and referenced appendices, including *Radon Mitigation Standards* (USEPA 402-R-93-078, revised April 1994).

In general, the monitoring points were installed through and penetrated below the CHG&E building slab as follows: A hammer drill was used to install a 3/4-inch diameter hole through the existing slab. The soils below the slab were drilled to a depth of six inches beneath the slab and 3/8-inch-diameter polyethylene tubing was installed to within one inch of the bottom of the boring. Sub-slab materials were examined at all locations to identify sub-slab construction and material details. In all locations, no sand or gravel sub-base could be identified and the building slab appears to have been constructed on top of native sandy silt and silt soils. A temporary clay bentonite seal between the tubing and the concrete sub-floor was installed to ensure that no air leaks could occur between the building interior and the sub-slab environments during testing.

Air pressure measurements were recorded at each monitoring point before the start of the test to confirm that static sub-slab air pressures were within normal ranges. The normal static pressures recorded during the testing were zero inches of water column (inWC). Air pressure measurements were then recorded at each MP location during the application of continuous vacuum on EW-1 at airflow rate of 40 CFM with a line pressure at the vacuum discharge point of 3 inches mercury. Pressure responses in each location were measured using a liquid manometer and recorded. Changes were recorded essentially instantaneously when the test vacuum was applied wherever responses were present. The pilot test was terminated once readings were completed in all MPs, and when the radius of MPs expanded to a point that no measurable pressure response was observed.

TCC abandoned and reclaimed all MP holes once the pilot testing activities were completed. The sub-slab small voids created to install the test apparatus were backfilled with residual base material, and the concrete slab floor was patched using high strength concrete to pre-test conditions. EW-1 was capped pending analysis.

After the EW-1 pilot test was complete, distances from the EW and the MPS were recorded, so that the ROI around the well could be confirmed. This was found to range between 30 and 50 feet in varying directions. The project team then met with CHG&E management to discuss EW-1 test findings and select seven additional EW locations offering the highest probability of creating a low pressure capture zone beneath the remainder of the building.

3.0 DEVELOPMENT OF THE SITE-WIDE SSDS PROGRAM

During November 2008, the project team installed, tested, and finalized operational controls for seven additional EWs in the facility.

3.1 Installation of Expanded EW Grid

Locations for the expanded EW network are shown on Figure 2. The wells were all installed as vertical four-inch diameter wells identical to the EW-1 construction detail described above, with the exception of EW-8. The screen for EW-8 was installed horizontally to accommodate a large pipe found in the excavation location. The pipe was believed to be related to the roof drain system, although not confirmed. All other construction details for EW-8 were unchanged. Refer to Table 1 which summarizes the technical specifications for the full EW network.

3.2 Supplemental Well Pilot Tests

A high volume air-compressor and vaccon pump assembly were connected sequentially to each new EW well-head in the following combinations:

- EW-1 tested at an airflow rate of 40 CFM (Table 2)
- EW-6 tested at an airflow rate of 40 CFM (Table 3)
- EW-8 tested at an airflow rate of 40 CFM (Table 4)
- EW-7 and EW-8 tested at a combined airflow rate of 40 CFM (Table 5)
- EW-5 and EW-7 tested at a combined airflow rate of 40 CFM (Table 6)
- EW-3 and EW-4 tested at a combined airflow rate of 40 CFM (Table 7)
- EW-2 and EW-4 tested at a combined airflow rate of 40 CFM (Table 8)

Airflows generated during testing were directed to exterior discharge locations since permanent discharge lines were not yet installed. The necessary delivery pressure was applied to the Vaccon unit to create a vacuum discharge of 40 cubic feet per minute (cfm) during each test. One-hundred and nineteen additional temporary MPs were installed to accurately quantify individual and overlapping ROIs. The resulting combined pressure response boundary shown in Figure 2 was created, showing that depressurization was achieved during the tests under a significant majority of the building footprint. EW test data are summarized within Table 2.

The tests indicated that wells EW-1 and EW-6 each needed 40 CFM to maintain desired ROIs, and that the other tested configurations were able to maintain ROIs with combined discharges of

40 CFM. These test conclusions allowed some consolidation of mechanical controls when developing the installed SSDS system.

3.3 Sub-slab Depressurization System Construction and Start-up

Based on the test data and site geometry, it was determined that the system could be divided into three SSDS zones, labeled on Figure 3 as Zones 1 through 3. The test conclusions were presented to CHG&E representatives during a December 2008 onsite project team meeting. Zone configurations were established and general conceptual piping layouts also occurred during that meeting.

- Zone 1 includes EW-1, EW-5, EW-7 and EW-8, requiring a minimum of 120 CFM.
- Zone 2 includes EW-2 and EW-6, requiring a minimum of 80 CFM.
- Zone 3 includes EW-3 and EW-4, requiring a minimum of 40 CFM.

Zone 1 includes EWs located in the office portion of the facility. Zone 2 includes EWs located in the garage spaces along the western edge of the facility. Zone 3 includes EWs located within the garage and supply room spaces along the northern and eastern edge of the facility.

Each zone was subsequently equipped with a Rotron 3-HP blower unit (Model DR656K72X, Part 080602, 60 Hertz) capable of producing approximately 130 CFM airflow at 40 inWC (see attached blower performance curve on product cut sheet). Each blower provides modest excess extraction capacity within each configured zone. Two-inch diameter Schedule 40 PVC piping was installed between each EW and the corresponding blower units. An inline sample port was installed at a working height of approximately five feet above each SSDS well head, allowing for future air quality sampling, as desired by CHG&E. The piping extends from each EW vertically to the ceiling and then follows ceiling framing to blower locations. Four-inch diameter PVC piping was used in locations where individual EWs converge. The four inch diameter manifold provides a slightly lower pressure zone within the system to equalize airflow distribution amongst all EWs.

Two-inch diameter copper vent piping connected to each blower exhaust extends to above the main roofline elevation, allowing the sub-slab soil gas to vent to the atmosphere. Each zone contains a system run light on the remote start/stop control panel located in the maintenance hallway (also known as the side bay area). Separate fault lighting for each zone is illuminated on a full-time basis unless the system becomes inoperable due to equipment malfunction or power outages (see photos).

The project team understands that operation and maintenance of the SSDS will be performed by onsite CHG&E personnel.

3.4 Sub-Slab Depressurization System Maintenance

Maintenance of the SSDS will be performed by onsite CHG&E personnel. Prior to starting any SSDS blower, ensure that any air flow control valves associated with the blowers are in the open position.

The SSDS consists of three Ametek Rotron 3-HP 460 volt/3 phase blowers, (Model DR656K72X, Part 080602, 60 Hertz, product cut sheet with manufacturer contact information is attached). The blowers are connected to eight sub-slab EWs, dividing the building into three extraction zones.

Each blower unit can be controlled from either the main roof-top control panel or the remote control panel located in the maintenance hallway (Figure 3). The control panels contain separate controls for each of the three zones. These controls include on and off buttons and an illuminated indicator light which is lit while blowers are operating.

The SSDS blowers are each powered by a three-phase electric motor. Should power to these motors be interrupted, the motors will shut down. Upon restoring power, the blowers must be manually restarted at either the main roof-top control panel or the remote control panel. The system should be checked for proper operation whenever there is an indication that electrical service to the blowers is interrupted.

Piping and EWs were custom constructed by project personnel. Standard schedule 40 PVC piping was used throughout the SSDS piping network.

The SSDS should be inspected on a monthly basis. During monthly inspections each blower should be checked to confirm that it is operating normally. Operating temperatures should be checked at each blower unit. Blowers should be warm to the touch, but not hot, and all blowers should be operating at the same approximate temperature. The piping coming into the blower unit should be cool to the touch, and the piping leaving the blower should be warm, but not hot.

During inspections, begin by listening to each blower for strange noises. Under normal operation, the blowers should emit a mild hum. Noises that might indicate mechanical problems include, but are not limited to; rattles, squeals, whines and vibrations.

Visually inspect visible piping, noting any kinks, cracks or any other visible damage. Listen for air leaks by walking throughout each piping network.

The system was installed by QuES&T, TCC and Todd J. Syska under the oversight of CHG&E personnel. If service is needed beyond that described herein, the contact information for the installers are as follows:

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Todd Syska
106 Spruce Lane
Clinton Corners, NY 12514
(914) 456-2290

PHOTOS

Photo 1
Cutting concrete for well installation.

