FINAL REPORT

Sub-Slab Vapor Mitigation Construction Completion Report Carlson Park Facility Rochester, New York

Carlson Park, LLC.

December 2013

O'BRIEN & GERE

MITIGATION TECH
Radon Correction Specialists ™

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Sub-Slab Vapor Mitigation Construction Completion Report

Carlson Park Facility
Rochester, New York

Prepared for
Carlson Park, LLC.

Sub-slab Vapor Mitigation
Construction Completion Report

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December 2013

I, Douglas M. Crawford, PE, am a registered Professional Engineer in the State of New York. I certify that I have personally examined, and am familiar with the information as it pertains to the practice of engineering, that is being submitted in the Sub-slab Vapor Mitigation Construction Completion Report for the Carlson Park Facility located in Rochester, New York. Based on my inquiry of those individuals with primary responsibility for obtaining such information, I certify that the statements and information are to the best of my knowledge and belief true, accurate and complete.

Douglas M. Crawford, P.E.
NYS PE License No. 66649

12/20/13
Date

Sub-slab Vapor Mitigation
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Rochester, New York

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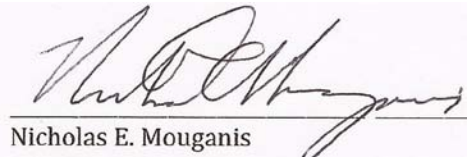
I certify that I installed and/or oversaw the installation of the Sub-slab Depressurization System described herein. The work was performed in accordance with applicable New York State Guidance and generally accepted industry practices. The work was also performed in general accordance with the NYSDEC-approved Work Plan entitled "Interim Remedial Measure (IRM) Work Plan For the Installation of a Sub-Slab Vapor Mitigation System – Carlson Park, Rochester, NY" dated December 26, 2006.



Nicholas E. Mouganis

December 20, 2013
Date

MITIGATION TECH
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NEHA NRPP ID Certification #100722 RMT (mitigation)
NEHA NRPP ID Certification #104867 RT (measurement)

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ABBREVIATIONS AND DEFINITIONS

Abbreviations

ASTM	American Society for Testing and Materials
CFM	Cubic feet per minute
EPA	United States Environmental Protection Agency
HVAC	Heating, ventilating, and air conditioning
IRM	Interim remedial measure
LLC	Limited Liability Company
MCDPH	Monroe County Department of Public Health
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OM&M	Operation, maintenance, and monitoring
PVC	Polyvinyl chloride
sf	Square feet
SSD	Sub-slab depressurization
TCE	Trichloroethene
VCP	Voluntary Cleanup Program
VOCs	Volatile organic compounds
W	Watts
WC	Water column
wci	Water column inch

Definitions

Agencies: NYSDEC, NYSDOH, and/or MCDPH, as well as these Departments' designated agents.

Backer Rod: A semi-rigid foam material resembling a rope of various diameters that is used to fill around pipes, etc. to assist in making a sealed penetration. For example, where a pipe is inserted through a concrete slab, a length of backer rod may be inserted into the opening around the pipe. Caulking can then be applied to the space above the backer rod and between the outside of the pipe and the slab opening to create a seal. The purpose of the backer rod is to hold the semi-fluid caulk in place until it sets or hardens.

Groundwater: Water present in the saturated zone. The saturated zone is a subsurface zone in which all the interstices are filled with water under pressure greater than that of the atmosphere. Although the zone may contain gas-filled interstices or interstices filled with fluids other than water, it is still considered saturated.

Mitigation System: Any system or steps designed to reduce soil vapor concentrations in the indoor air of a building.

Pressure Field Extension: The distance that a pressure change is induced in the sub-slab area, measured from single or multiple vapor extraction points.

Sub-Slab Depressurization (Active): Achieving lower sub-slab air pressure relative to indoor air pressure by use of a fan-powered vent drawing air from beneath the concrete slab and venting it to the outside.

Sub-Slab Depressurization Unit: One or more extraction point(s) connected to a riser, a vent fan and associated piping, together with an attached manometer.

1 BACKGROUND

1.1 OVERVIEW

This report documents the installation and initial evaluation of the sub-slab depressurization (SSD) system that was installed at the Carlson Park Facility located in Rochester, New York (the Site). Findings of dissolved, volatile organic compounds (VOCs) in shallow groundwater outside, and adjacent to, several of the facility buildings, prompted the installation of the SSD system as a non-emergency Interim Remedial Measure (IRM) for the facility. The installation of the system as a non-emergency IRM was approved by the New York State Department of Environmental Conservation (NYSDEC), the New York State Department of Health (NYSDOH), and the Monroe County Department of Public Health (MCDPH). The primary objective for implementing this preemptive, precautionary measure was to mitigate potential migration of possible VOC vapors that could be present beneath the facility building (Figure 1) slabs. The SSD system is intended to minimize the risk of vapor intrusion by maintaining a negative pressure below the building slabs relative to the air pressure above the slabs.

1.2 SITE DESCRIPTION

The Site is located at 100 Carlson Road (between Blossom Road and Humboldt Street) in a mixed light industrial, commercial, and residential area on the eastern perimeter of the City of Rochester, New York (Figure 2). It is bounded by a residential area along Hampden Road to the east, railroad tracks to the south, commercial and industrial facilities to the west, and the Channel 8 WROC News Office and Humboldt Street to the north. The facility consists of approximately 39 acres, of which approximately 35 acres are improved with former manufacturing buildings, access roads, and parking areas. The overall "footprint" of the buildings occupies a total area of approximately 600,000 square feet (sf), with an additional 200,000 sf of second floor space. There are ten individual buildings numbered 1 through 10 with the tenth building sub-divided into three sections and referred to as 10A, 10B and 10C (Figure 1).

1.3 SITE HISTORY

The buildings were constructed in four main segments starting in the early 1920s. Manufacturing operations began at the Site in 1925, and continued until approximately 1985. Starting circa 1978, portions of the facility began to be leased to multiple tenants for general office space, commercial distribution warehouses, and light industrial uses. Currently, one small office area is occupied by the property owner, and the rest of the facility experiences varying degrees of occupancy.

Dissolved trichloroethene (TCE), a VOC, was first detected at the Site in a basement sump in 1998. A preliminary soil and groundwater investigation initiated in 2000 indicated localized shallow groundwater quality impacts from VOCs consisting of primarily TCE and its breakdown products (Carlson Park, LLC, 2006). Water removed from the sump is currently pre-treated through a carbon filter system before being discharged to the sanitary sewer. Remedial investigation activities are ongoing under the Voluntary Cleanup Program (VCP) to evaluate the nature and extent of subsurface VOCs at the site (Site Code V00514-8).

2 SYSTEM IMPLEMENTATION

2.1 OVERVIEW

A Work Plan (Carlson Park, LLC, 2006), presenting information on the design, installation, testing, and monitoring of a proposed facility-wide SSD system was submitted by Carlson Park, LLC and approved by the Agencies in January 2007. A SSD system functions by creating a negative pressure under the floor slab, so that vapors present in the subsurface can be collected and vented outside. This prevents or minimizes the potential for such vapors to migrate into the occupied areas of the buildings. Given the age, size and complexity of the Carlson Park facility, the initial SSD-related work represented a starting point for the installation of a final facility-wide SSD system. Installation of the SSD system was initiated in 2008 utilizing generally accepted procedures and protocols typical of radon mitigation systems. It was originally anticipated that multiple, independent, active SSD extraction points would be installed at 34 locations within the Site buildings. Based upon observations made during installation of the originally planned program and initial test results, additional SSD components were progressively installed. This resulted in the installation of a total of 54 extraction points connected to 36 fans as part of the final facility-wide SSD System. In addition, air ventilation systems (*i.e.* exhaust fans) were employed to supplement the facility-wide SSD system by addressing potential vapor migration in three areas of the buildings where SSD units could not be installed due to various physical constraints and limitations.

The SSD components were installed as permanent, integral additions to the existing buildings. The SSD System was installed in general accordance with NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (dated October 2006), which incorporates United States Environmental Protection Agency (EPA) radon guidance for technical requirements and design of vapor mitigation systems (EPA 402-R-93-078 Radon Mitigation Standards, revised April 1994; EPA 402-K-03-007, May 2006) and the American Society for Testing and Materials (ASTM) *Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings* (ASTM E 2121-03, EPA 402-K-03-007). Since the ASTM document applies to residential buildings and this facility is a large, commercial building, reference was also made to the document, *Radon Prevention in the Design and Construction of Schools and Other Large Buildings*, June 1994 (EPA/625/R-92/016). In addition to being used for radon mitigation, these types of systems have become widely accepted for use in sub-slab soil vapor mitigation of VOCs. The key components of the vapor mitigation system are described below.

2.2 SUB-SLAB DEPRESSURIZATION SYSTEM PLACEMENT

As discussed in the Work Plan (Carlson Park, LLC, 2006), in April 2006 limited pre-design testing was performed at Buildings 4 and 7 by Mitigation Tech of Brockport, New York, to assess the appropriateness of installing a facility-wide SSD system at this facility. The tests were conducted by applying a known vacuum to test points and measuring the resulting differential pressure at various neighboring locations. The general overall conclusion from the tests was that SSD was a viable strategy for mitigating potential vapor intrusion at this facility.

Based on information obtained from the limited pre-design sub-slab soil vapor tests (Carlson Park, LLC, 2006), each SSD extraction point was projected to have a potential coverage area of up to approximately 20,000 square feet. The estimated average SSD coverage area was then used to estimate the total number of extraction points to be installed beneath each building slab (*i.e.*, footer area). Accordingly, based upon the above criteria, at least one SSD unit was planned for installation within each area enclosed by subgrade foundation footers. In addition to the minimum placement of at least a single SSD unit within each footer area, additional SSD units and/or extraction points were to be installed in larger areas to achieve at least a minimum, acceptable pressure differential. The actual placement of each SSD unit and/or extraction point was also subject to constraints imposed by existing structural conditions and interior access considerations at the time of installation. Attempts were made to avoid installing piping where it would be a hindrance such as in corridors and work spaces. The final facility-wide system consists of 36 SSD units with 54 extraction points.

Installation of SSD units was impracticable in three areas. Utility tunnels with earthen floors are present around the basement of Buildings 10A, 10B, and 10C, and under a portion of the western edge of Building 4 (Figure 3). Given the impracticability of installing SSD units in these areas, a negative pressure ventilation system (i.e. exhaust fans) was installed within each of these tunnel systems instead. The fans were installed to draw air from the tunnels and exhaust it above the roof. The ventilation system induces a negative pressure in tunnel areas. Additional information regarding the exhaust fans is provided in Section 2.5 below.

2.3 SLAB PREPARATION

Prior to installing SSD units, the exposed portions of the sub-slab were inspected for potential weaknesses (e.g. cracks, joints, and penetrations). Accessible weaknesses identified as having a potential to influence sub-slab depressurization were sealed using polyurethane sealant. Large penetrations were filled with concrete and also sealed with polyurethane sealant. Openings or cracks that existed where the slab met the foundation wall (floor-wall joint), were sealed with polyurethane caulk. When the opening or channel was greater than 0.50 inch in width, a foam backer rod or other comparable filler material was inserted into the channel before application of the sealant.

As stated above, SSD units could not be installed in three areas and therefore ventilation fans were installed as an alternative mitigation technique. To aid in the performance of this system, cracks, openings or other penetrations observed in the walls and ceiling of the tunnel were sealed (Figures 4 and 5). Such sealing was accomplished in a similar manner described for sealing the floor slab. Polyurethane sealants and mechanical barriers were applied to cracks or penetrations (Figure 6) and other openings (Figure 7) to enhance the barrier between the concrete ceiling and wall slab and the ambient air within the tunnels.

2.4 SUB-SLAB DEPRESSURIZATION (SSD) UNITS

A total of 36 SSD units, each comprised of a rooftop fan and one or more extraction points were installed at strategic locations throughout the buildings to form the overall facility-wide SSD system. The SSD units were installed as permanent, integral additions to the structure. The effectiveness of the overall facility-wide SSD system is enhanced by the continued operation and maintenance of certain ventilation exhaust fans present in the building, as described in Section 2.5 below. The key components of each SSD unit include extraction points, riser piping, and vent fans (including a vacuum indicator). Each of these components is discussed below.

Extraction Points

Each extraction point consisted of a 5-inch core boring through the concrete floor slab from which 1 to 2 cubic feet of sub-slab material (*i.e.*, soil, gravel) was removed to create an extraction pit. Extraction pits were connected directly to vent pipes which consisted of 3-inch or 4-inch Schedule 40 polyvinyl chloride (PVC) pipe. Vent piping was inserted into the boring and sealed with polyurethane sealant/caulk (Figure 8). The location of each vapor extraction point is provided in Table 1. The location of each of these vapor extraction points is identified by column designations based upon an alpha-numeric coordinate system used in the buildings (Figure 3).

Vent/Riser Piping

The vent/riser piping consists of 3-inch and 4-inch schedule 40 PVC pipes that connect the extraction points to an exterior mounted vacuum fan, either through a roof penetration or sidewall penetration. Weatherproof flashing or sealant was applied to the penetrations. Vent pipes were sloped to allow rainwater or condensate within the pipes to drain downward back into the extraction point. Piping is independently supported, and not supported from existing building mechanical systems. Piping is labeled at each level as "Sub-Slab Vent" with its column designation. With the exception of one location, the vent pipes were constructed of 3-inch schedule 40 PVC. At location D6 in Building 8, larger 4-inch and 6-inch PVC pipes were used to accommodate a total of three extraction points connected to a single fan. The larger diameter piping was installed at that location in order to utilize an existing air duct shaft (for ease of installation).

Vent Fans

With the exception of one location, the vent fans installed as part of this program consisted of RADONAWAY GP-501 centrifugal in-line fans. The GP-501 consumes approximately 140 watts (W) of electricity and produces a static pressure differential of up to 4.2 water column inch (wci) and 95 cubic feet per minute (CFM) air flow at 1.0 inch water column (WC) pressure. The fans were connected via 3-inch PVC pipe to the extraction pit and exhaust. In Building 8 at location D6, a RADONAWAY RP-265 centrifugal in-line fan was installed and 4-inch and 6-inch PVC pipes were used. The RP-265 consumes approximately 130 W of electricity and produces a static pressure differential of up to 2.4 wci and 207 CFM air flow at 1.0 inch WC pressure. Consistent with Section 4.2 of the *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (NYSDOH, 2006), vent fans were roof mounted and exterior to ambient air and discharge points are at least 12 inches above the roof, 10 feet above the ground level, and 10 feet away from openings that are less than 2 feet below the discharge point. Fans were field painted to resist yellowing and are connected to a designated circuit as indicated in Table 1. Fans are connected to the piping with rubber *Fernco* couplings, to facilitate simple replacement (Figure 9).