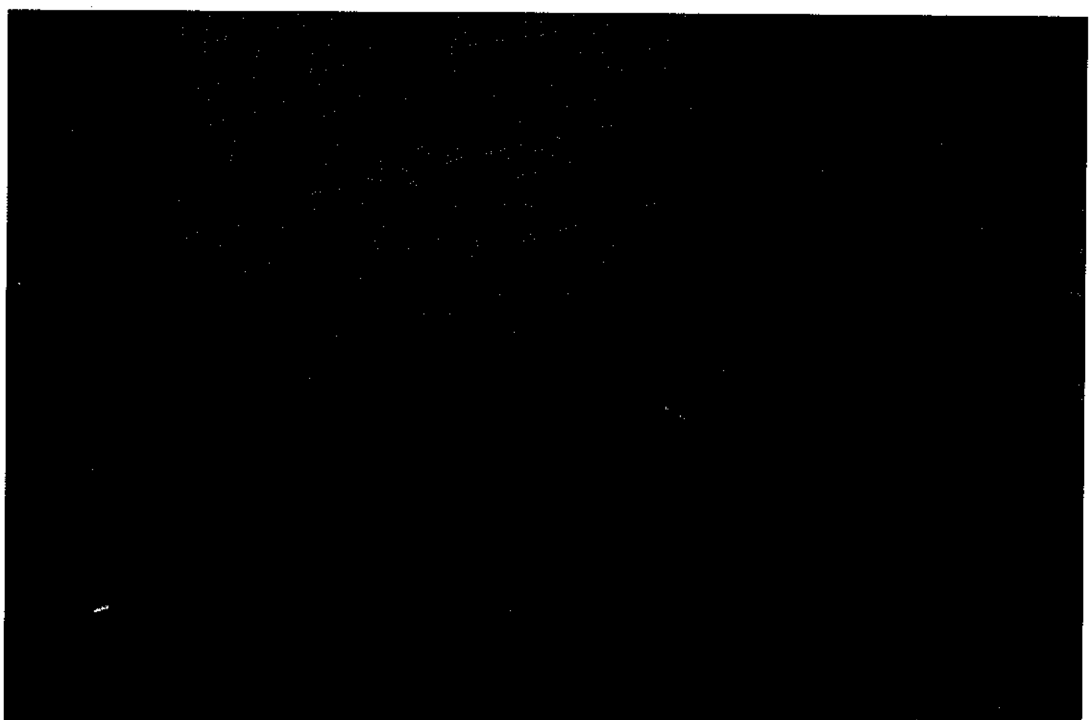


Photo 2
Typical well excavation. (EW-1 shown)

Photo 3

Typical screened portion of SSDS well. EW-1 shown here.

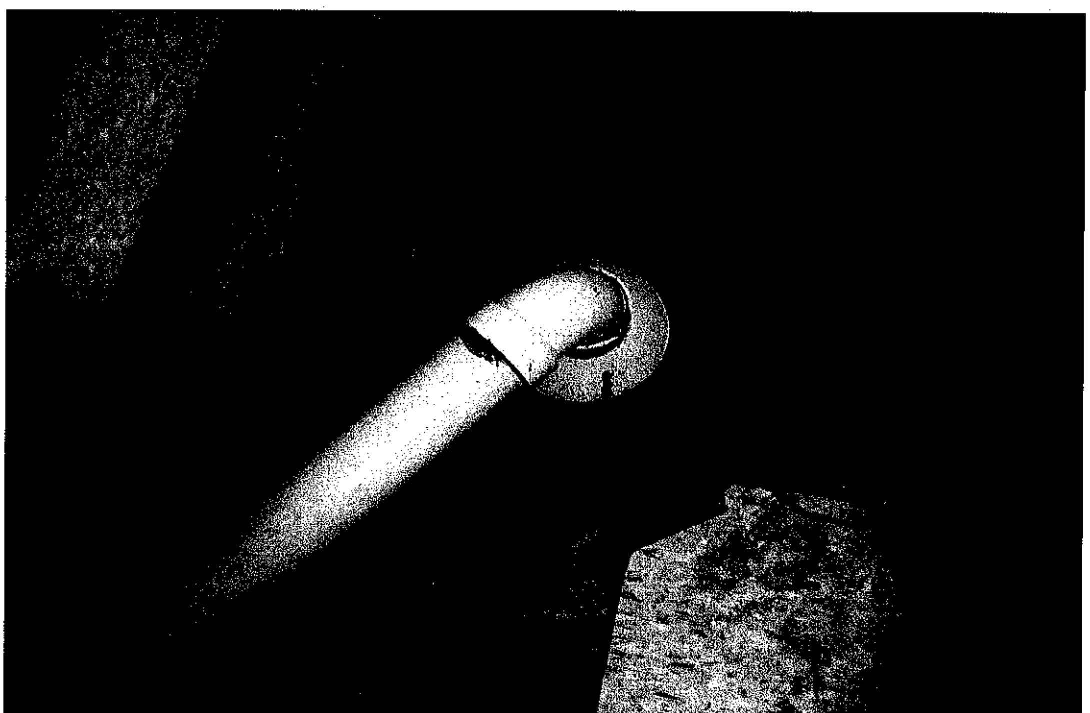


Photo 4

Slotted SSDS well (EW-1) prior to backfill.

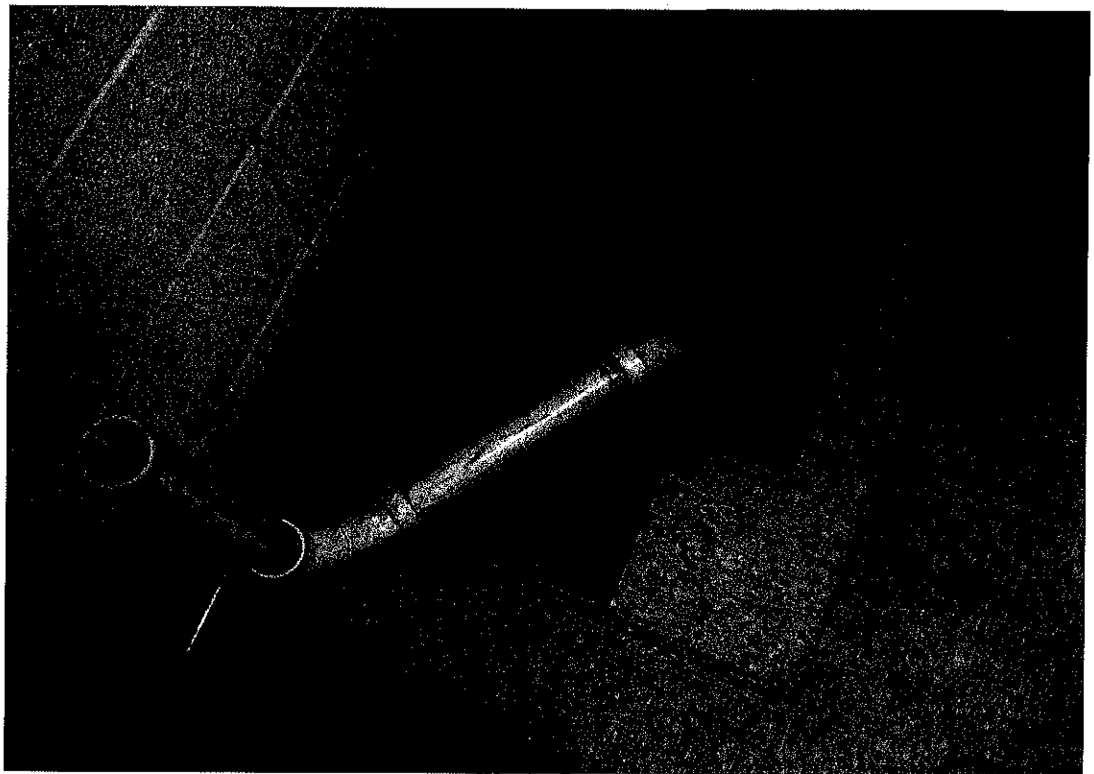


Photo 5

One inch diameter gravel backfill placed around screened pipe interval.