2.5 EXHAUST FANS

In addition to the 36 SSD units, a total of four independent exhaust fans were installed at three locations in selected portions of the facility basement. At these three locations, sub-slab vapor mitigation units could not be installed due to physical constraints and limitations (*i.e.*, groundwater, crawl space). As a result, air ventilation systems were employed instead to address potential vapor migration. The fans create and maintain a negative pressure in these areas and discharge basement air outside the building. Two redundant 10,000 CFM (maximum rated capacity) exhaust fans (Figure 10) and controls (Figure 11) were installed above the basement tunnel between Buildings 10B and 10C (Figure 3). One of these two fans operates continuously, while the other fan serves as a back-up. An exhaust fan was installed at the western end of Building 4 (Figure 3). This fan has a 4,000 CFM maximum rated capacity, and was installed in an isolated, unused basement area. An existing air duct situated at that location was retrofitted with the fan in order to ventilate this area in lieu of installing SSD there. A fourth exhaust fan with a 585 CFM maximum rated capacity was installed in a small basement area beneath the northwest corner of Building 6. This fan also is intended to keep that small basement area continuously ventilated.

2.6 ELECTRICAL SUPPLY

Wiring for the SSD system was installed by a qualified electrician. Care was taken so that wiring was not located in, or chased through, the SSD installation duct work or other heating or cooling duct work. The SSD fans (installed on the exterior of buildings) were hardwired into an electric circuit so that plugged fans were not used outdoors. If the rated electricity requirement of a SSD vent fan exceeded 50 percent of the circuit capacity into which it was connected, or if the total connected load on the circuit (including the vent fan) exceeded 80 percent of the circuit's rated capacity, a separate, dedicated circuit was installed to power that fan.

2.7 INSTRUMENTATION AND CONTROLS

An electrical disconnect switch or a circuit breaker was installed for each SSD vent fan circuit to permit deactivation of the fan for maintenance or repair. Each vent fan is equipped with a vacuum indicator mounted in a visible location on or near the riser pipe associated with that fan. The indicator consists of an oil filled U-tube style graduated manometer (Figure 12). The indicator is inspected by observing the level of colored fluid. This indicator provides a simple visual check that vacuum is present in the riser pipe, by observing that the fluid levels on each side of the indicator are uneven. The vacuum can also be quantified by noting the actual level in Wci on the graduated manometer.

3 SYSTEM CONFIRMATION TESTING

3.1 OVERVIEW

Following installation of the initial set of SSD units, tests were performed to verify that each of the units were operating as intended, and to measure the resulting vacuum created under the sub-slabs. Based on vacuum measurements made after the initial SSD units were installed, it was determined that installation of additional SSD units and/or extraction points would better achieve desired sub-slab depressurization. Consequently, additional SSD units and extraction points were installed and tested in an iterative manner until acceptable sub-slab depressurization results were obtained. Ultimately, a total of 36 SSD units, including 36 fans and 54 extraction points were installed in the buildings. The number of extraction points installed per building ranged from one for Buildings 10A (area of 18,000 sf) and 10B (area of 23,000 sf) to 11 for Building 5 (area of 44,000 sf). The number of fans installed per building ranged from one for Buildings 10A, 10B, 10C to six for Building 7. The total number of SSD components installed within each building area is shown in Tables 1 and 2.

3.2 TESTING PROTOCOLS

Once the installation of the initially proposed and subsequent SSD units was completed, testing in general accordance with the approved Work Plan (Carlson Park, LLC, 2006) was initiated to confirm that the SSD units were both installed and functioning properly. The integrity of the fan mounting seals and joints in the interior vent piping were reexamined and verified, and suction and flow in system piping were checked to confirm that the system was operating as intended. In addition, proper operation of monitoring devices (*i.e.*, manometers) was confirmed and proper system-wide labeling (Figure 13) was verified. Also, the manometer readings were taken for each unit and recorded.

The vacuum achieved at various sub-slab test point locations created by each of the installed SSD units was also tested by obtaining vacuum (Pressure Field Extension) readings at vacuum test points installed throughout the facility (Figure 3). A total of 80 test points consisting of 3/4" holes drilled through the concrete floor slab were strategically located at various, selected distances from each of the 54 SSD extraction points. A digital micro-manometer was calibrated in ambient air and the probe inserted into the test hole (while encased in a rubber stopper to maintain a seal) followed by observation and recording of the reading. Once this testing was complete, the vacuum test points were subsequently filled with polyurethane to function as semi-permanent plugs. Testing was conducted under normal heating, ventilation, and air conditioning (HVAC) operating conditions. A total of 72 test points were initially installed and measurements were taken during the heating season between November 2008 and February 2009. An additional six test points were installed in February and March 2010, followed by an additional two resulting in a total of 80 test points. These eight additional test points were added following the installation of more SSD extraction points and retesting of several previously tested locations. The final number of test points per building (Table 2) ranged from two in Building 10C to 12 in Building 8.

3.3 TESTING RESULTS

Findings of the various testing and checks performed were as follows:

1. The fan mounting seals were inspected and found to be in good condition.
2. The integrity of joints was inspected and found to be in good condition.
3. Manometers installed on each SSD unit were checked and proper manometer operation was confirmed.
4. Manometers associated with each SSD unit were read and the readings provided in Table 1.
5. System wide labeling was performed which included at least one "Sub-Slab Vent" label and one unique identifying label on each unit.
6. The opportunity for back-drafting was assessed and it was concluded that there are no gravity flue appliances in the vicinity of the SSD units to cause back drafting.

A summary of the results of the vacuum testing for the various extension test points in each of the buildings is presented in Table 2. For each building, Table 2 presents the building area, the number of SSD units installed, and the pressure differential for each extension test point. The test point locations and associated readings are presented in Figure 3.

3.4 DATA EVALUATION

Guidance documents reviewed for this project recommend that a minimum level of negative pressure be achieved following design and installation of SSD systems. As noted before, the October 2006 NYSDOH Guidance incorporates EPA radon guidance for technical requirements and design of vapor mitigation systems. As appropriate, the ASTM document entitled *Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings* (ASTM E 2121-03, EPA 402-K-03-007) was also referenced during this project. Since the ASTM document applies to residential buildings and this facility is a large, commercial building, reference was also made to the document entitled *Radon Prevention in the Design and Construction of Schools and Other Large Buildings*, EPA/625/R-92/016, dated June 1994. This document recommends a minimum of one radon suction pit per 100,000 ft^2 of slab area and a minimum pressure of -0.002 wci. In addition, the document states that a slight pressure differential (as little as 0.001 wci relative to the sub-slab and outdoors) prevents radon entry into the building.

The ratio of building area to number of SSD suction points at the Carlson Park facility ranges from 4,400 ft^2 to 20,000 ft^2 per point, a substantially greater density (five to twenty times) than the 100,000 ft^2 noted in the 1994 EPA document. Negative differential pressures between sub-slab and ambient air ranged from 0.002 to 1.195 wci. This indicated that the minimum pressure differential requirement was met or exceeded thereby resulting in the presence of significant sub-slab negative pressure in the buildings. An evaluation of existing information to date indicates that the facility has been successfully depressurized due to the documented presence of vacuum.

As noted above, the three exhaust fans installed in Buildings 4, 6, and 10 had maximum rated capacities of 4000, 585 and 10,000 CFM, respectively. Under a static pressure of 0.125 inches WC, rated flows were 1976 and 285 for the exhaust fans installed in Buildings 4 and 6 respectively. Under a static pressure of 1.0 inch WC, the rated flow was 7,000 CFM for the exhaust fans installed in Building 10. The estimated volume of ventilated space in each of Buildings 4, 6, and 10 are 77,000; 1,100 and 115,000 cubic feet, respectively. Based upon the flow air rating at the pressures noted for each of the ventilation exhaust fans installed in Buildings 4, 6, and 10, and the estimated volume of space being ventilated, an approximate rate of air exchange was estimated. For Buildings 4, 6 and 10, it was estimated that the number of air exchanges per hour were approximately 1.5, 15 and 3.7, respectively.

4 OPERATION, MONITORING, AND MAINTENANCE

The New York State Soil Vapor Intrusion Guidance (2006) states that operation, monitoring and maintenance (OM&M) of a SSD system should be included as part of site management. As such, an operation, monitoring and maintenance Plan was prepared and included as Appendix D to this document. System operation, monitoring and maintenance are briefly discussed below.

4.1 SYSTEM OPERATION

Overall, the components of the SSD and ventilation systems must be operated in accordance with the manufacturer's instructions (Appendices A, B and C). Vent fans must be kept in continuous operation (24 hours/day, 7 days/week) in occupied building areas. The SSD unit fans restart automatically in the event of a power loss. The three ventilation exhaust fans installed with the SSD System should also be in continuous operation.

Until such time that final soil and/or groundwater remediation efforts are able to adequately address impacts due to the presence of VOCs, appropriate operation of the existing SSD system shall continue as needed in occupied areas. Once the SSD system is no longer required, the vapor mitigation system may be shut down and/or removed and OM&M requirements ceased. This decision will be made with the approval of the Agencies and in accordance with applicable regulations. Until the system is shut down, site management activities must proceed.

In light of NYSDEC's issuance of its DER-31 Green Remediation Policy, a review was made to assess whether energy use could be reduced at the site. During this review, it was concluded that the SSD units in unoccupied buildings may be temporarily shut down to conserve energy. The exact buildings that are shut down would vary depending on changes in leases. If such a building becomes re-occupied, the SSD units in those buildings will be re-started and be in operation for no less than two weeks of continuous operation prior to re-occupying that building. Over the two-week period, approximately 195,000 cubic feet of air would have been removed from the subsurface by the 95 cfm fan operating at its 1- inch water pressure rating. Removal of this substantial volume of subsurface air is expected to return the sub-slab back to its depressurized condition. Based on an average vapor attenuation factor of 3.6×10^{-5} for TCE (Johnson et al., 2002) the space above the slab is expected to have a concentration 27,000 times less than the negligible concentration in the evacuated sub-slab. Manometer readings would be taken to confirm that the required depressurization is indeed being accomplished. If manometer readings deviate more than one-quarter inch from the prior readings, further testing will be performed to identify and rectify potential problems that may be identified.

4.2 MONITORING AND INSPECTION

To confirm continued effectiveness of the SSD units that were installed, each unit will be inspected on a routine basis and appropriate monitoring conducted in accordance with the requirements identified in the OM&M Plan in Appendix D.

Routine inspections of the mitigation system will be performed annually and whenever the building undergoes significant alteration. These inspections will also include the four exhaust ventilation fans that were installed at the three locations to supplement the SSD system in certain problem areas. In addition, annual inspections will be conducted with ALL SSD units (including those in unoccupied buildings) running for a minimum of two weeks prior to conducting the inspections.

Monitoring and testing of the various components of the facility-wide SSD system will be performed and documented. Records shall include quarterly monitoring reports, annual inspection reports, test data and other readings collected, records of problems and/or malfunctions identified, records of repairs/replacements or modifications made to the system, and records of observations reported by building occupants. An annual Periodic Review Report shall be prepared annually as described in Appendix D.

4.3 MAINTENANCE

Routine maintenance will be conducted as required for continued operation of the SSD system. For each of the SSD units installed as part of the facility-wide SSD system, the routine and non-routine OM&M protocols identified in Appendix D must be followed. The OM&M activities will be documented and records maintained at the facility. Required maintenance (e.g., replacing improperly operating vent fans), repairs and/or adjustments must be made to the system to facilitate its continued effectiveness. Components will be replaced upon findings of damage or failure. The need for repairs and/or adjustments may be influenced by changes in conditions from those present when system operations were initiated. If significant changes are made to the premises or if the system's performance is questionable, the system must be evaluated by a Professional Engineer to be adjusted or modified, as appropriate. The extent of such activities will primarily depend upon the reason for the changes and the associated reduction in sub-slab depressurization.

REFERENCES

ASTM. *Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings,* (ASTM E 2121-03, EPA 402-K-03-007). American Society for Testing and Materials. May 2006.

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TABLE 1
CARLSON PARK - Rochester, New York
Sub-slab Vapor Mitigation System Summary

Building No.	Extraction Location	Fan Location	Panel #	Circuit #	Panel Location	Manometer Reading on SSD Riser (wci)
1	A53	A53	MR	39	D52	3.6
	C53	C53	1-1-2	9	C55	3.6
	B/C50					
	E53	E53	1-1-3	31	E52	2.8
	G53	G53	Stockroom #1	18	F54	1.4
	D55	D55	1-1-2	9	C55	0.5
2	A-B45 U&L	A-B45 U&L	02	41	E45	2
	C45	C45				2.5
	E45	E45		24		3.6
	G43	G43	RP2-4	2	G45	1.3
3	A37	A37	RP6	41	B39	3.1
	C36	C36	RP2-3-1	20	C36	3.1
	D39					
	F37	F37	RP7-1-3	2	G37	3.4
	G38	G38		12		3.5
4	FF29	FF29	RP1-2-4	24	GG25	3.6
	NN29	NN29	RP6-2-4	11	NN26	3.2
	TT29	TT29	RP9-2-4	19	TT27	1.8
	XX29					
5	R32	P34	RP5-2	24	M34	3.2
	R40					
	R36					
	N32	O36		30		2.3
	N36					
	N39					
	L34	K34		32		2.4
	K36					
	K40					
	J32					
	J38	G38	RP-7-1-3	12	G37	3.5
6	B2	A3	P-1	4	A3	1.7
	B3					
	F3					
7	A58	A58	South #2	23A	A58 East wall	3.5
	B63	B63	#1 West	20	B63	3.5
	B57	B57	#2 West	16	C55	2.9
	C59	C59	N.E. Col. 3	41	C59	3.2
	E60	E60	Row 3 Col. B East	20	E62	3.5
	G60	G61	Café Pnl. #2	29	G60	3.8
8	P5	N5	A-4	6	N4 2nd Floor	3.9
	N3					
	K8	K9	Equip. Rm Pnl #1	7	Elev. Equip. Rm	3.5
	G5	G5	RP5-2-8	26	H5 2nd Floor	3.7
	J2					
	D6	A1	RP10-2-4	42	Bldg. 4-2 WW28	2.3
	B4					
	A8					
9	C67	C67	PP1I Sect.2	34	D67	3.3
	F66	F66	PP1L Sect. 2	28	G67	3.5
10A	F6	F7	LQ	8	10B Penthouse	2.1
10B	X14	X14	RP1-2-10B	7	E16	3.7
10C	U23	X23	LL	8	Z24	3.4
10C	W21					

TABLE 2
CARLSON PARK - Rochester, New York
Sub-slab Vapor Mitigation System Testing Results

Building Number	Building Area (Sq ft)	Number of Extraction Points	Manometer (wci)	Test Point Number	Pressure Δ (wci)	≥ 0.002 wci
1	65,000	6	3.6, 3.6, 2.8, 1.4, 0.5	1	0.005	√
				2	0.036	√
				3	0.010	√
				4	0.010	√
				5	0.046	√
				6	0.006	√
				7	0.065	√
				8	0.050	√
2	74,000	5	2, 2.5, 3.6, 1.3	1	0.085	√
				2	0.005	√
				3	0.057	√
				4	0.030	√
				5	0.004	√
				6	0.040	√
				7	0.029	√
3	74,000	5	3.1, 3.1, 3.4, 3.5	1	0.003	√
				2	0.005	√
				3	0.205	√
				4	0.006	√
				5	0.008	√
				6	0.036	√
				7	0.005	√
				8	0.034	√
				9	0.010	√
4	74,000	4	3.6, 3.2, 1.8	1	0.028	√
				2	0.125	√
				3	0.012	√
				4	0.005	√
				5	0.008	√
				6	0.028	√
				7	0.022	√
5	44,000	11	3.2, 2.3, 2.4, 3.5	1	0.030	√
				2	0.006	√
				3	0.454	√
				4	0.043	√
				5	0.028	√
				6	0.030	√
				7	1.195	√
				8	0.016	√
				9	0.005	√
				10	0.016	√
				11	0.005	√
6	15,000	3	1.7	1	0.075	√
				2	0.011	√
				3	0.091	√
				4	0.011	√
				5	0.020	√
				6	0.018	√
7	74,000	6	3.5, 3.5, 2.9, 3.2, 3.5, 3.8	1	0.006	√
				2	0.031	√
				3	0.005	√
				4	0.338	√
				5	0.745	√
				6	0.183	√
				7	0.010	√
8	58,000	8	3.9, 3.5, 3.7, 2.3	1	0.007	√
				2	0.002	√
				3	0.016	√
				4	0.024	√
				5	0.020	√
				6	0.124	√
				7	0.009	√
				8	0.124	√
				9	0.029	√
				10	0.011	√
				11	0.012	√
				12	0.008	√
9	33,000	2	3.3, 3.5	1	0.005	√
				2	0.035	√
				3	0.050	√
				4	0.047	√
10A	18,000	1	2.1	1	0.009	√
				2	0.012	√
				3	0.020	√
10B	20,000	1	3.7	1	0.037	√
				2	0.002	√
				3	0.003	√
				4	0.002	√
10C	20,000	2	3.4	1	0.010	√
				2	0.004	√

NOTES:

Sq ft	Square feet
Δ	Difference
wci	Water column inch
SSD	Sub-slab Depressurization

S_2 C_2 inc.

Building Slab Layout

Carlson Park
Rochester, New York

Figure 1

DRAWN BY	SCALE	DATE	DWG. NO.
JCR	1:1,500	8/17/06	IRM-01

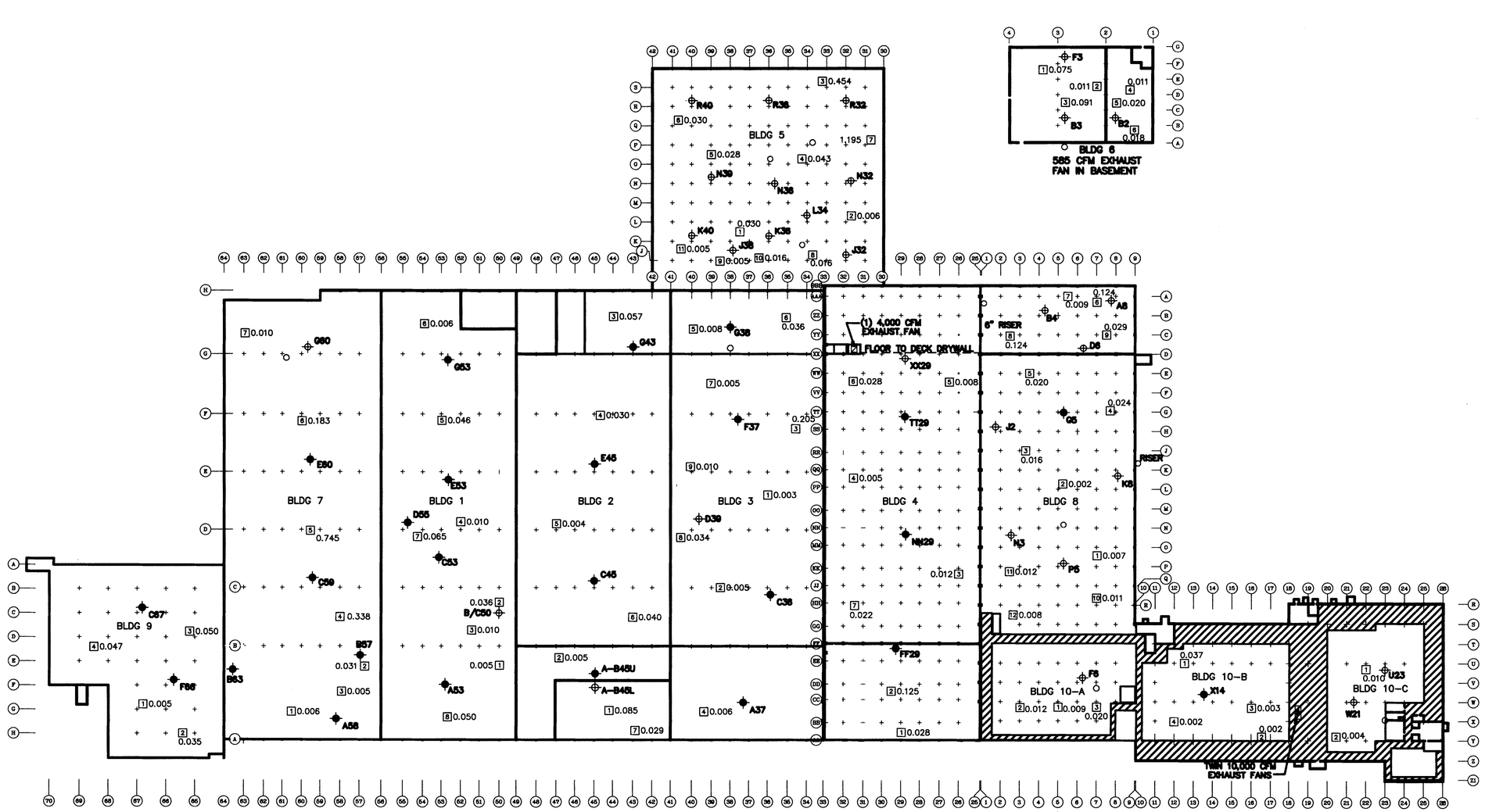
FIGURE 2

CARLSON PARK
100 CARLSON ROAD
ROCHESTER, NEW YORK

SITE LOCATION

20207.50098-001
DECEMBER 2013

O'BRIEN & GERE



LEGEND:

- [1] TEST POINT
- ⊕ EXTRACTION POINT
- ○ FAN LOCATION
- ◆ EXTRACTION POINT AND FAN LOCATION
- 0.024 NEGATIVE VACUUM PRESSURE IN WATER COLUMN INCH
- A37 SUB–SLAB DEPRESSURIZATION SYSTEM LOCATION CODE
- CFM CUBIC FEET PER MINUTE
- UTILITY TUNNEL

NOTE:

BASE MAP OBTAINED FROM TIMOTHY J. FORWARD, ARCHITECT, IN 2009

NOTE:

FLOOR PLAN AND TEST POINT LOCATIONS OBTAINED FROM DRAWING: 09005CLP SET 01 V01_FIG3_053112.DWG, DATED 05/31/2012 CREATED BY AECOM.

RECORD DRAWINGS

To the best of our knowledge, information and belief, based on information provided by others, these record drawings substantially represent the project as constructed.

O'BRIEN & GERE ENGINEERS, INC.

By: _____

STATE OF NEW YORK · DOUGLAS M CRAWFORD · 065643 · LICENSED PROFESSIONAL ENGINEER

IN CHARGE OF DWC

DESIGNED BY NM CHECKED BY KJ

DRAWN BY SED

1/64"=1'–0" 64 32 0 64 128

NO.	DATE	REVISION	INIT.
0	03/28/2013	RECORD DRAWING	

O'BRIEN & GERE

CARLSON PARK
100 CARLSON ROAD
ROCHESTER, NEW YORK

GENERAL
SUB–SLAB DE–PRESSURIZATION SYSTEM AND TEST POINT LOCATIONS

FILE NO. 20207.50098–002

DATE DECEMBER 2013

FIG–3

FIGURE 4. Typical Sealing of Creases and Tiny Spaces with Caulk.

FIGURE 5. Typical Sealing of Large Openings.

FIGURE 6. Areas Around Utilities Sealed with Caulk.

FIGURE 7. Potential Sources of Leaking Air Sealed With Caulk.

FIGURE 8. Typical Floor Penetration Sealed With Caulk.

FIGURE 9. Typical Fan installation.

FIGURE 10. Exhaust Fans Installed on Building 10 Roof.

FIGURE 11. Labeled Fan Control Located Within Building 10.

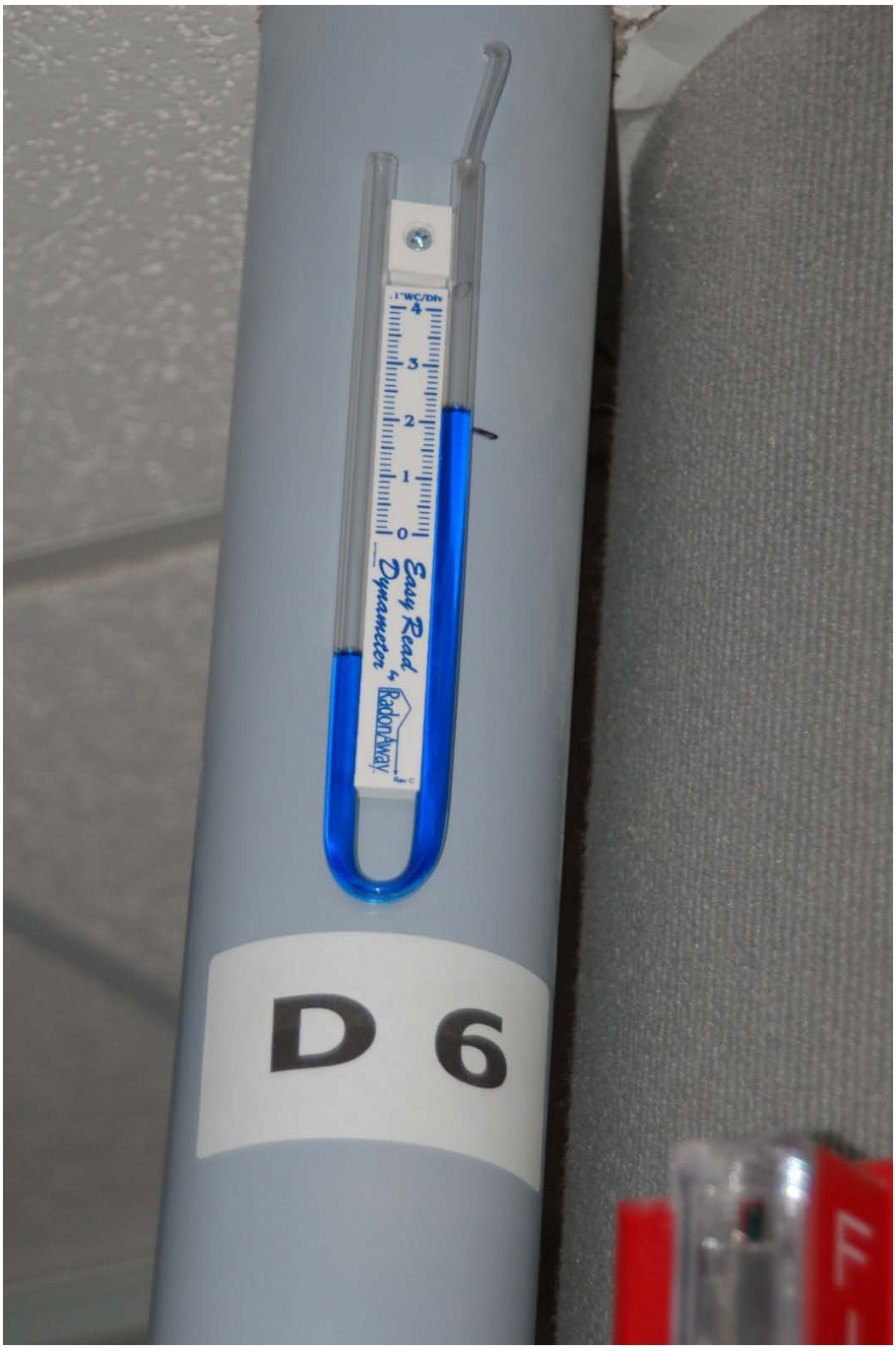


FIGURE 12. Typical Manometer Installation.

FIGURE 13. Typical Vent Pipe Labeling.

Radonaway GP Series Fan Installation Instructions

RadonAway™
The World's Leading Radon Fan Manufacturer

GP Series

Radon Mitigation Fans

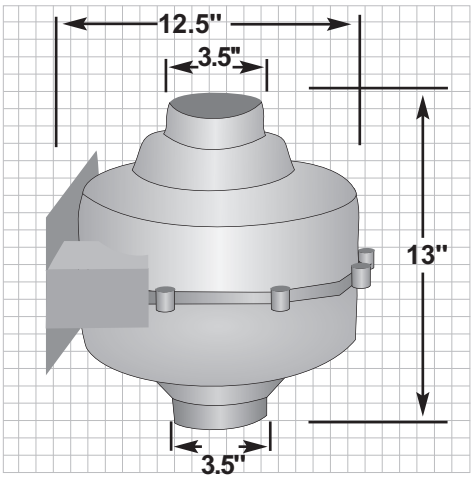
All RadonAway fans are specifically designed for radon mitigation. GP Series Fans provide a wide range of performance that makes them ideal for most sub-slab radon mitigation systems.

Features:

- Five-year hassle-free warranty
- Mounts on duct pipe or with integral flange
- 3.5" diameter ducts for use with 3" or 4" pipe
- Electrical box for hard wire or plug in
- ETL Listed - for indoor or outdoor use
- Meets all electrical code requirements
- Thermally protected
- Rated for commercial and residential use.

Model	Watts	Max. Pressure "WC	Typical CFM vs. Static Pressure WC						
			1.0"	1.5"	2.0"	2.5"	3.0"	3.5"	4.0"
GP201	40-60	2.0	82	58	5	-	-	-	-
GP301	55-90	2.6	92	77	45	10	-	-	-
GP401	60-110	3.4	93	82	60	40	15	-	-
GP501	70-140	4.2	95	87	80	70	57	30	10

Choice of model is dependent on building characteristics including sub-slab materials and should be made by a radon professional.



For Further Information Contact:

10/08
P/N 02002

RadonAway Ward Hill, MA IN014 Rev F

XP/GP/XR Series Fan Installation Instructions

Please Read And Save These Instructions.

DO NOT CONNECT POWER SUPPLY UNTIL FAN IS COMPLETELY INSTALLED. MAKE SURE ELECTRICAL SERVICE TO FAN IS LOCKED IN "OFF" POSITION. DISCONNECT POWER BEFORE SERVICING FAN.

1. **WARNING!** Do not use fan in hazardous environments where fan electrical system could provide ignition to combustible of flammable materials.

2. **WARNING!** Do not use fan to pump explosive or corrosive gases.

3. **WARNING!** Check voltage at the fan to insure it corresponds with nameplate.