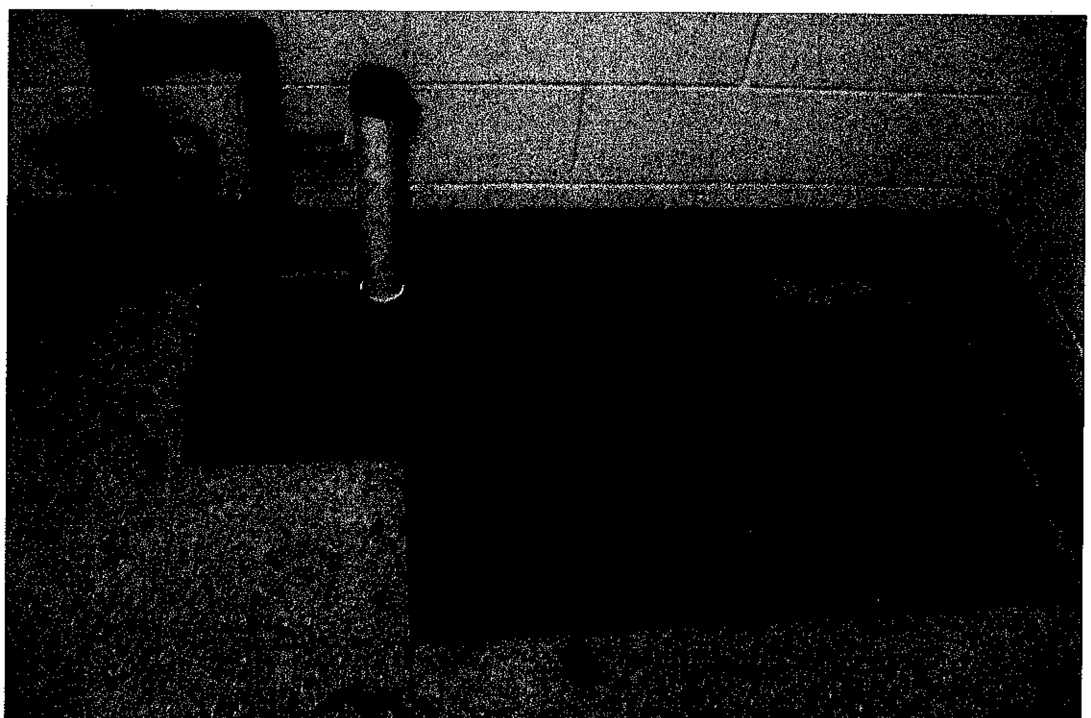


Photo 6

Minimum four inch thick concrete patch installed over SSDS excavations.

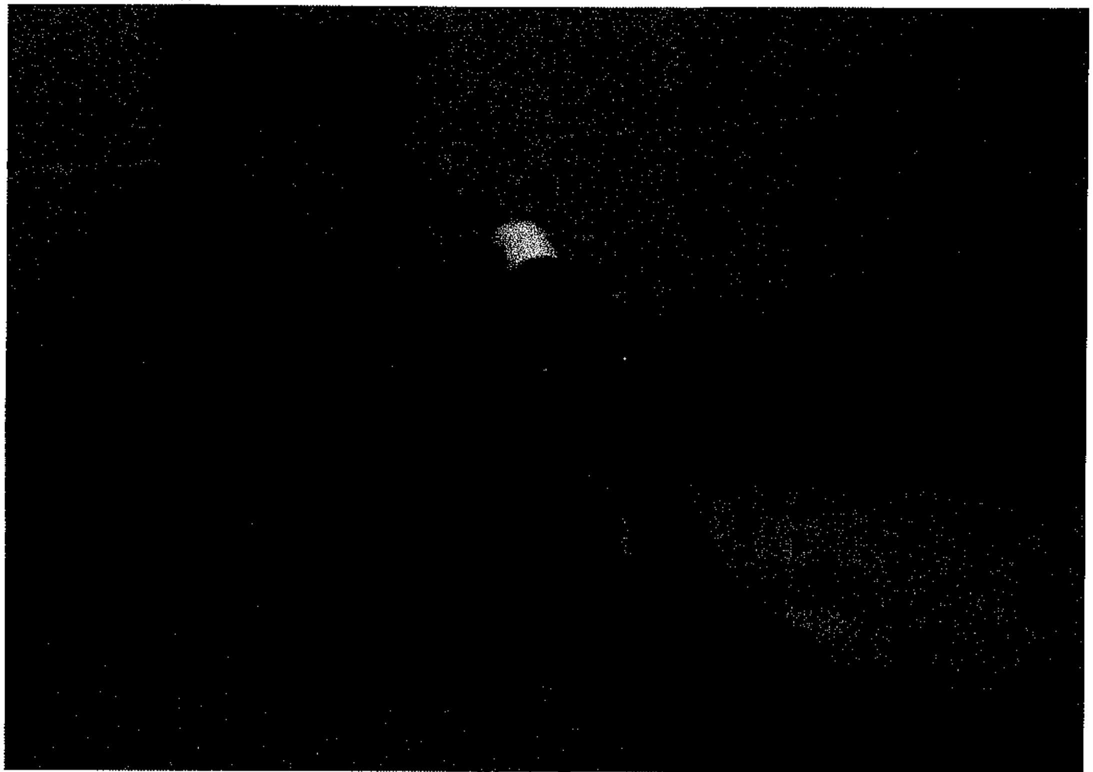


Photo 7

Test SSDS well connected to vacuum hose.

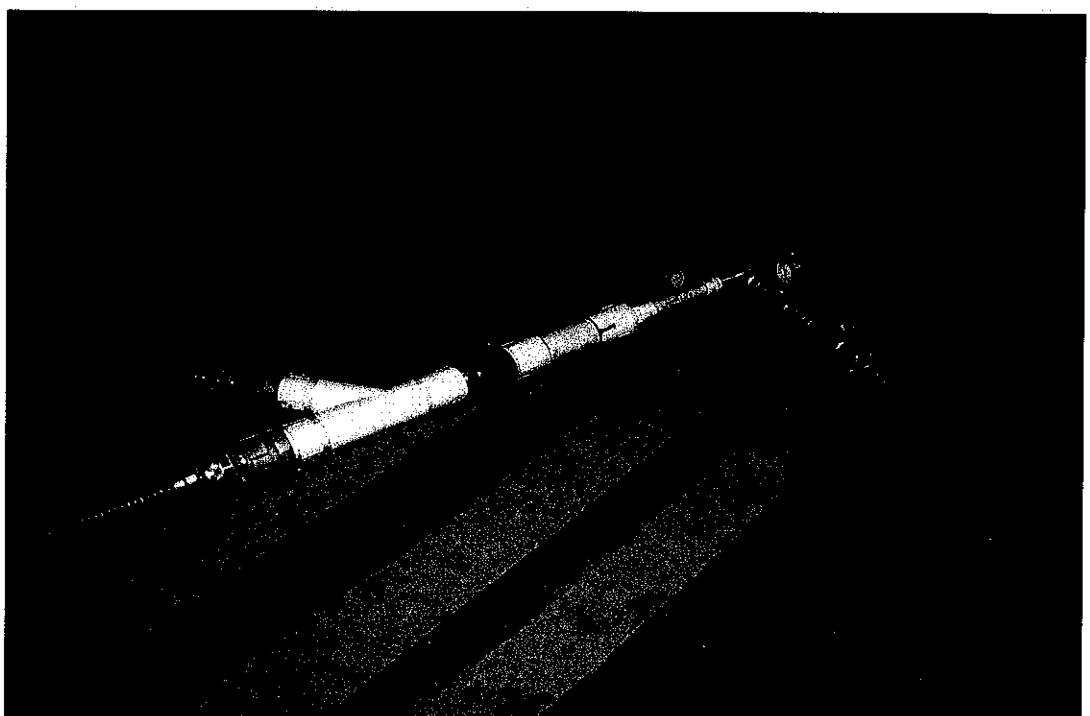


Photo 8

Test pump showing temporary vacuum hoses connected to two test SSDS wells.