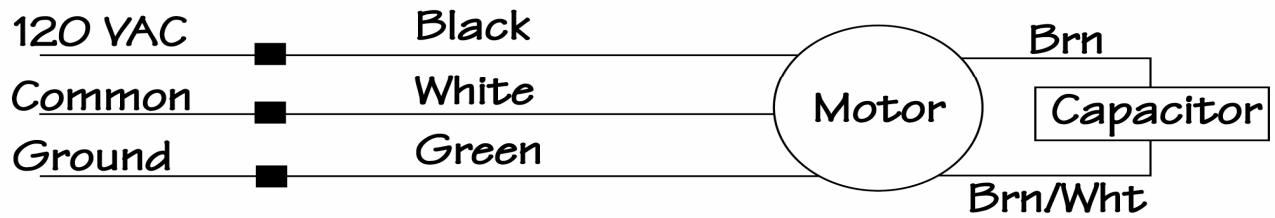
4. **WARNING!** Normal operation of this device may affect the combustion airflow needed for safe operation of fuel burning equipment. Check for possible backdraft conditions on all combustion devices after installation.

5. **NOTICE!** There are no user serviceable parts located inside the fan unit. **Do NOT attempt to open.** Return unit to the factory for service.

6. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician.

7. **WARNING!** Do not leave fan unit installed on system piping without electrical power for more than 48 hours. Fan failure could result from this non-operational storage.

DynaVac GP/XP/XR/RP Series Fan Wiring Diagram



DynaVac - XP/XR Series		DynaVac - GP Series	
XP101	p/n 23008-1,-2	GP201	p/n 23007-1
XP151	p/n 23010-1,-2	GP301	p/n 23006-1,-2
XP201	p/n 23011-1,-2	GP401	p/n 23009-1
XR161	p/n 23018-1,-2	GP501	p/n 23005-1,-2
XR261	p/n 23019-1,-2		

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The DynaVac GP/XP/XR Series Radon Fans are intended for use by trained, professional Radon mitigators. The purpose of this instruction is to provide additional guidance for the most effective use of a DynaVac Fan. This instruction should be considered as a supplement to EPA standard practices, state and local building codes and state regulations. In the event of a conflict, those codes, practices and regulations take precedence over this instruction.

1.2 ENVIRONMENTALS

The GP/XP/XR Series Fans are designed to perform year-round in all but the harshest climates without additional concern for temperature or weather. For installations in an area of severe cold weather, please contact RadonAway for assistance. When not in operation, the fan should be stored in an area where the temperature is never less than 32 degrees F. or more than 100 degrees F.

1.3 ACOUSTICS

The GP/XP/XR Series Fan, when installed properly, operates with little or no noticeable noise to the building occupants. The velocity of the outgoing air should be considered in the overall system design. In some cases the "rushing" sound of the outlet air may be disturbing. In these instances, the use of a RadonAway Exhaust Muffler is recommended.

1.4 GROUND WATER

In the event that a temporary high water table results in water at or above slab level, water may be drawn into the riser pipes thus blocking air flow to the GP/XP/XR Series Fan. The lack of cooling air may result in the fan cycling on and off as the internal temperature rises above the thermal cutoff and falls upon shutoff. Should this condition arise, it is recommended that the fan be turned off until the water recedes allowing for return to normal operation.

1.5 SLAB COVERAGE

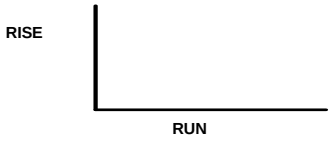
The GP/XP/XR Series Fan can provide coverage up to 2000+ sq. ft. per slab penetration. This will primarily depend on the sub-slab material in any particular installation. In general, the tighter the material, the smaller the area covered per penetration. Appropriate selection of the GP/XP/XR Series Fan best suited for the sub-slab material can improve the slab coverage. The GP & XP series have a wide range of models to choose from to cover a wide range of subslab material. The higher static suction fans are generally used for tighter subslab materials. The XR Series is specifically designed for high flow applications such as stone/gravel and drain tile. Additional suction points can be added as required. It is recommended that a small pit (5 to 10 gallons in size) be created below the slab at each suction hole.

1.6 CONDENSATION & DRAINAGE

Condensation is formed in the piping of a mitigation system when the air in the piping is chilled below its dew point. This can occur at points where the system piping goes through unheated space such as an attic, garage or outside. The system design must provide a means for water to drain back to a slab hole to remove the condensation. The GP/XP/XR Series Fan **MUST** be mounted vertically plumb and level, with the outlet pointing up for proper drainage through the fan. Avoid mounting the fan in any orientation that will allow water to accumulate inside the fan housing. The GP/XP/XR Series Fans are **NOT** suitable for underground burial.

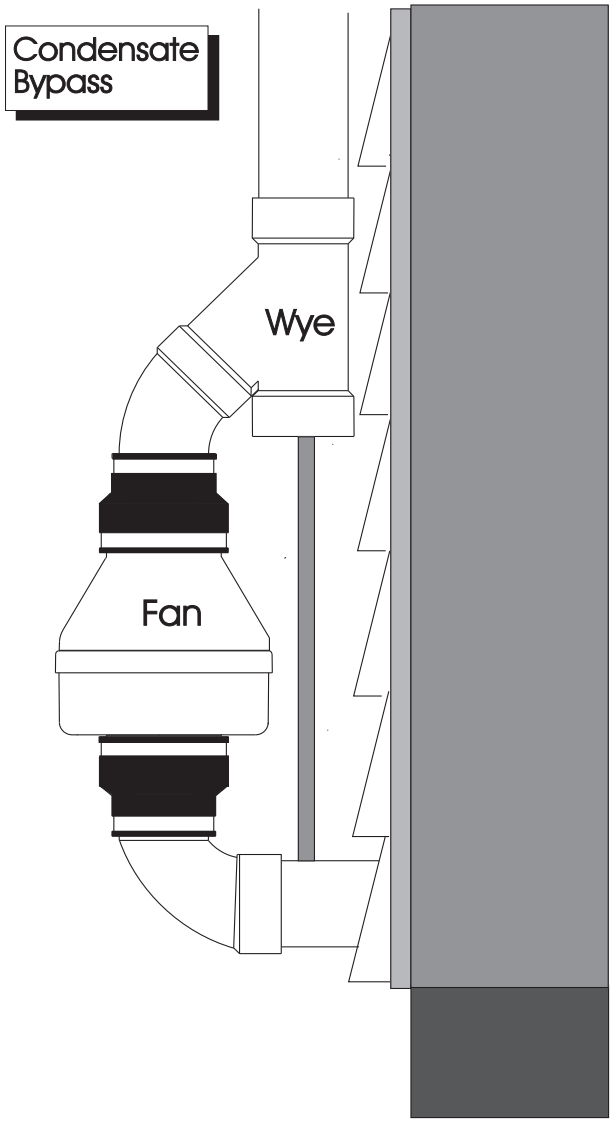
For GP/XP/XR Series Fan piping, the following table provides the minimum recommended pipe diameter and pitch under several system conditions.

Pipe Dia.	Minimum Rise per Foot of Run* @25 CFM	@50 CFM	@100 CFM
4″	1/8″	1/4″	3/8″
3"	1/4"	3/8"	1 1/2"



*Typical GP/XP/XR Series Fan operational flow rate is 25 - 90 CFM. (For more precision, determine flow rate by using the chart in the addendum.)

Under some circumstances in an outdoor installation a condensate bypass should be installed in the outlet ducting as shown. This may be particularly true in cold climate installations which require long lengths of outlet ducting or where the outlet ducting is likely to produce large amounts of condensation because of high soil moisture or outlet duct material. Schedule 20 piping and other thin-walled plastic ducting and Aluminum downspout will normally produce much more condensation than Schedule 40 piping.



The bypass is constructed with a 45 degree Wye fitting at the bottom of the outlet stack. The bottom of the Wye is capped and fitted with a tube that connects to the inlet piping or other drain. The condensation produced in the outlet stack is collected in the Wye fitting and drained through the bypass tube. The bypass tubing may be insulated to prevent freezing.

1.7 "SYSTEM ON" INDICATOR

A properly designed system should incorporate a "System On" Indicator for affirmation of system operation. A manometer, such as a U-Tube, or a vacuum alarm is recommended for this purpose.

1.8 ELECTRICAL WIRING

The GP/XP/XR Series Fans operate on standard 120V 60 Hz. AC. All wiring must be performed in accordance with the National Fire Protection

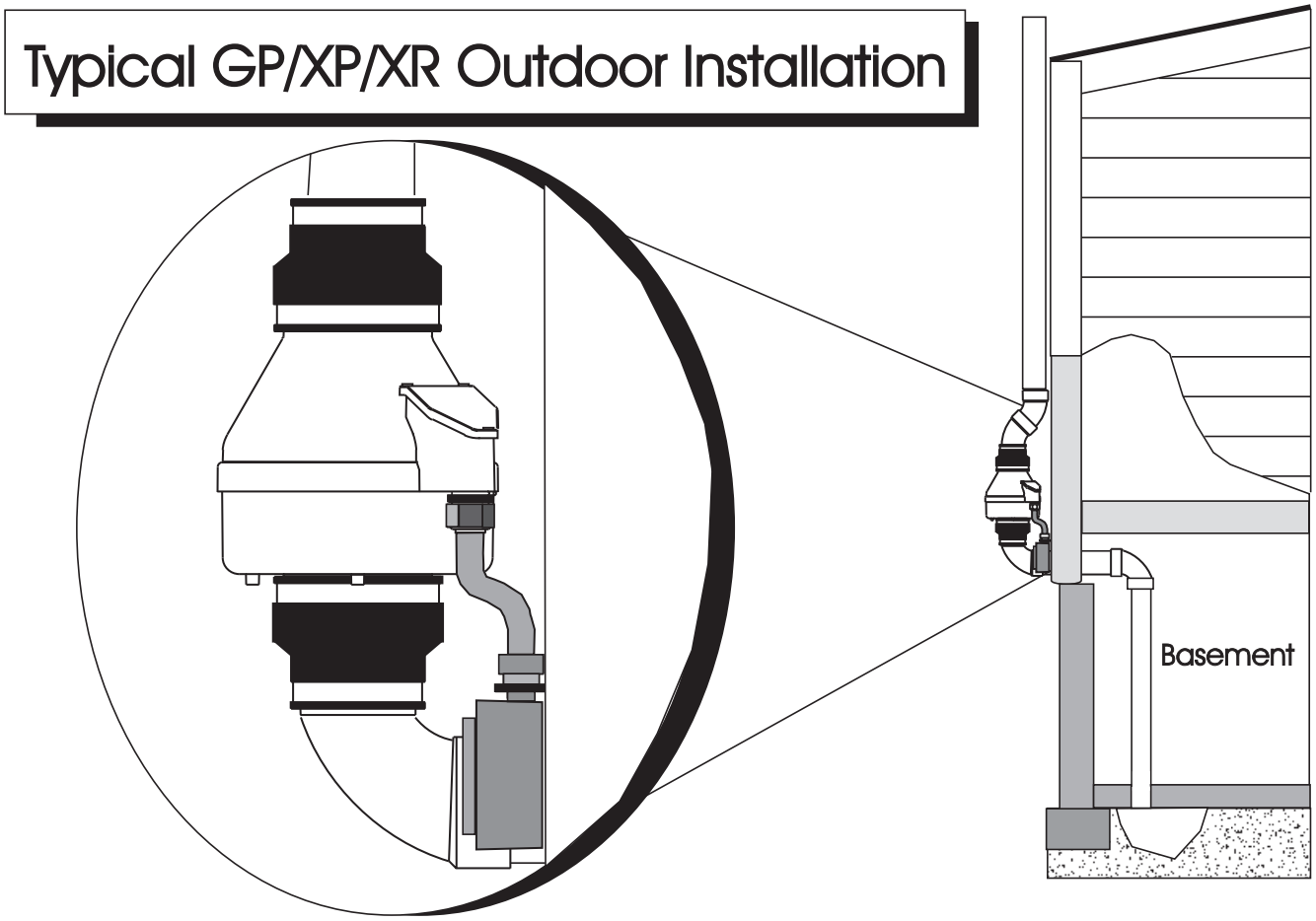
Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a U.L. listed watertight conduit.

1.9 SPEED CONTROLS

The GP/XP/XR Series Fans are rated for use with electronic speed controls ,however, they are generally not recommended.

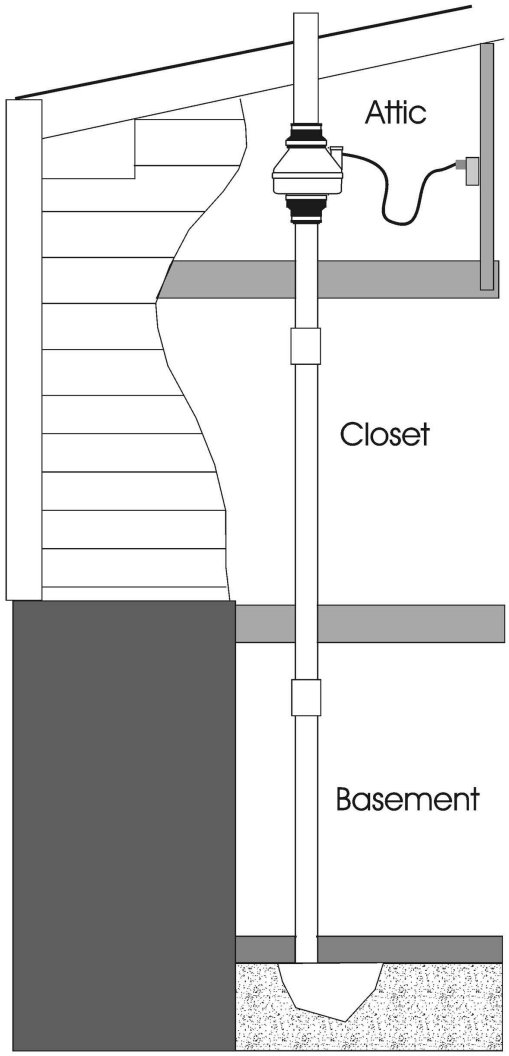
2.0 INSTALLATION

The GP/XP/XR Series Fan can be mounted indoors or outdoors. (It is suggested that EPA recommendations be followed in choosing the fan location.) The GP/XP/XR Series Fan may be mounted directly on the system piping or fastened to a supporting structure by means of optional mounting bracket.



2.1 MOUNTING

Mount the GP/XP/XR Series Fan vertically with outlet up. Insure the unit is plumb and level. When mounting directly on the system piping assure that the fan does not contact any building surface to avoid vibration noise.



2.2 MOUNTING BRACKET (optional)

The GP/XP/XR Series fan may be optionally secured with the integral mounting bracket on the GP Series fan or with RadonAway P/N 25007-2 mounting bracket for an XP/XR Series fan. Foam or rubber grommets may also be used between the bracket and mounting surface for vibration isolation.

2.3 SYSTEM PIPING

Complete piping run, using flexible couplings as means of disconnect for servicing the unit and vibration isolation.