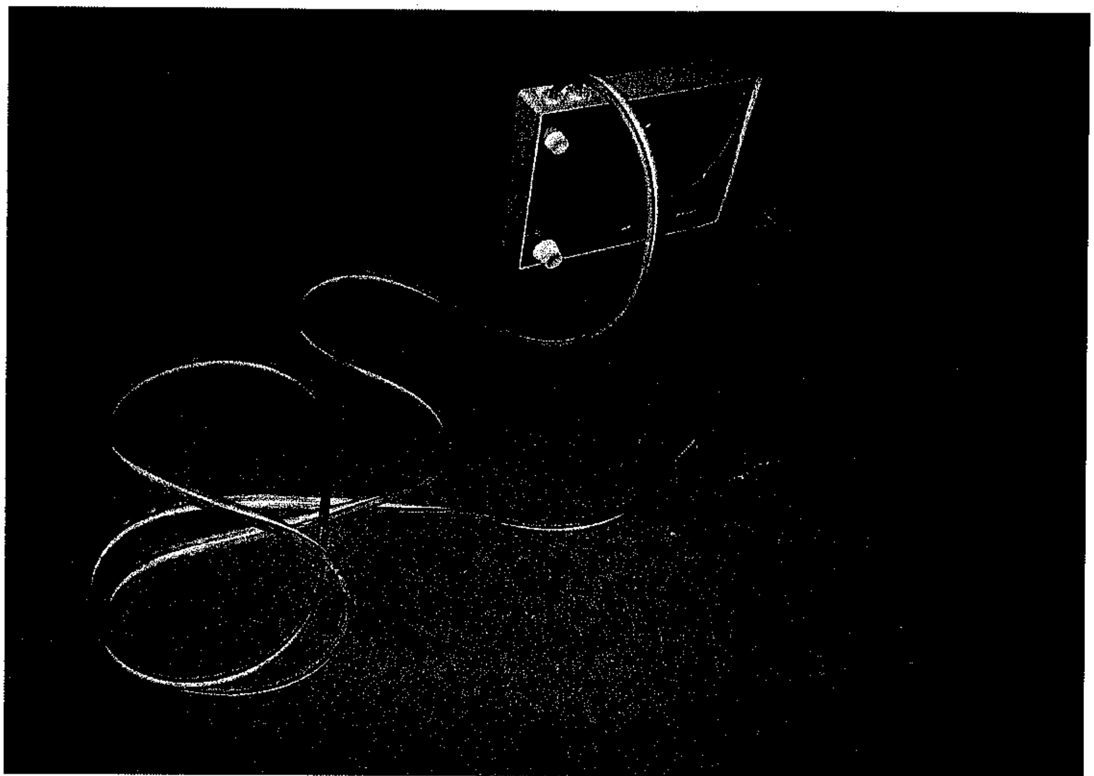


Photo 9

Liquid manometer used to measure sub-slab pressure response to pilot test at temporary monitoring points.

Photo 10

Monitoring point being patched with high strength concrete after completion of pilot test.

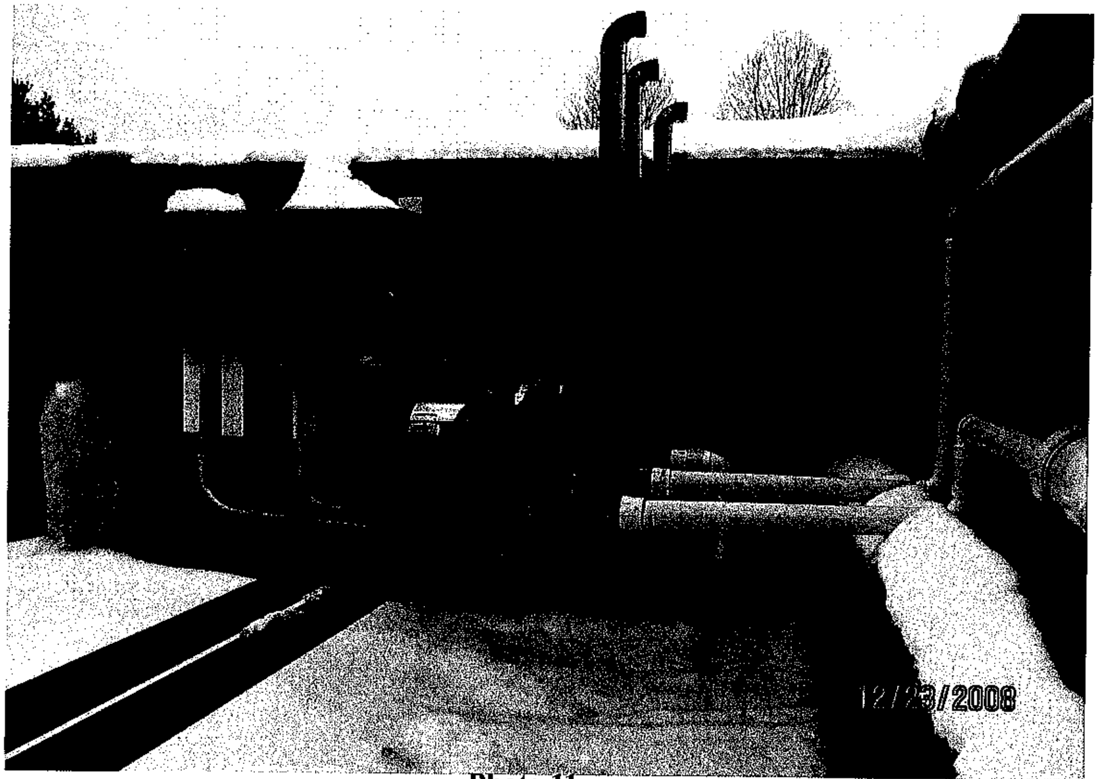


Photo 11

SSDS system on roof. Shown in photo are three blower units (Zones 1-3), rooftop electric panel, rooftop controls, copper discharge piping and influent piping.

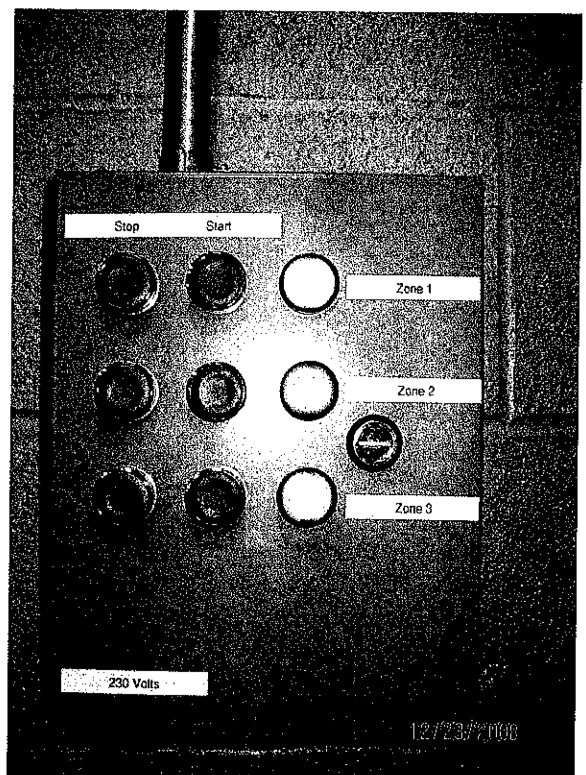


Photo 12

Remote system control box located in maintenance hallway.

TABLES

Table 1: Extraction Well Construction Data
CHGE Little Britain Road Site

	Extraction Wells							
	EW-1	EW-2	EW-3	EW-4	EW-5	EW-6	EW-7	EW-8
	Janitor's Closet	Welding Shop Garage	Electric Line Garage	Store Room	Gas Training Corridor	Maintenance Garage	Conference Room	Mail Room
Slab Thickness	6	10	6	6	4	4	4	4
Screen Length	24	23	28	26	19	18	21	14
Excavation Depth	31	32	36	36	28	28	32	24
Soil Type	Silty SAND and SILT, with some gravel	Silty SAND and SILT, with some gravel	Silty SAND with gravel, SILT with some clay and gravel.	Silty SAND with gravel, SILT with some clay and gravel.	SILT with some gravel, cobbles and sand	SILT with some gravel, cobbles and sand	SILT with gravel, cobbles and sand	SILT with gravel, cobbles and sand

Table 2: Pressure response observed during pilot test of EW-1.
CHGE Little Britain Road Site

Monitoring Point	Pressure Response (inches WC)
MP-1	0.800
MP-2	0.280
MP-3	0.260
MP-5	0.008
MP-6	NR
MP-7	NR
MP-8	NR
MP-9	0.020
MP-10	0.020
MP-11	0.040
MP-12	0.040
MP-13	NR
MP-18	NR
MP-19	NR
MP-22	0.010
MP-23	0.011*
MP-24	0.005*
MP-25	0.005
MP-26	NR
MP-27	0.050
MP-28	NR
MP-29	0.005*
MP-30	0.030

Notes:
* = Pressure response on second attempt
NR = No response
Pressure measured using liquid manometer accurate to 0.001 inches water column.