2.4 ELECTRICAL CONNECTION

Connect wiring with wire nuts provided, observing proper connections:

Fan Wire	Connection
Green	Ground
Black	AC Hot
White	AC Common

2.5 VENT MUFFLER (optional)

Install the muffler assembly in the selected location in the outlet ducting. Solvent weld all connections. The muffler is normally installed at the end of the vent pipe.

2.6 OPERATION CHECKS

_____ **Verify** all connections are tight and **leak-free**.

_____ **Insure** the GP/XP/XR Series Fan and all ducting is secure and vibration-free.

_____ **Verify** system vacuum pressure with manometer. **Insure** vacuum pressure is **less than** maximum recommended operating pressure

(Based on sea-level operation, at higher altitudes reduce by about 4% per 1000 Feet.)
(Further reduce Maximum Operating Pressure by 10% for High Temperature environments)
See Product Specifications. If this is exceeded, increase the number of suction points.

_____ **Verify Radon levels by testing to EPA protocol.**

XP/XR SERIES PRODUCT SPECIFICATIONS

The following chart shows fan performance for the XP & XR Series Fan:

Typical CFM Vs Static Suction "WC									
	0"	.25"	.5"	.75"	1.0"	1.25"	1.5"	1.75"	2.0"
XP101	125	118	90	56	5	-	-	-	-
XP151	180	162	140	117	78	46	10	-	-
XP201	150	130	110	93	74	57	38	20	-
XR161	215	175	145	105	75	45	15	-	-
XR261	250	215	185	150	115	80	50	20	-

Maximum Recommended Operating Pressure*		
XP101	0.9" W.C.	(Sea Level Operation)**
XP151	1.3" W.C.	(Sea Level Operation)**
XP201	1.7" W.C.	(Sea Level Operation)**
XR161	1.3" W.C.	(Sea Level Operation)**
XR261	1.6" W.C.	(Sea Level Operation)**

**Reduce by 10% for High Temperature Operation*
***Reduce by 4% per 1000 feet of altitude*

Power Consumption @ 120 VAC	
XP101	40 - 49 watts
XP151	45 - 60 watts
XP201	45 - 66 watts
XR161	48 - 75 watts
XR261	65 - 105 watts

XP Series Inlet/Outlet: 4.5" OD (4.0" PVC Sched 40 size compatible)

XR Series Inlet/Outlet: 5.875" OD

Mounting: Mount on the duct pipe or with optional mounting bracket.

Recommended ducting: 3" or 4" Schedule 20/40 PVC Pipe

Storage temperature range: 32 - 100 degrees F.

Normal operating temperature range: -20 - 120 degrees F.

Maximum inlet air temperature: 80 degrees F.

Size: 9.5H" x 8.5" Dia. **Weight**: 6 lbs. (XR261 - 7 lbs)

Continuous Duty **Thermally protected**

Class B Insulation **3000 RPM**

Residential Use Only **Rated for Indoor or Outdoor use**

LISTED Electric Fan ETL® Tested to UL Std. 507

77728

GP SERIES PRODUCT SPECIFICATIONS

The following chart shows fan performance for the GPx01 Series Fan:

Typical CFM Vs Static Suction "WC	1.0"	1.5"	2.0"	2.5"	3.0"	3.5"	4.0"
GP501	95	87	80	70	57	30	5
GP401	93	82	60	38	12	-	-
GP301	92	77	45	10	-	-	-
GP201	82	58	5	-	-	-	-

Maximum Recommended Operating Pressure*		
GP501	3.8" W.C.	(Sea Level Operation)**
GP401	3.0" W.C.	(Sea Level Operation)**
GP301	2.4" W.C.	(Sea Level Operation)**
GP201	1.8" W.C.	(Sea Level Operation)**

**Reduce by 10% for High Temperature Operation*

***Reduce by 4% per 1000 feet of altitude*

Power Consumption @ 120 VAC	
GP501	70 - 140 watts
GP401	60 - 110 watts
GP301	55 - 90 watts
GP201	40 - 60 watts

Inlet/Outlet: 3.5" OD (3.0" PVC Sched 40 size compatible)

Mounting: Fan may be mounted on the duct pipe or with integral flanges.

Weight: 12 lbs.

Size: 13H" x 12.5" x 12.5"

Recommended ducting: 3″ or 4" Schedule 20/40 PVC Pipe

Storage temperature range: 32 - 100 degrees F.

Normal operating temperature range: -20 - 120 degrees F.

Maximum inlet air temperature: 80 degrees F.

Continuous Duty

Class B Insulation

3000 RPM

Thermally protected

Rated for Indoor or Outdoor Use

GP301C / GP501C Rated for Commercial Use

LISTED Electric Fan ETL® Tested to UL Std. 507

77728

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the GPx01/XP/XR Series Fan for shipping damage within 15 days of receipt. Notify RadonAway of any damages immediately. Radonaway is not responsible for damages incurred during shipping. However, for your benefit, Radonaway does insure shipments.

There are no user serviceable parts inside the fan. **Do not attempt to open.** Return unit to factory for service.

Install the GPx01/XP/XR Series Fan in accordance with all EPA standard practices, and state and local building codes and state regulations.

WARRANTY

Subject to any applicable consumer protection legislation, RadonAway warrants that the GPX01/XP/XR/RP Series Fan (the "Fan") will be free from defects in materials and workmanship for a period of 90 days from the date of purchase (the "Warranty Term").

RadonAway will replace any Fan which fails due to defects in materials or workmanship. The Fan must be returned (at Owner's cost) to the RadonAway factory. Any Fan returned to the factory will be discarded unless the Owner provides specific instructions along with the Fan when it is returned regardless of whether or not the Fan is actually replaced under this warranty. Proof of purchase must be supplied upon request for service under this Warranty.

This Warranty is contingent on installation of the Fan in accordance with the instructions provided. This Warranty does not apply where any repairs or alterations have been made or attempted by others, or if the unit has been abused or misused. Warranty does not cover damage in shipment unless the damage is due to the negligence of RadonAway.

5 YEAR EXTENDED WARRANTY WITH PROFESSIONAL INSTALLATION.

RadonAway will extend the Warranty Term of the fan to 5 years from date of manufacture if the Fan is installed in a professionally designed and professionally installed radon system or installed as a replacement fan in a professionally designed and professionally installed radon system. Proof of purchase and/or proof of professional installation may be required for service under this warranty. Outside the Continental United States and Canada the extended Warranty Term is limited to one (1) year from the date of manufacture.

RadonAway is not responsible for installation, removal or delivery costs associated with this Warranty.

EXCEPT AS STATED ABOVE, THE GPx01/XP/XR/RP SERIES FANS ARE PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL RADONAWAY BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR RELATING TO, THE FAN OR THE PERFORMANCE THEREOF. RADONAWAY'S AGGREGATE LIABILITY HEREUNDER SHALL NOT IN ANY EVENT EXCEED THE AMOUNT OF THE PURCHASE PRICE OF SAID PRODUCT. THE SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR OR REPLACEMENT OF THE PRODUCT, TO THE EXTENT THE SAME DOES NOT MEET WITH RADONAWAY'S WARRANTY AS PROVIDED ABOVE.

For service under this Warranty, contact RadonAway for a Return Material Authorization (RMA) number and shipping information. No returns can be accepted without an RMA. If factory return is required, the customer assumes all shipping cost to and from factory.

RadonAway
3 Saber Way
Ward Hill, MA 01835
TEL. (978) 521-3703
FAX (978) 521-3964

Record the following information for your records:

Serial No._____
Purchase Date_____

Radonaway RP Series Fan Installation Instructions

RadonAway™
The World's Leading Radon Fan Manufacturer

RP Series

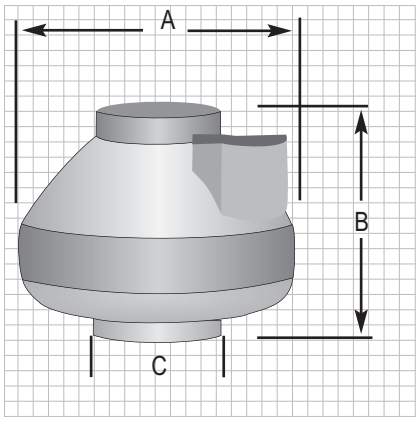
Radon Mitigation Fans

All RadonAway fans are specifically designed for radon mitigation. RP Series Fans provide superb performance, run ultra-quiet and are attractive. They are ideal for most sub-slab radon mitigation systems.

Features:

- Five-year hassle-free warranty
- Quiet and attractive
- Thermally protected
- Motorized impeller
- ETL Listed - for indoor or outdoor use
- Meets all electrical code requirements
- Rated for commercial and residential use

Model	Watts	Max. Pressure "WC	Typical CFM vs. Static Pressure WC					A"	B"	C"
			0"	.5"	1.0"	1.5"	2.0"			
RP140	14-20	0.8	134	68	-	-	-	9.7	7.9	4
RP145	37-71	2.1	173	132	94	55	11	9.7	7.9	4
RP260	52-72	1.8	275	180	105	20	-	11.8	9.9	6
RP265	86-140	2.5	327	260	207	139	57	11.8	9.9	6
RP380	103-156	2.3	510	393	268	165	35	13.41	10.53	8



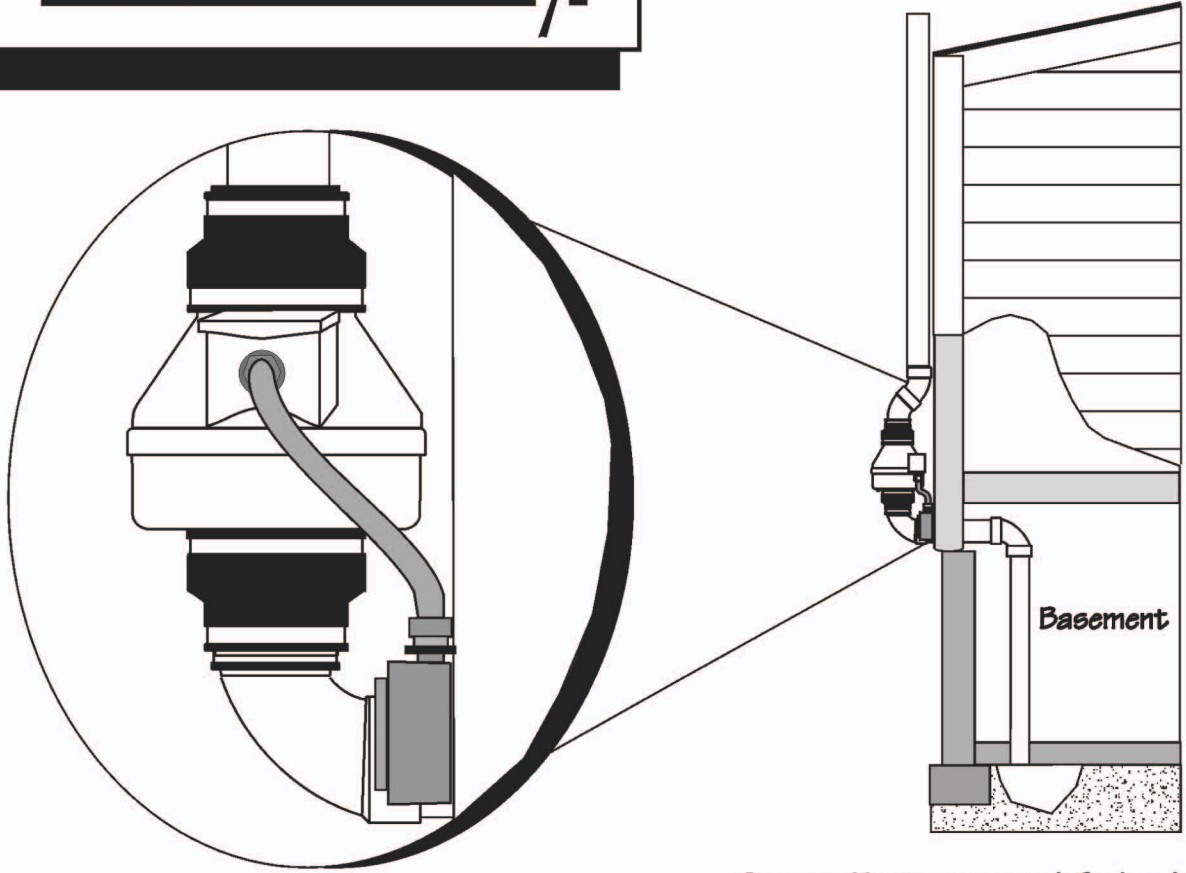
Choice of model is dependent on building characteristics including sub-slab materials and should be made by a radon professional.

For Further Information Contact:

4/09
P/N 02008

RP Series Installation Instructions

By RadonAway™



Spruce Environmental Technologies, Inc.
Ward Hill, MA P/N IN020 Rev J

RadonAway™

Series Fan Installation Instructions

Please Read and Save These Instructions.

DO NOT CONNECT POWER SUPPLY UNTIL FAN IS COMPLETELY INSTALLED.
MAKE SURE ELECTRICAL SERVICE TO FAN IS LOCKED IN "OFF" POSITION.
DISCONNECT POWER BEFORE SERVICING FAN.

1. **WARNING!** Do not use fan in hazardous environments where fan electrical system could provide ignition to combustible or flammable materials.

2. **WARNING!** Do not use fan to pump explosive or corrosive gases.

3. **WARNING!** Check voltage at the fan to insure it corresponds with nameplate.

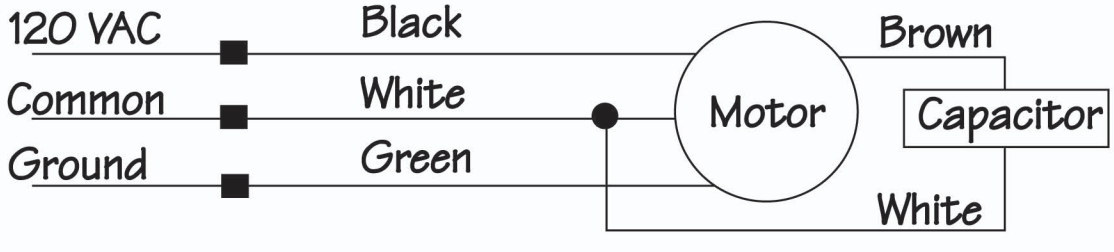
4. **WARNING!** Normal operation of this device may affect the combustion airflow needed for safe operation of fuel burning equipment. Check for possible backdraft conditions on all combustion devices after installation.

5. **NOTICE!** There are no user serviceable parts located inside the fan unit.
Do NOT attempt to open. Return unit to the factory for service.

6. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician

7. **WARNING!** Do not leave fan unit installed on system piping without electrical power for more than 48 hours. Fan failure could result from this non-operational storage.

DynaVac RP Series Fan Wiring Diagram



INSTALLATION INSTRUCTIONS IN020 Rev I

DynaVac - RP Series
RP140 p/n 23029-1
RP145 p/n 23030-1
RP260 p/n 23032-1
RP265 p/n 23033-1
RP380 p/n 28208

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The DynaVac RP Series Radon Fans are intended for use by trained, professional Radon mitigators. The purpose of this instruction is to provide additional guidance for the most effective use of a DynaVac Fan. This instruction should be considered as a supplement to EPA standard practices, state and local building codes and state regulations. In the event of a conflict, those codes, practices and regulations take precedence over this instruction.

1.2 ENVIRONMENTALS

The RP Series Fans are designed to perform year-round in all but the harshest climates without additional concern for temperature or weather. For installations in an area of severe cold weather, please contact RadonAway for assistance. When not in operation, the fan should be stored in an area where the temperature is never less than 32 degrees F. or more than 100 degrees F.

1.3 ACOUSTICS

The RP Series Fan, when installed properly, operates with little or no noticeable noise to the building occupants. The velocity of the outgoing air should be considered in the overall system design. In some cases the "rushing" sound of the outlet air may be disturbing. In these instances, the use of a RadonAway Exhaust Muffler is recommended.

1.4 GROUND WATER

In the event that a temporary high water table results in water at or above slab level, water may be drawn into the riser pipes thus blocking air flow to the RP Series Fan. The lack of cooling air may result in the fan cycling on and off as the internal temperature rises above the thermal cutoff and falls upon shutoff. Should this condition arise, it is recommended that the fan be turned off until the water recedes allowing for return to normal operation.

1.5 SLAB COVERAGE

The RP Series Fan can provide coverage up to 2000+ sq. ft. per slab penetration. This will primarily depend on the sub-slab material in any particular installation. In general, the tighter the material, the smaller the area covered per penetration. Appropriate selection of the RP Series Fan best suited for the sub-slab material can improve the slab coverage. The RP140/145/155 are best suited for general purpose use. The RP260 can be used where additional airflow is required and the RP265/380 is best suited for large slab, high airflow applications. Additional suction points can be added as required. It is recommended that a small pit (5 to 10 gallons in size) be created below the slab at each suction hole.

1.6 CONDENSATION & DRAINAGE

Condensation is formed in the piping of a mitigation system when the air in the piping is chilled below its dew point. This can occur at points where the system piping goes through unheated space such as an attic, garage or outside. The system design must provide a means for water to drain back to a slab hole to remove the condensation. The RP Series Fan **MUST** be mounted vertically plumb and level, with the outlet pointing up for proper drainage through the fan. Avoid mounting the fan in any orientation that will allow water to accumulate inside the fan housing. The RP Series Fans are **NOT** suitable for underground burial.

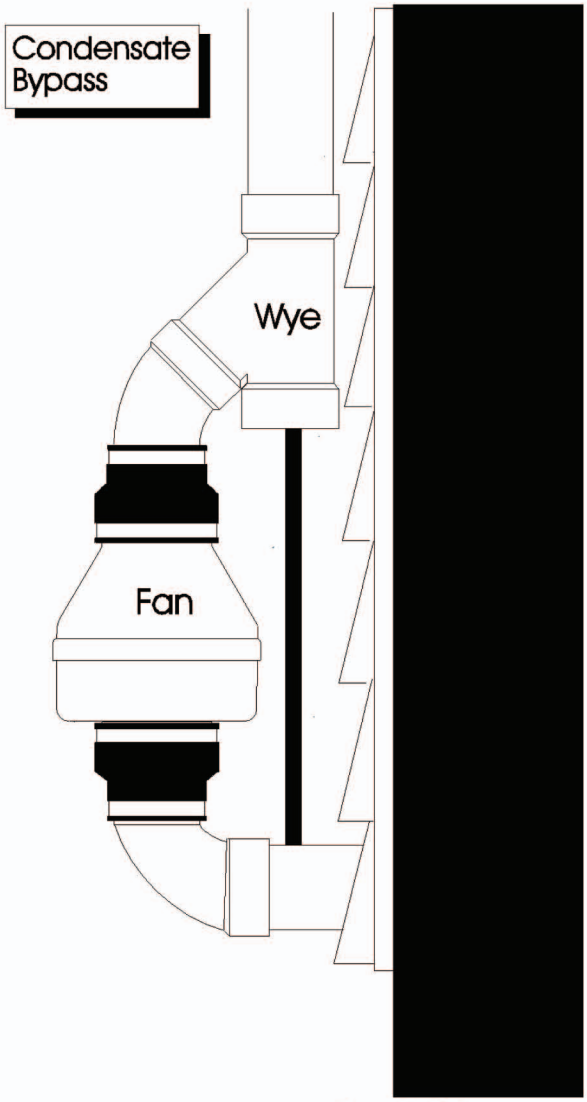
For RP Series Fan piping, the following table provides the minimum recommended pipe diameter and pitch under several system conditions.

Pipe Dia.	Minimum Rise per Ft of Run*				
	@25 CFM	@50 CFM	@100 CFM	@200 CFM	@300 CFM
6"	-	3/16	1/4	3/8	3/4
4"	1/8	1/4	3/8	2 3/8	-
3"	1/4	3/8	1 1/2	-	-

*Typical RP1xx/2xx Series Fan operational flow rate is 25 - 90 CFM 0n 3" and 4" pipe. (For more precision, determine flow rate by measuring Static Pressure, in WC, and correlate pressure to flow in the performance chart in the addendum.)

Under some circumstances in an outdoor installation a condensate bypass should be installed in the outlet ducting as shown. This may be particularly true in cold climate installations which require long lengths of outlet ducting or where the outlet ducting is likely to produce large amounts of condensation because of high soil moisture or outlet duct material. Schedule 20 piping and other thin-walled plastic ducting and Aluminum downspout will normally produce much more condensation than Schedule 40 piping.

The bypass is constructed with a 45 degree Wye fitting at the bottom of the outlet stack. The bottom of the Wye is capped and fitted with a tube that connects to the inlet piping or other drain. The condensation produced in the outlet stack is collected in the Wye fitting and drained through the bypass tube. The bypass tubing may be insulated to prevent freezing.



1.7 "SYSTEM ON" INDICATOR

A properly designed system should incorporate a "System On" Indicator for affirmation of system operation. A manometer, such as a U-Tube, or a vacuum alarm is recommended for this purpose.

1.8 ELECTRICAL WIRING

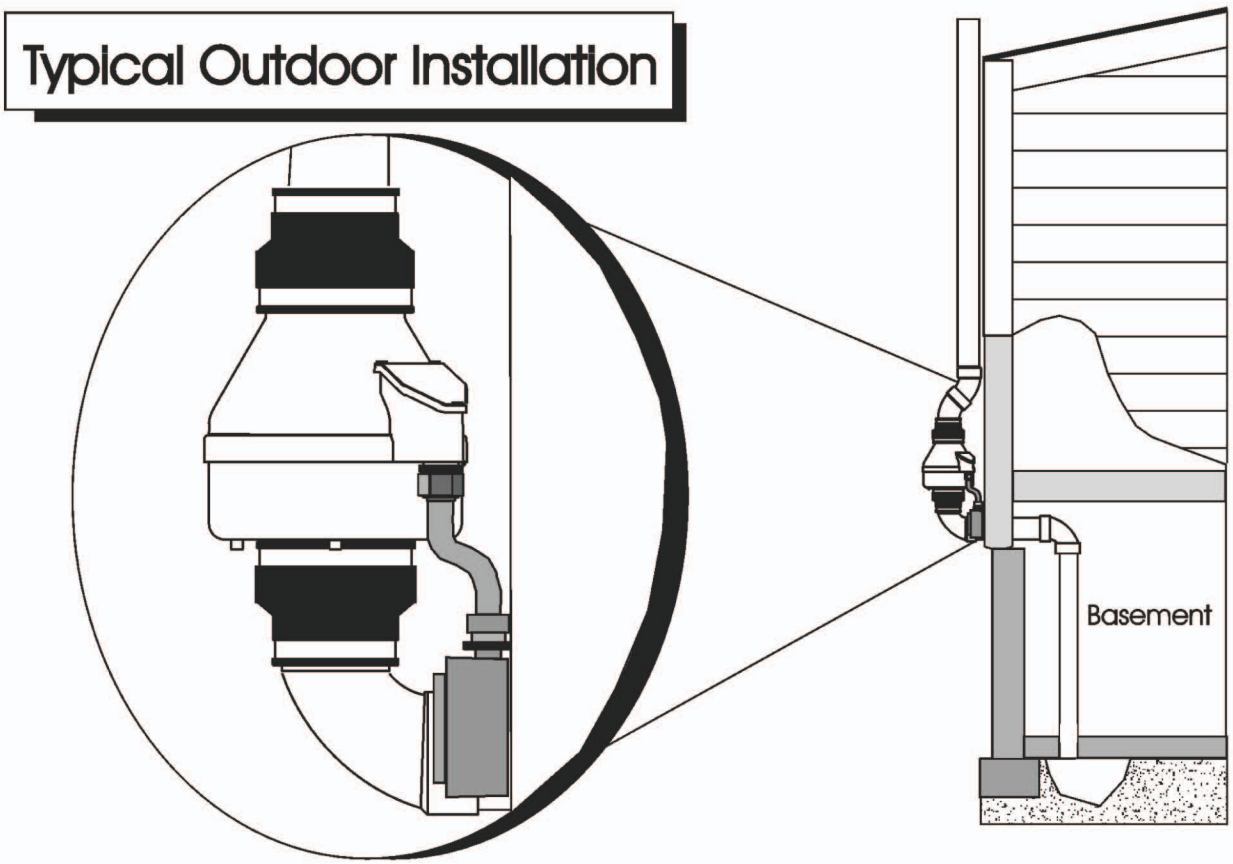
The RP Series Fans operate on standard 120V 60 Hz. AC. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a U.L. listed watertight conduit. Ensure that all exterior electrical boxes are outdoor rated and properly sealed to prevent water penetration into the box. A means, such as a weep hole, is recommended to drain the box.

1.9 SPEED CONTROLS

The RP Series Fans are rated for use with electronic speed controls ,however , they are generally not recommended.

2.0 INSTALLATION

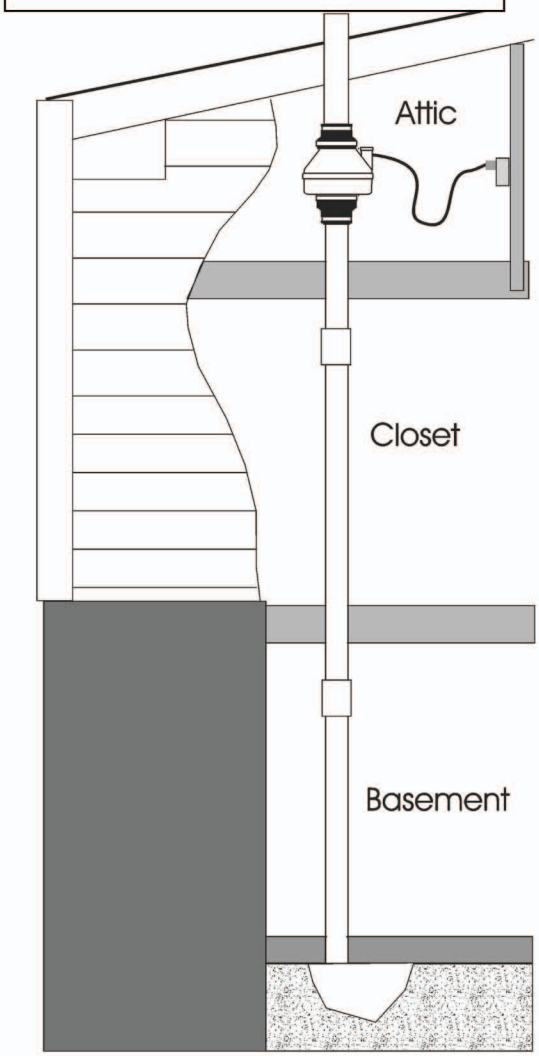
The RP Series Fan can be mounted indoors or outdoors. (It is suggested that EPA recommendations be followed in choosing the fan location.) The RP Series Fan may be mounted directly on the system piping or fastened to a supporting structure by means of optional mounting bracket.



2.1 MOUNTING

Mount the RP Series Fan vertically with outlet up. Insure the unit is plumb and level. When mounting directly on the system piping assure that the fan does not contact any building surface to avoid vibration noise.

Typical Indoor Installation



2.2 MOUNTING BRACKET (optional)

The RP Series fan may be optionally secured with the RadonAway P/N 25007-2 (25033 for RP385) mounting bracket. Foam or rubber grommets may also be used between the bracket and mounting surface for vibration isolation.

2.3 SYSTEM PIPING

Complete piping run, using flexible couplings as means of disconnect for servicing the unit and vibration isolation.

2.4 ELECTRICAL CONNECTION

Connect wiring with wire nuts provided, observing proper connections(See Section 1.8):

Fan Wire	Connection
Green	Ground
Black	AC Hot
White	AC Common

2.5 VENT MUFFLER (optional)

Install the muffler assembly in the selected location in the outlet ducting. Solvent weld all connections. The muffler is normally installed at the end of the vent pipe.

2.6 OPERATION CHECKS

_____ **Verify** all connections are tight and **leak-free**.

_____ **Insure** the RP Series Fan and all ducting is secure and vibration-free.

_____ **Verify** system vacuum pressure with manometer. **Insure** vacuum pressure is **less than** maximum recommended operating pressure

(Based on sea-level operation, at higher altitudes reduce by about 4% per 1000 Feet.)

(Further reduce Maximum Operating Pressure by 10% for High Temperature environments)

See Product Specifications. If this is exceeded, increase the number of suction points.

_____ **Verify Radon levels by testing to EPA protocol.**

RP SERIES PRODUCT SPECIFICATIONS

The following chart shows fan performance for the RP Series Fan:

Typical CFM Vs Static Pressure "WC									
	0"	.25"	.5"	.75"	1.0"	1.25"	1.5"	1.75"	2.0"
RP140	135	103	70	14	-	-	-	-	-
RP145	166	146	126	104	82	61	41	21	3
RP260	272	220	176	138	103	57	13	-	-
RP265	334	291	247	210	176	142	116	87	52
RP380*	497	401	353	281	220	176	130	80	38

* Tested with 6″ inlet and discharge pipe.

Power Consumption 120 VAC, 60Hz 1.5 Amp Maximum			Maximum Recommended Operating Pressure* (Sea Level Operation)**	
RP140	17 - 21	watts	RP140	0.8" W.C.
RP145	41 - 72	watts	RP145	1.7" W.C.
RP260	52 - 72	watts	RP260	1.5" W.C.
RP265	91 - 129	watts	RP265	2.2" W.C.
RP380	95 - 152	watts	RP380	2.0" W.C.

**Reduce by 10% for High Temperature Operation*
***Reduce by 4% per 1000 feet of altitude*

	Size	Weight	Inlet/Outlet
RP140	8.5H" x 9.7" Dia.	5.5 lbs.	4.5" OD (4.0" PVC Sched 40 size compatible)
RP145	8.5H" x 9.7" Dia.	5.5 lbs.	4.5" OD (4.0" PVC Sched 40 size compatible)
RP155	8.5H" x 9.7" Dia.	5.5 lbs.	5.0" OD
RP260	8.6H" x 11.75" Dia.	5.5 lbs.	6.0″ OD
RP265	8.6H" x 11.75" Dia.	6.5 lbs.	6.0″ OD
RP380	10.53H" x 13.41" Dia.	11.5 lbs.	8.0″ OD

Recommended ducting: 3" or 4" RP1xx/2xx, 6″ RP380, Schedule 20/40 PVC Pipe

Mounting: Mount on the duct pipe or with optional mounting bracket.