Table 3: Pressure response observed during pilot test of EW-6.
CHGE Little Britain Road Site

Monitoring Point	Pressure Response (inches WC)
MP-31	0.050
MP-32	NR
MP-33	0.010
MP-34	NR
MP-35	0.020
MP-36	0.010
MP-37	NR
MP-38	NR
MP-39	NR
MP-40	0.010
MP-41	0.150
MP-42	NR
MP-43	NR
MP-44	NR
MP-45	0.120
MP-46	0.010
MP-47	NR

Notes:
* = Pressure response on second attempt
NR = No response
Pressure measured using liquid manometer accurate to 0.001 inches water column.

Table 4: Pressure response during pilot test of EW-8.
CHGE Little Britain Road Site

Monitoring Point	Pressure Response (inches WC)
MP-36	NR
MP-48	NR
MP-49	NR
MP-50	NR
MP-51	0.050
MP-52	0.135
MP-53	NR
MP-54	0.070
MP-55	NR
MP-56	0.015
MP-57	0.080
MP-58	0.010
MP-59	0.005
MP-60	NR
MP-61	0.010
MP-62	0.010
MP-63	NR
MP-64	0.015

Notes:
* = Pressure response on second attempt
NR = No response
Pressure measured using liquid manometer accurate to 0.001 inches water column.

Table 5: Pressure response observed during pilot test of EW-7 and EW-8 combined.
CHGE Little Britain Road Site

Monitoring Point	Pressure Response (inches WC)
MP-47	NR
MP-48	NR
MP-50	NR
MP-53	NR
MP-55	0.005
MP-56	0.010
MP-59	NR
MP-60	0.150
MP-63	NR
MP-65	NR
MP-66	0.025
MP-67	NR
MP-68	0.025
MP-69	NR
MP-70	0.030
MP-71	0.275
MP-72	NR

Notes:
* = Pressure response on second attempt
NR = No response
Pressure measured using liquid manometer accurate to 0.001 inches water column.

Table 6: Pressure response observed during pilot test of EW-5 and EW-7 combined.
CHGE Little Britain Road Site

Monitoring Point	Pressure Response (inches WC)
MP-73	NR
MP-74	0.040
MP-69	0.005
MP-75	0.400
MP-76	0.300
MP-77	0.020
MP-78	NR
MP-79	1.750
MP-80	NR
MP-81	0.350
MP-82	0.030
MP-83	0.020
MP-84	NR
MP-67	0.010
MP-85	0.170
MP-86	NR
MP-87	0.050
MP-88	0.005
MP-89	NR

Notes:
* = Pressure response on second attempt
NR = No response
Pressure measured using liquid manometer
accurate to 0.001 inches water column.

Table 7: Pressure response observed during pilot test of EW-3 and EW-4 combined.
CHGE Little Britain Road Site

Monitoring Point	Pressure Response (inches WC)
MP-94	0.010
MP-95	0.015
MP-96	0.010
MP-97	NR
MP-98	0.025
MP-99	0.030
MP-100	NR
MP-101	0.020
MP-102	NR
MP-103	0.100
MP-104	0.020
MP-105	0.005
MP-106	NR
MP-107	0.010
MP-108	0.005
MP-109	0.010

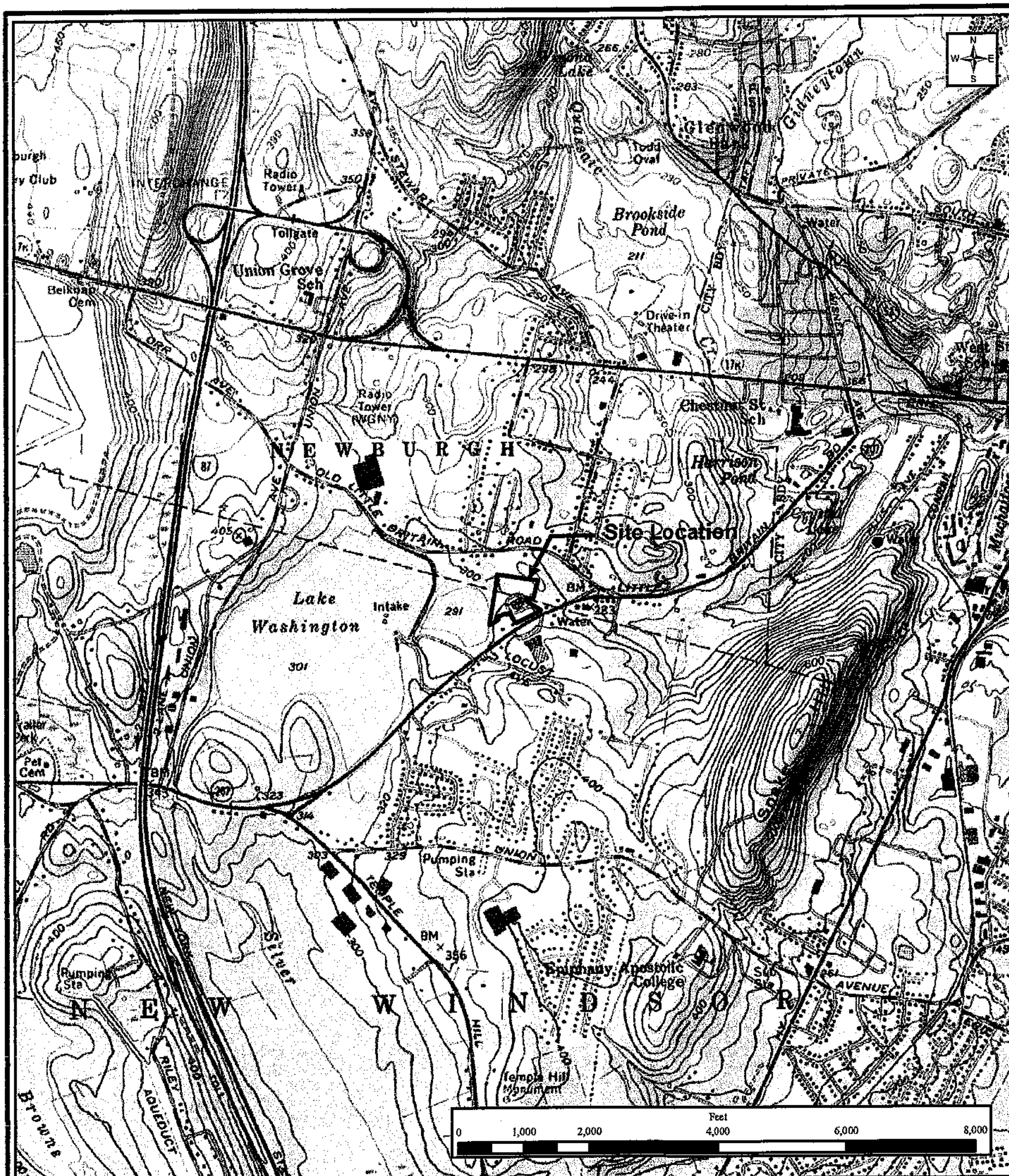
Notes:
* = Pressure response on second attempt
NR = No response
Pressure measured using liquid manometer
accurate to 0.001 inches water column.

Table 8: Pressure response observed during pilot test of EW-2 and EW-4 combined.
CHGE Little Britain Road Site

Monitoring Point	Pressure Response (inches WC)
MP-110	0.01
MP-111	0.01
MP-112	NR
MP-113	NR
MP-114	0.035
MP-115	NR
MP-116	0.015
MP-117	NR
MP-118	NR
MP-33	NR
MP-104	0.005
MP-107	NR
MP-110	NR
MP-120	0.005

Notes:
* = Pressure response on second attempt
NR = No response
Pressure measured using liquid manometer
accurate to 0.001 inches water column.

FIGURES



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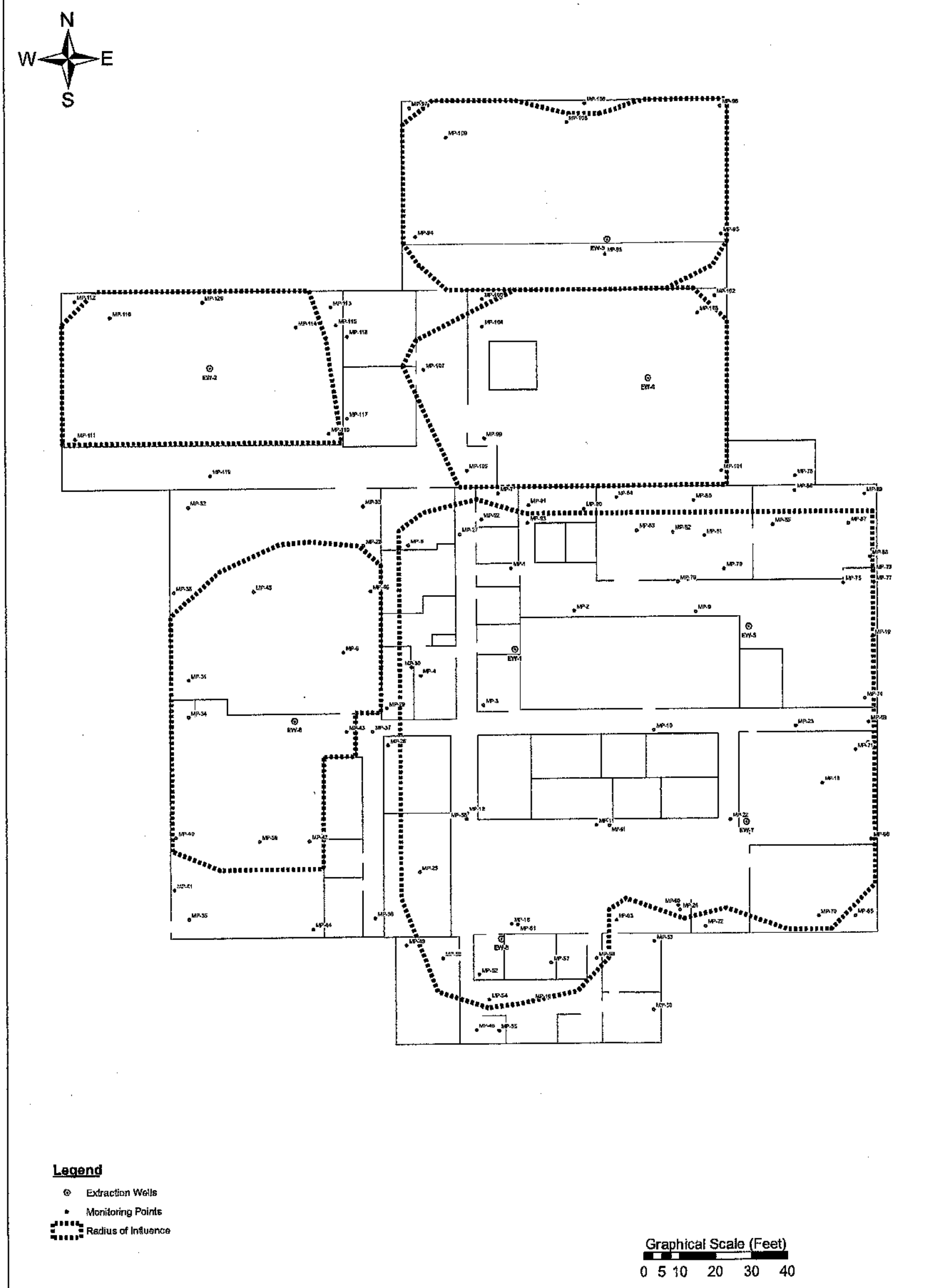
Little Britain Road Central Hudson Gas & Electric Facility

Figure 1: Site Location Map

Town of Newburgh, Orange County, New York

Drawn:	EOB
Date:	January 2009
Scale:	1:24,000
Project:	40814.00
Figure:	1



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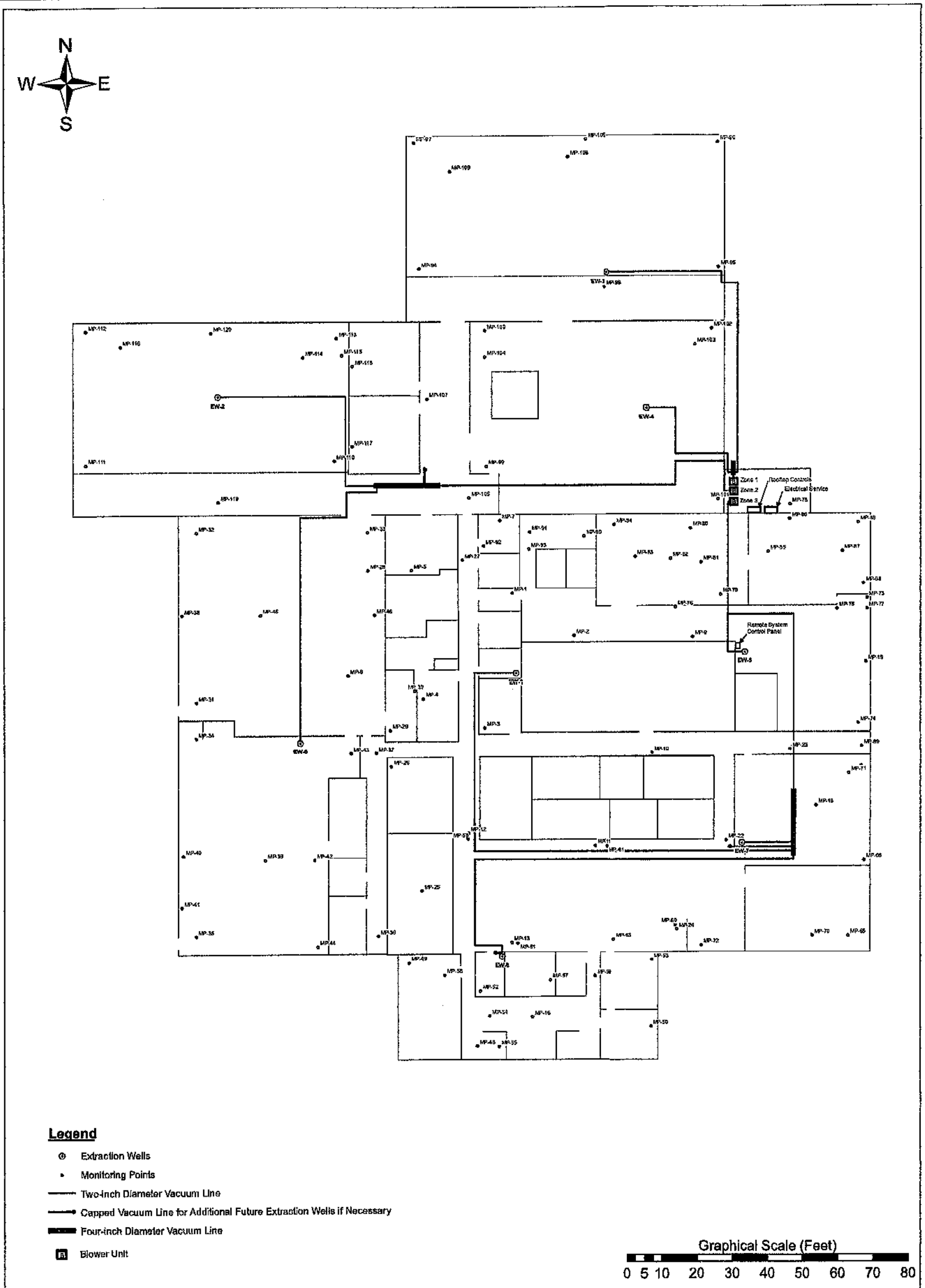
Little Britain Road Central Hudson Gas & Electric Facility