Storage temperature range: 32 - 100 degrees F.

Normal operating temperature range: -20 - 120 degrees F.

Maximum inlet air temperature: 80 degrees F.

Continuous Duty

Class B Insulation

Thermally protected

3000 RPM

Rated for Indoor or Outdoor Use

LISTED Electric Fan ETL® 77728 Tested to UL Std. 507 ® 2100 HVI CERTIFIED

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the GP/XP/XR/RP Series Fan for shipping damage within 15 days of receipt. Notify **RadonAway of any damages immediately**. Radonaway is not responsible for damages incurred during shipping. However, for your benefit, Radonaway does insure shipments.

There are no user serviceable parts inside the fan. **Do not attempt to open.** Return unit to factory for service.

Install the GP/XP/XR/RP Series Fan in accordance with all EPA standard practices, and state and local building codes and state regulations.

WARRANTY

Subject to any applicable consumer protection legislation, RadonAway warrants that the GPX01/XP/XR/RP Series Fan (the "Fan") will be free from defects in materials and workmanship for a period of 90 days from the date of purchase (the "Warranty Term").

RadonAway will replace any Fan which fails due to defects in materials or workmanship. The Fan must be returned (at Owner's cost) to the RadonAway factory. Any Fan returned to the factory will be discarded unless the Owner provides specific instructions along with the Fan when it is returned regardless of whether or not the Fan is actually replaced under this warranty. Proof of purchase must be supplied upon request for service under this Warranty.

This Warranty is contingent on installation of the Fan in accordance with the instructions provided. This Warranty does not apply where any repairs or alterations have been made or attempted by others, or if the unit has been abused or misused. Warranty does not cover damage in shipment unless the damage is due to the negligence of RadonAway.

5 YEAR EXTENDED WARRANTY WITH PROFESSIONAL INSTALLATION.

RadonAway will extend the Warranty Term of the fan to 5 years from date of manufacture if the Fan is installed in a professionally designed and professionally installed radon system or installed as a replacement fan in a professionally designed and professionally installed radon system. Proof of purchase and/or proof of professional installation may be required for service under this warranty. Outside the Continental United States and Canada the extended Warranty Term is limited to one (1) year from the date of manufacture.

RadonAway is not responsible for installation, removal or delivery costs associated with this Warranty.

EXCEPT AS STATED ABOVE, THE GPx01/XP/XR/RP SERIES FANS ARE PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL RADONAWAY BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR RELATING TO, THE FAN OR THE PERFORMANCE THEREOF. RADONAWAY'S AGGREGATE LIABILITY HEREUNDER SHALL NOT IN ANY EVENT EXCEED THE AMOUNT OF THE PURCHASE PRICE OF SAID PRODUCT. THE SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR OR REPLACEMENT OF THE PRODUCT, TO THE EXTENT THE SAME DOES NOT MEET WITH RADONAWAY'S WARRANTY AS PROVIDED ABOVE.

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RadonAway
3 Saber Way
Ward Hill, MA 01835
TEL. (978) 521-3703
FAX (978) 521-3964

Record the following information for your records:

Serial No._____
Purchase Date_____

Exhaust Fan Specifications

Packaged Wall Fan Aluminum Propeller Direct Drive

Description - Fan shall be a wall mounted, direct driven, aluminum propeller exhaust fan with integral housing, shutter, and inlet guard.

Certifications - Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705).

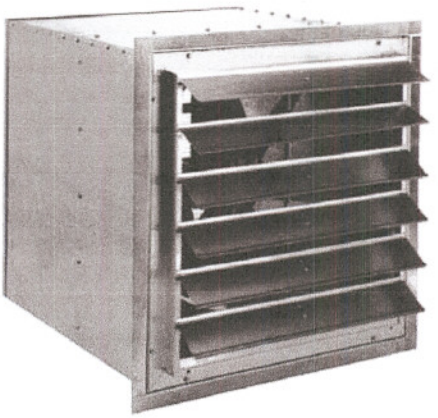
Construction - Fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The motor shall be mounted on a 12 gauge steel wire guard. The wire guard shall be bolted to a minimum 14 gauge wall panel with continuously welded corners and an integral venturi. Fan shall be enclosed in minimum 18 gauge galvanized steel wall housing with factory installed shutter and inlet guard. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM and static pressure. Unit shall be shipped in ISTA Certified Transit Tested Packaging.

Coating - All steel fan components shall be Lorenized™ with an electrostatically applied, baked polyester powder coating. Each component shall be subject to a five stage environmentally friendly wash system, followed by a 1.5 to 2.5 mil thick baked powder finish. Paint must exceed 1,000 hour salt spray under ASTM B117 test method.

Propeller - Propeller shall have aluminum blades riveted to a painted steel hub. The hub shall be securely fastened to the motor shaft utilizing two setscrews. Propeller shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

Motor - Motor shall be 115/1/60, open drip-proof type.

Product - Fan shall be type SPD as manufactured by Loren Cook Company of Springfield, Missouri.



Model SPD and SPD-S are furnished standard with UL 705 listing (Power Ventilator/ZACT) when furnished with factory supplied motor.

Model SPD and SPD-S are furnished standard with cUL listing (Power Ventilator) when furnished with factory supplied motor.

SPD Dimension Data

SIZE	A	B*	C	D*	WALL OPENING	WALL HOUSING GAUGE	SHIPPING WEIGHT
8	15-1/2	13	10	13-3/4	13-1/4	18 GA.	53
10	19-1/2	17	14	17-3/4	17-1/4	18 GA.	65
12	19-1/2	17	14	17-3/4	17-1/4	18 GA.	76
14	23-1/2	21	18	22-1/4	21-1/4	18 GA.	82
16	23-1/2	21	18	22-1/4	21-1/4	18 GA.	95
18	27-1/2	25	22	23-1/4	25-1/4	18 GA.	113
20	27-1/2	25	22	23-1/4	25-1/4	18 GA.	132
24	33-1/2	31	27-1/2	23-1/4	31-1/4	18 GA.	142

All dimensions in inches. Weight in pounds. * B and D dimensions are to the outside of fasteners on wall housing.
**Shipped loose for field mounting.

Cook

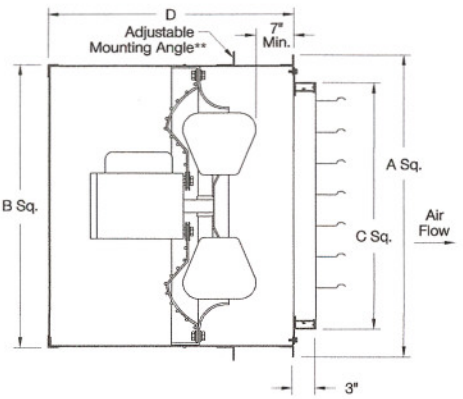
16SP10D

HP .167

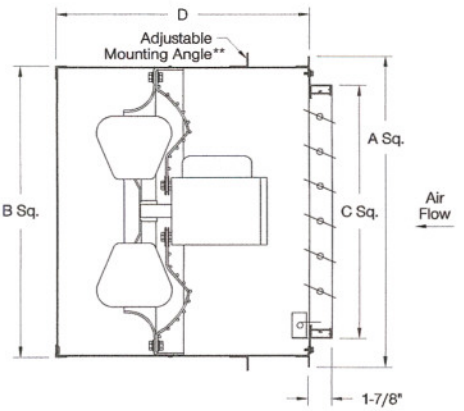
CFM 2,000

RPM 1050

EXHAUST - SPD



SUPPLY - SPD-S



SPD 8-24 Data

SPD - Direct Drive

Fan Size	Catalog Number	Mtr. HP	Max. BHP	RPM	FA Sones	CFM vs. Static Pressure				
						0.000	0.125	0.250	0.375	0.500
8	8SP15D	1/80	0.01	1250	1.7	168				
				1350	2.2	181				
				1450	2.7	195	83			
				1550	3.2	208	97			
				1690	3.8	227	116			
10	10SP15D	1/25	0.10	1050	3.1	591	200			
				1150	3.8	648	263			
				1250	4.6	704	323			
				1350	5.4	760	487			
				1450	6.2	817	604			
				1550	7.1	873	676	320		
12	12SP15D	1/8	0.19	1050	4.9	1006	566			
				1150	5.9	1102	773			
				1250	6.9	1198	903	461		
				1350	8.0	1293	1016	578		
				1450	9.1	1389	1127	725		
				1550	10.4	1485	1245	958	587	
				1615	11.1	1547	1328	1075	662	
14	14SP10D	1/6	0.15	650	2.4	1091				
				750	3.4	1259	607			
				850	4.5	1426	845			
				950	5.7	1594	1143			
				1050	6.9	1762	1382	836		
				1130	7.9	1896	1568	1012		
16	16SP10D	1/6	0.25	650	3.5	1490				
				750	4.8	1720	999			
				850	6.2	1949	1379			
				950	7.8	2178	1689	1007		
				1050	9.1	2408	1976	1362		
				1115	10.1	2557	2156			
18	18SP10D	1/3	0.51	650	4.6	2261	1213			
				750	6.2	2608	1607	706		
				850	7.8	2956	2290	1198		
				950	10.1	3304	2735	1848	1001	
				1050	12.0	3173	2234	1540		
				1095	12.8	3808	3370	2404	1942	1148
20	20SP10D	1/3	0.50	650	5.8	2917	1839			
				750	7.6	3366	2524	1224		
				850	9.8	3815	3129	2006	1059	
				950	12.9	4264	3675	2822	1734	
				1050	15.2	4713	4184	3501		
				1075	15.8	4825	4309	3660		
24	24SP10D	1/2	0.68	650	7.2	4091	3206	1878		
				750	9.2	4721	3986	2941	1928	
				850	11.4	5350	4720	3905	3026	2081
				950	14.0	5979	5429	4785	3868	2975
				1050	16.8	6609	6119	5557		

Performance shown is for Installation Type A: free inlet, free outlet. Performance ratings include the effects of shutter, housing and wire guard in the airstream. The sound ratings shown are loudness values in fan sones at 5 ft. (1.5 m) in a hemispherical free field calculated per AMCA Standard 301. Values shown are for Installation Type A: free inlet fan sone levels. Model SPD is not licensed to bear the AMCA Seal.

Building 6 – Exhaust Fan Specifications

Exhaust Fan, Direct Drive, Shutter Mounted, Speed Controllable, Propeller Dia 10 In, CFM @ 0.000-In SP 585, @ 0.125-In SP 285, Sones @ 0.000-In. SP @ 5 Ft. 6.6, Voltage 115, 60 Hz, Single Phase, Full Load Amps 1.4, HP 1/30, Max Ambient Temp 104 F, Motor Type Shaded Pole, Bearing Type Sleeve, Height 13 1/8 In, Width 13 1/8 In, Max Depth 10 11/16 In, Sq Opening Required 10 1/2 In, Propeller Material Stamped Aluminum, Guard Material Steel, Includes Automatic Shutter

Brand	DAYTON
Mfr. Model #	1HLA1

Item	Exhaust Fan
Type	Direct Drive, Shutter Mounted, Speed Controllable
Propeller Dia. (In.)	10
CFM @ 0.000-In. SP	585
CFM @ 0.125-In. SP	285
Sones @ 0.000-In. SP @ 5 Ft.	6.6
Motor RPM	1550
Voltage	115
Hz	60
Phase	1
Full Load Amps	1.5
HP	1/25
Max. Ambient Temp. (F)	104
Motor Type	Shaded Pole
Motor Enclosure	Totally Enclosed Air-Over
Motor Insulation	Class A
Bearing Type	Sleeve
Height (In.)	13-1/8
Width (In.)	13-1/8
Max. Depth (In.)	10-11/16
Sq. Opening Required (In.)	10-1/2
Frame Material	Cold Rolled Steel
Frame Finish	White Polyester
Propeller Material	Stamped Aluminum
Guard Material	Steel
Wire Guard Finish	Gray Polyester
Speed Control	1DGV1
Number of Blades	5
Thermal Protection	Auto
Agency Compliance	UL Listed for US and Canada
Includes	Automatic Shutter

Upblast Centrifugal Exhaust Ventilator Roof Mounted Belt Drive

Description - Fan shall be a spun aluminum, roof mounted, belt driven, upblast centrifugal exhaust ventilator.

Certifications - Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA Certified Ratings Seal for Sound and Air Performance.

Construction - Fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have a one piece inlet spinning and continuously welded curb cap corners for maximum leak protection. The windband shall have a rolled bead for added strength. A two piece top cap shall have stainless steel quick release latches to provide access into the motor compartment without the use of tools. An integral conduit chase shall be provided into the motor compartment to facilitate wiring connections. The motor, bearings and drives shall be mounted on a minimum 14 gauge steel power assembly, isolated from the unit structure with rubber vibration isolators. These components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. Lifting lugs shall be provided to help prevent damage from improper lifting. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure and maximum fan RPM. Unit shall be shipped in ISTA Certified Transit Tested Packaging.

Wheel - Wheel shall be centrifugal backward inclined, constructed of 100 percent aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

Motor - Motor shall be heavy duty type with permanently lubricated sealed ball bearings and furnished at the specified voltage, phase and enclosure.

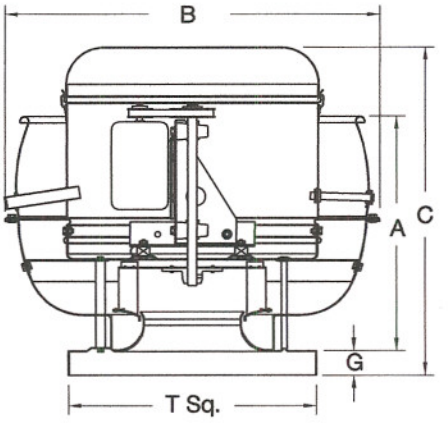
Bearings - Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty regreasable ball type in a cast iron pillowblock housing selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

Belts and Drives - Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150 percent of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.

Product - Fans shall be models ACRUB, ACRUB-HP or ACRUB-XP as manufactured by Loren Cook Company of Springfield, Missouri.

Loren Cook Company certifies that the ACRUB, ACRUB-HP and ACRUB-XP shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Type ACRUB, ACRUB-HP and ACRUB-XP are furnished standard with UL 705 and cUL 705 listings (Power Ventilator/ ZACT) when furnished with factory supplied motor.