Figure 2: Subslab Depressurization System Pilot Test Results

Town of Newburgh, Orange County, New York

Drawn:	EOS
Date:	January 2009
Scale:	As Shown
Project:	40814.00



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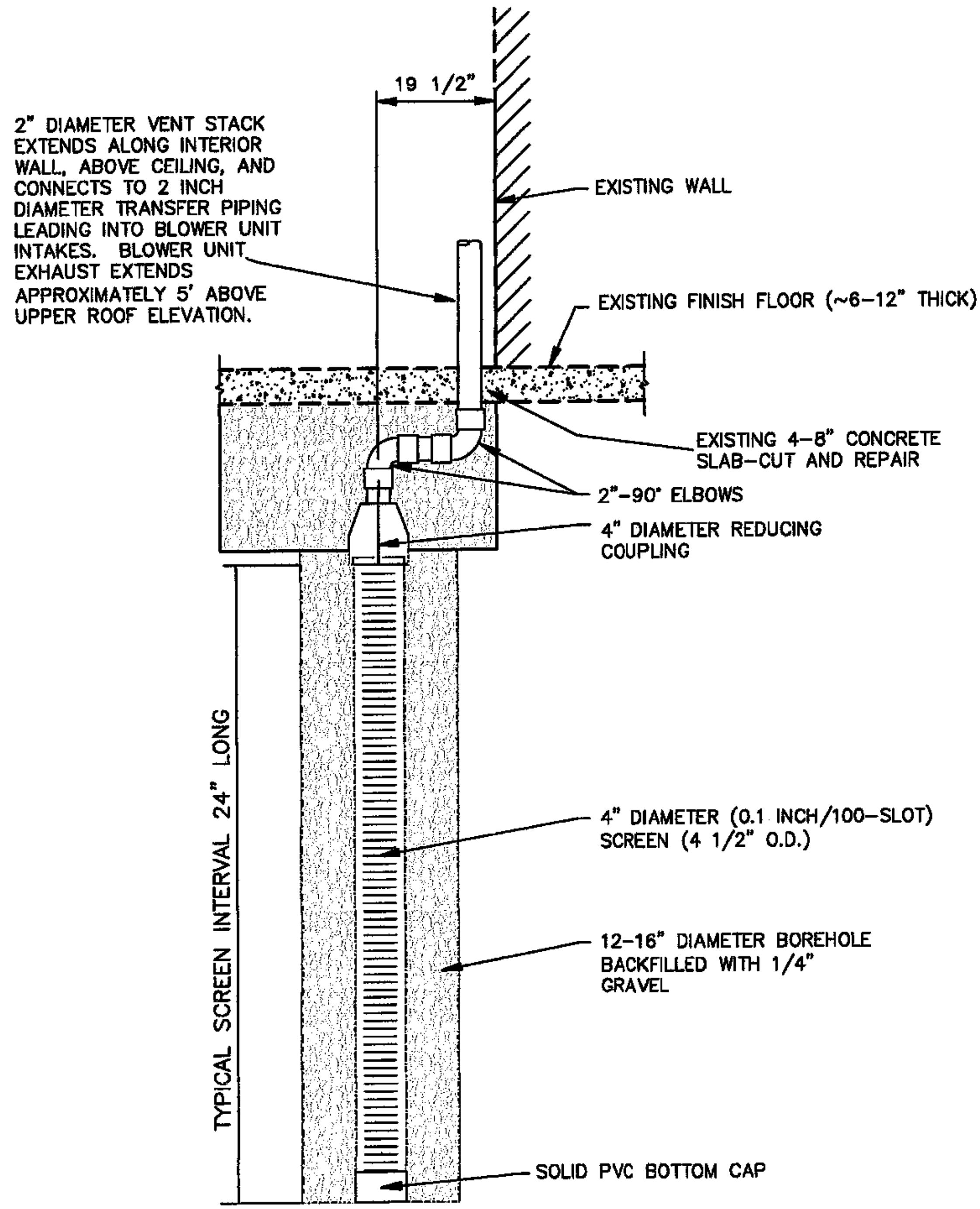
Little Britain Road Central Hudson Gas & Electric Facility

Figure 3: Subslab Depressurization System Piping Diagram & Controls Layout

Town of Newburgh, Orange County, New York

Drawn:	EOB
Date:	January 2009
Scale:	As Shown
Project:	40814.00



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THE Chazen COMPANIES
Engineers/Surveyors
Planners
Environmental Scientists

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100 Glen Street Glens Falls, NY 12801
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CENTRAL HUDSON GAS & ELECTRIC

FIGURE 4
TYPICAL SUB-SLAB VAPOR WELL CONSTRUCTION DETAIL

TOWN OF NEWBURGH, ORANGE COUNTY, NEW YORK

drawn	checked
EJO	DM/RUM
date	scale
JAN 2009	N.T.S.
project no.	
40814.00	
sheet no.	
FIGURE 4	

Drawing Name: X:\4\40800-40899\40814.00 QUEST CHGE SSDS\Figures\WELL DETAIL.dwg Date Printed: Jan 21, 2009, 10:11am XXXXX

BLOWER UNIT CUT SHEET

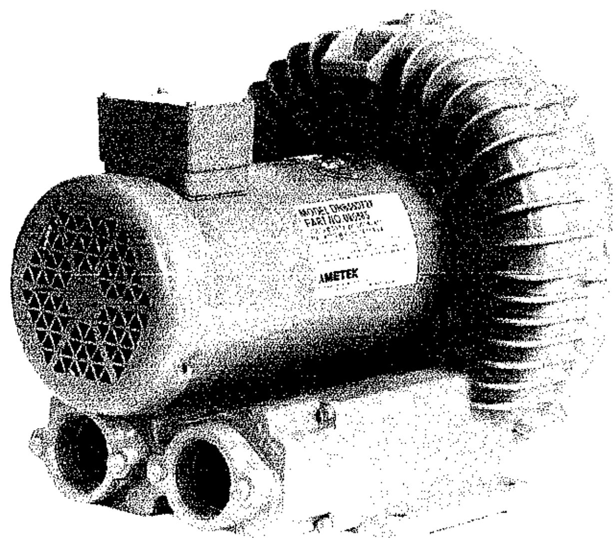
DR 656 & CP 656 Regenerative Blower

FEATURES
- Manufactured in the USA
- CE compliant – Declaration of Conformity on file
- Maximum flow: 210 SCFM
- Maximum pressure: 106 IWG
- Maximum vacuum: 6.39" Hg (87 IWG)
- Standard motor: 4.0 HP, TEFC
- Cast aluminum blower housing, impeller & cover; cast iron muffler extension & flanges (threaded)
- UL & CSA approved motor with permanently sealed ball bearings
- Inlet & outlet internal muffling
- Quiet operation within OSHA standards

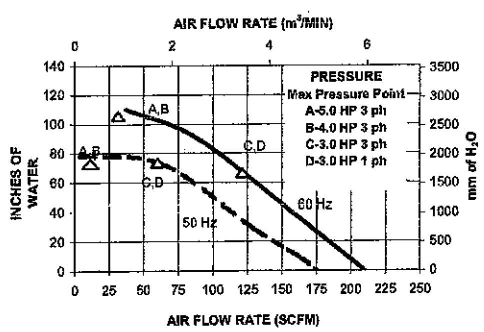
MOTOR OPTIONS
- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

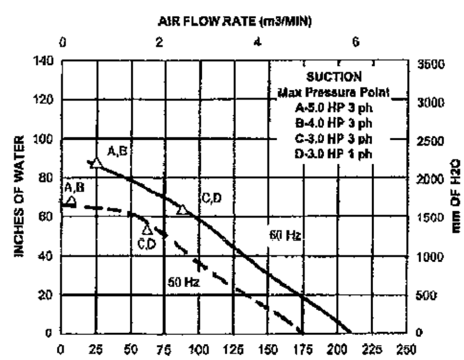
BLOWER OPTIONS
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs
- Cast iron cover for additional noise resonance

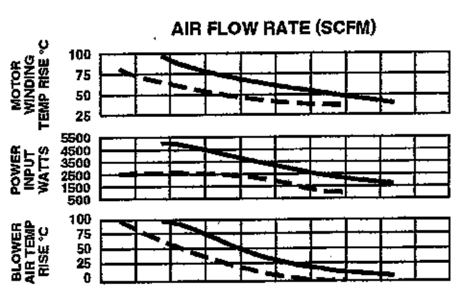
ACCESSORIES (See Catalog Accessory Section)
- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges & relief valves
- Switches – air flow, pressure, vacuum or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)

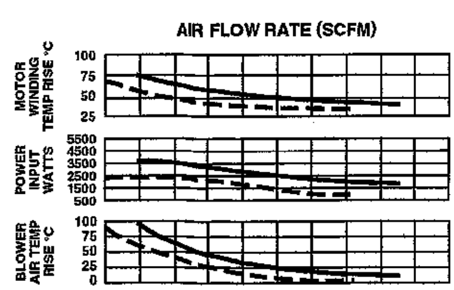


BLOWER PERFORMANCE AT STANDARD CONDITIONS









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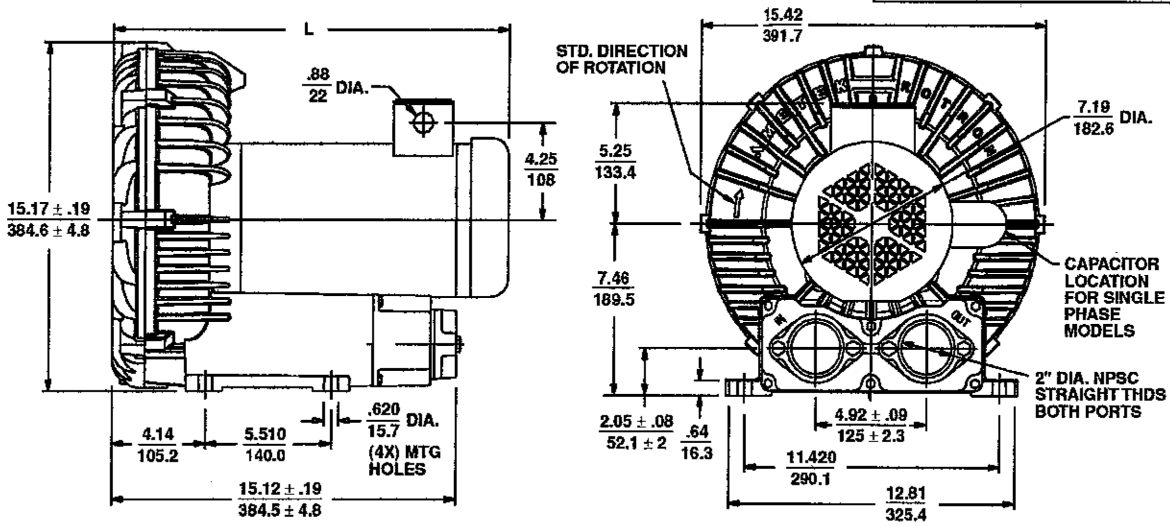
DR 656 & CP 656 Regenerative Blower

Scale CAD drawing available upon request.



DIMENSIONS: $\frac{IN}{MM}$
TOLERANCES: .XX ± $\frac{.08}{2}$
(UNLESS OTHERWISE NOTED)

MODEL	L (IN)	L (MM)
DR656D72/86X	17.77	451.3
DR656CK72/86X	17.39	441.7
DR656K58X	17.39	441.7

SPECIFICATIONS

MODEL	DR656CK72X	DR656CK86X	DR656K72X	DR656K58X	DR656D72X	DR656D86X	CP656CR72XLR
Part No.	080582	080583	080602	080603	080585	080604	080065
Motor Enclosure – Shaft Material	TEFC – **CS**	TEFC – **CS**	TEFC – **CS**	TEFC – **CS**	TEFC – **CS**	TEFC – **CS**	Chem TEFC – **SS**
Horsepower	4	4	3	3	5	5	4
Voltage [1]	230/460	575	230/460	115/230	230/460	575	Same as DR656CK72X 080582 except add Chemical Processing (CP) features from catalog inside front cover
Phase – Frequency [1]	Three-60 Hz	Three-50/60 Hz	Three-60 Hz	Single-60 Hz	Three-60 Hz	Three-60 Hz	
Insulation Class [2]	F	F	F	F	F	F	
NEMA Rated Motor Amps	10/5	4	7.4/3.7	31/15.5	12.8/6.4	4.8	
Service Factor	1.15	1.0	1.15	1.0	1.0	1.15	
Locked Rotor Amps	94/47	80	54/27	200/100	160/80	60	
Max. Blower Amps [3]	11.4/5.7	4.56	8.8/4.4	27.8/13.9	13/6.5	5.2	
Recommended NEMA Starter Size	1/0	0	0/0	1.5/1	1/1	1	
Shipping Weight lb / kg	110 lb (49.9 kg)	110 lb (49.9 kg)	114 lb (51.8 kg)	112 lb (50.8 kg)	112 lb (50.8 kg)	114 lb (51.8 kg)	

1 Rotron motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **200-220/380-415 VAC-3 ph-50 Hz**. Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz**. All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

2 Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

3 Maximum blower amps corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

Specifications subject to change without notice. Please consult your Local Field Sales Engineer for specification updates.

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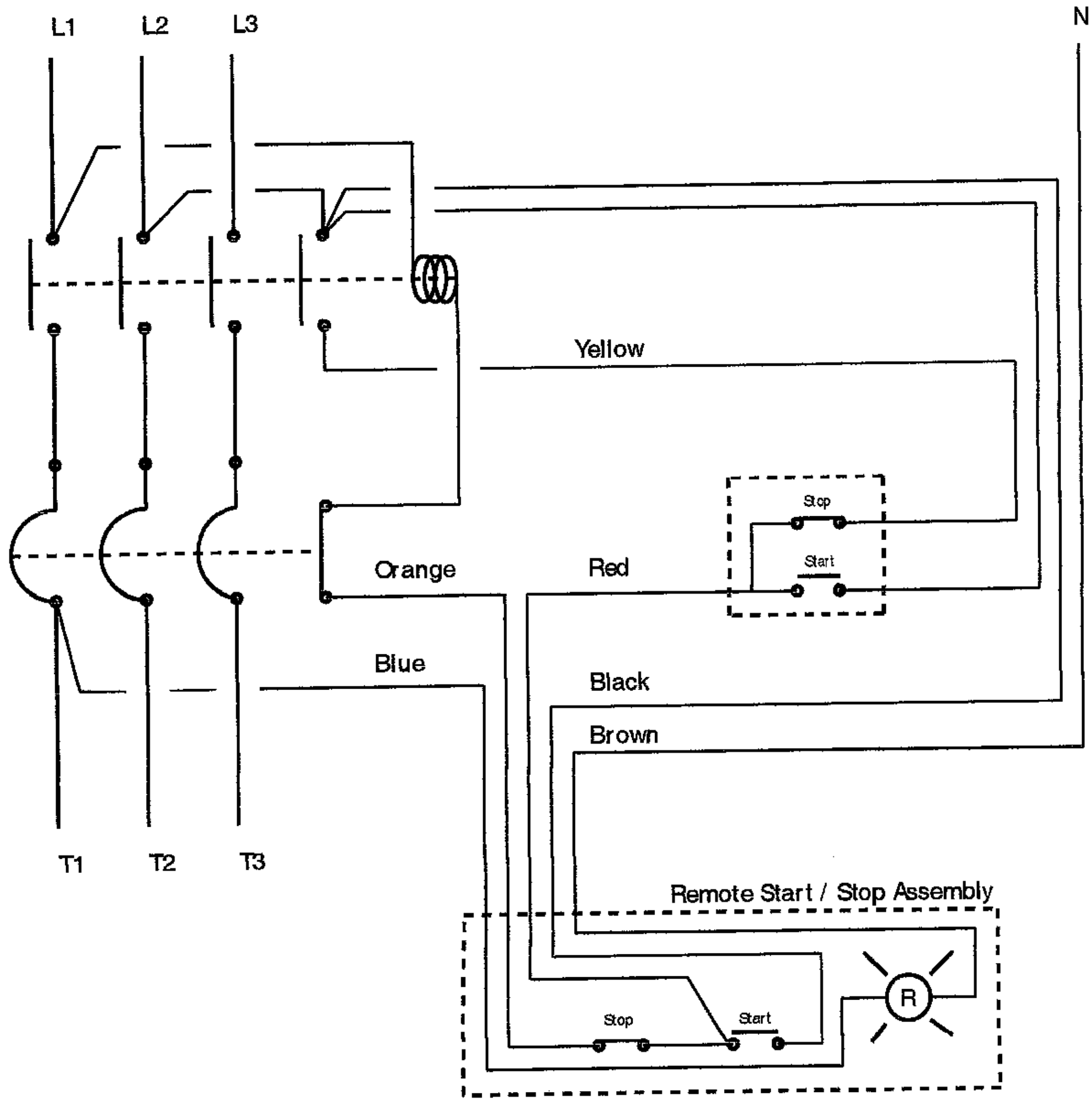

CHG&E Sub-Slab System 610 Little Briten Rd, New Windsor, NY Control Wiring	
Page 1 of 1	Todd J. Syska
Scale: Not to Scale	Date: 12-17-08