ACRUB Dimension Data

Size	A	B	C			G	T Sq.	Roof Opening Square*	Ship. Wt.
			ACRUB	ACRUB-HP	ACRUB-XP				
100	12-1/2	25-1/4	20-3/16	-	-	2	18	13-1/2	30
120	19-1/16	30-3/16	28-1/4	-	-	2	20	15-1/2	61
135	19-1/16	30-3/16	28-5/8	-	-	2	20	15-1/2	66
150	20-15/16	34-11/16	30-1/4	27-1/2	-	2	24	19-1/2	77
165	20-15/16	34-11/16	30-3/4	27-3/4	26-11/16	2	24	19-1/2	83
180	24-13/16	39-7/16	35-7/8	33-3/8	31-9/16	3	30	25-1/2	100
195	24-13/16	39-7/16	36-3/8	33-1/2	32-1/8	3	30	25-1/2	110
210	25-15/16	45-1/4	38-3/8	35-3/8	32-3/4	3	30	25-1/2	220
225	25-15/16	45-1/4	38-1/8	35-1/2	33-5/16	3	30	25-1/2	242
245	28-1/2	49-1/4	41-1/16	37-5/16	34-1/16	3	30	25-1/2	264
270	28-1/2	49-1/4	41-1/16	37-5/16	35	3	36	31-1/2	286
300	33-7/8	54-1/4	49-15/16	45-15/16	41-7/16	3	36	31-1/2	336
330	34-1/8	54-1/4	50-7/16	46-11/16	43-1/8	3	42	37-1/2	374
365	36-3/8	64-1/4	52-7/16	48-7/16	44-1/4	3	42	37-1/2	420
402	37-7/8	64-1/4	54-11/16	-	-	3	48	43-1/2	484
445	31-5/8	76-1/4	57-3/16	-	-	3	54	49-1/2	556
490	33-3/8	76-1/4	58-1/16	-	-	3	54	49-1/2	715

All dimensions in inches. *Roof opening size for curbs supplied by Loren Cook Company only. Weights in pounds, less motor.

330 ACRUB / ACSC

Catalog Number	Mtr. HP/ Drv. Wt.	Fan RPM	Tip Speed	0.000" SP		0.125" SP		0.250" SP		0.375" SP		0.500" SP		0.625" SP		0.750" SP		0.875" SP		1.000" SP		1.250" SP		1.500" SP	
				Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP
330R5B	1/2	341	2946	7650		6920		6050		4379															
330SC5B	23 lbs.			7.0	.45	6.5	.49	5.7	.50	4.9	.44														
330R6B	3/4	393	3395	8817		8189		7512		6630		5013													
330SC6B	31 lbs.			9.2	.68	8.9	.73	8.0	.76	7.3	.76	6.6	.68												
330R7B	1	433	3740	9714		9147		8551		7866		6934													
330SC7B	36 lbs.			11.2	.91	10.9	.97	10.0	1.01	9.2	1.02	8.6	1.01												
330R8B	1-1/2	498	4302	11173		10681		10176		9639		9024		8243		7127									
330SC8B	38 lbs.			14.6	1.39	14.6	1.45	13.7	1.51	12.9	1.55	12.1	1.56	11.5	1.54	10.8	1.49								
330R9B	2	523	4518	11734		11265		10787		10286		9734		9066		8220		6813							
				16.0	1.61	16.0	1.68	15.2	1.74	14.3	1.78	13.6	1.80	12.9	1.79	12.2	1.77	11.7	1.62						
330SC9B	50 lbs.	548	4734	12294		11848		11394		10922		10416		9831		9115		8190							
				17.1	1.85	17.1	1.92	16.4	1.99	15.6	2.04	14.9	2.07	14.2	2.07	13.6	2.05	13.0	2.02						
330R10B	3	588	5079	13192		12776		12354		11921		11468		10974		10400		9711		8849					
				19.0	2.29	19.0	2.36	18.4	2.43	17.8	2.49	17.1	2.54	16.5	2.56	15.8	2.55	15.2	2.53	14.6	2.50				
330SC10B	74 lbs.	629	5434	14112		13723		13331		12930		12516		12079		11598		11046		10395		8382			
				21	2.80	21	2.88	21	2.96	20	3.03	19.4	3.08	18.8	3.12	18.1	3.14	17.6	3.12	17.0	3.10	15.9	2.86		
330R11B	5	689	5952	15458		15103		14746		14384		14014		13632		13231		12798		12312		11122		9180	
				25	3.68	25	3.77	25	3.85	24	3.93	23	4.00	23	4.06	22	4.10	21	4.12	21	4.12	19.6	4.06	18.5	3.76
330SC11B	98 lbs.	748	6462	16781		16455		16127		15795		15459		15114		14761		14391		13997		13086		11937	
				28	4.71	28	4.80	28	4.90	28	4.99	27	5.07	26	5.14	26	5.20	25	5.25	25	5.27	24	5.25	22	5.19

330 ACRUB-HP / ACSC-HP

Catalog Number	Mtr. HP/ Drv. Wt.	Fan RPM	Tip Speed	0.250" SP		0.375" SP		0.500" SP		0.750" SP		1.000" SP		1.250" SP		1.500" SP		1.750" SP		2.000" SP		2.250" SP		2.500" SP	
				Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP
330RH5B	1/2	416	3593	5392		4522																			
330SCH5B	23 lbs.			8.0	.49	7.2	.50																		
330RH6B	3/4	479	4138	6641		5951		5189																	
330SCH6B	31 lbs.			10.7	.72	9.9	.75	9.1	.77																
330RH7B	1	528	4561	7553		6985		6319		4552															
330SCH7B	36 lbs.			13.0	.95	12.2	.99	11.5	1.02	10.0	1.00														
330RH8B	1-1/2	567	4898	8259		7756		7173		5850															
				15.0	1.16	14.2	1.21	13.5	1.24	12.0	1.27														
330SCH8B	38 lbs.	606	5235	8953		8498		7990		6818		5091													
				17.1	1.40	16.3	1.45	15.6	1.50	14.3	1.55	12.7	1.51												
330RH9B	2	668	5771	10037		9640		9212		8210		7104													
330SCH9B	50 lbs.			19.9	1.85	19.5	1.91	18.8	1.96	17.5	2.05	16.1	2.08												
330RH10B	3	718	6203	10900		10537		10153		9286		8292		7157											
				22	2.27	22	2.34	21	2.40	20	2.51	18.9	2.57	17.5	2.57										
330SCH10B	74 lbs.	767	6626	11738		11402		11052		10285		9385		8439		7220									
				25	2.75	25	2.82	24	2.89	23	3.01	22	3.10	20	3.14	19.1	3.11								
330RH11B	5	839	7248	12958		12654		12343		11680		10930		10083		9215		8146							
				28	3.56	28	3.64	28	3.72	27	3.87	26	3.99	25	4.07	24	4.12	22	4.09						
330SCH11B	98 lbs.	912	7879	14186		13908		13626		13036		12395		11673		10888		10091		9164		7774			
				33	4.55	33	4.63	33	4.72	32	4.88	30	5.04	29	5.16	28	5.24	27	5.28	26	5.27	25	5.17		

330 ACRUB-XP / ACSC-XP

Catalog Number	Mtr. HP/ Drv. Wt.	Fan RPM	Tip Speed	1.000" SP		1.250" SP		1.500" SP		1.750" SP		2.000" SP		2.250" SP		2.500" SP		3.000" SP		3.500" SP		4.000" SP		4.500" SP	
				Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP
330RX7B	1	684	5909	3521		2913																			
330SCX7B	36 lbs.			13.3	1.01	12.8	1.03																		
330RX8B	1-1/2	735	6349	4058		3615		2932																	
				15.6	1.23	15.1	1.27	14.5	1.26																
330SCX8B	38 lbs.	786	6790	4558		4163		3739		3040															
				17.0	1.46	17.1	1.52	16.5	1.56	16.1	1.54														
330RX9B	2	826	7136	4922		4580		4187		3731		3045													
				18.0	1.65	18.4	1.74	18.0	1.79	17.6	1.81	17.4	1.76												
330SCX9B	50 lbs.	866	7481	5266		4976		4613		4236		3699		3092											
				19.3	1.86	19.4	1.96	19.5	2.03	19.1	2.07	18.9	2.08	18.7	2.02										
330RX10B	3	930	8034	5798		5560		5269		4925		4576		4124		3496									
				22	2.24	22	2.35	22	2.45	21	2.52	21	2.57	21	2.58	21	2.53								
330SCX10B	74 lbs.	994	8587	6317		6104		5870		5588		5263		4937		4557		3487							
				24	2.66	24	2.79	24	2.90	24	3.01	24	3.08	24	3.13	24	3.15	23	3.04						
330RX11B	5	1057	9131	6822		6623		6419		6190		5918		5611		5305		4463							
				26	3.13	26	3.26	26	3.39	27	3.52	27	3.62	27	3.70	26	3.75	26	3.78						
		1120	9676	7325		7132		6945		6748		6525		6265		5976		5389		4434					
330SCX11B	98 lbs.			29	3.65	29	3.79	29	3.94	29	4.07	29	4.20	29	4.31	29	4.40	29	4.49	28	4.46				
		1182	10211	7817		7629		7451		7272		7082		6865		6618		6069		5476		4502			
				32	4.22	31	4.37	31	4.52	32	4.67	32	4.82	32	4.95	32	5.07	32	5.23	31	5.30	31	5.21		

Performance certified is for Installation Type A: free inlet, free outlet. Power rating (BHP) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories) in the airstream. The sound ratings shown are loudness values in fan sones at 5 ft. (1.5m) in a hemispherical free field calculated per AMCA Standard 301. Values shown are for Installation Type A: free inlet fan sone levels. **Shaded area indicates reinforced wheel required.**

Operation, Monitoring and Maintenance Plan

DECEMBER 2013

Sub-Slab Vapor Mitigation Operation, Monitoring and Maintenance Plan Carlson Park Facility Rochester, New York

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B Radonaway RP Series Fan Installation Instructions
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1 OVERVIEW

1.1 INTRODUCTION

A Sub-slab Depressurization (SSD) System was installed at the Carlson Park Facility (Figure 1) located at 100 Carlson Road, Rochester, New York. Details of the system construction and testing are provided in the Sub-Slab Vapor Mitigation, Construction Completion Report (December, 2013). This Operation, Monitoring and Maintenance (OM&M) Plan serves as a guide for use in operating, monitoring and maintaining the system. It includes a brief summary of the facility-wide SSD system and accompanying information to assist with operating, monitoring and maintaining individual components of the system. Forms for documenting various monitoring activities are also included.

1.2 SITE LOCATION

The Site is located at 100 Carlson Road (between Blossom Road and Humboldt Street) in a mixed light industrial, commercial, and residential area on the eastern perimeter of the City of Rochester, New York. The building location is depicted in Figure 2. It is bounded by a residential area along Hampden Road to the east, railroad tracks to the south, commercial/industrial facilities to the west, and the Channel 8 WROC News Office and Humboldt Street to the north. The facility consists of approximately 39 acres, of which approximately 35 acres are improved with former manufacturing buildings, access roads, and parking areas. The overall "footprint" of the buildings occupies a total area of approximately 600,000 square feet, with an additional 200,000 square feet of second floor space. There are ten individual buildings numbered 1 through 10 with the tenth building sub-divided into three sections and referred to as 10A, 10B and 10C (Figure 3).

2 SYSTEM OPERATION

The mitigation system primarily uses sub-slab depressurization which involves the inducement of a vacuum under the concrete slab of the building. Vacuum is induced by a fan, mounted on the exterior of the building, which pulls sub-slab soil vapor through polyvinyl chloride (PVC) pipes that penetrate the slab (referred to as extraction points). Another mitigation technique that is being used in conjunction with SSD involves ventilation of inaccessible and problematic spaces, such as the basement tunnels and crawlspaces. This section summarizes the various components of the SSD system and outlines their operation.

2.1 SYSTEM COMPONENTS

The facility-wide SSD system consists of 36 individual SSD units, comprising a total of 54 individual extraction points and 36 vent fans installed in the nine contiguous and one stand-alone building (*i.e.* Building 6) comprising the Carlson Park Business Complex (Figure 3). A summary of the SSD units within each building together with the associated fan location and electrical circuit is listed in Table 1 and shown in Figure 3.

Each individual SSD unit is made up of a pipe connecting one or more extraction points in the sub-slab to a vent in the roof fitted with an in-line vent fan (Figure 3). Vent pipes were constructed of 3-inch schedule 40 PVC except in Building 8 at location D6. At location D6, larger 4-inch and 6-inch PVC pipes were used to accommodate a total of three extraction points connected to a single fan. The exterior mounted fans connected to the vent pipes extract vapor from the sub-slab and vent it to the atmosphere. Fans are connected to the piping with rubber *Fernco* couplings for ease of replacement. The pressure differential between the sub-slab and the indoor air is monitored with the use of manometers (Figure 4) mounted on each of the labeled (Figure 5) vent pipes.

With the exception of location D6 in Building 8, the vent fans (Figure 6) installed as part of this program consisted of RADONAWAY GP-501 centrifugal in-line fans. The GP-501 consumes approximately 140 watts (W) of electricity and produces a static pressure differential of up to 4.2 water column inch (wci), and 95 cubic feet per minute (CFM) air flow at 1 inch water column (WC) pressure. Each of these fans was installed within 3-inch PVC vent pipes. In Building 8 at location D6, a RADONAWAY RP-265 centrifugal in-line fan was installed within a combination of 4-inch and 6-inch PVC vent pipes. The RP-265 consumes approximately 130 W of electricity and produces a static pressure differential of up to 2.4 water column inch (wci), and 207 CFM air flow and 1 inch WC pressure. The fans are powered by electricity from various circuits across the building complex.

In addition to the 36 SSD units, a total of four independent exhaust fans were installed at three locations in selected portions of the basement within the facility to supplement the facility-wide SSD system by ventilating these basement areas. At these three basement locations within the buildings it was not practical to install SSD units due to physical constraints and limitations (*i.e.*, ground water, crawl space). Two redundant 10,000 CFM (maximum rated capacity) exhaust fans (Figure 7) and controls (Figure 8) were installed in the basement tunnel between Buildings 10B and 10C (Figure 3). One of these two fans operates continuously, while the other fan serves as a back-up. In addition, another exhaust fan (4,000 CFM maximum rated capacity) was installed at the western end of Building 4 (Figure 3), and was tied in to an existing air duct. A fourth exhaust fan (585 CFM maximum rated capacity) was installed within a small basement area situated beneath the northwest corner of Building 6.

A list of the installed vent and exhaust fans is provided below and manufacturer's literature is included in Attachments A, B and C.

Equipment	**Location**
Radonaway RP series fans	All units except one location in Bldg 8
Radonaway GP series fans	Building 8, location D6
Radonaway Easy read Dynameter™ Monitor	All units
Exhaust fan (ACRUB/ACSC 330 R11B)	Building 10
Exhaust fan (SPD Size 10, 4,000 CFM)	Building 4
Exhaust fan (Dayton 10 in. 1HLA1)	Building 6

2.2 ROUTINE OPERATION

Overall, the components of the ventilation systems must be operated in accordance with the manufacturer's recommendations (Attachments A, B, and C). All fans must be kept in continuous operation (24 hours/day, 7 days/week) as applicable to occupied buildings. The extraction fans in each SSD unit restart automatically in the event of a power loss. The ventilation exhaust fans installed in Buildings 4, 6 and 10 must also be in continuous operation. Operation and routine testing as described below shall be performed by the facility personnel or an outside contractor.

The SSD units situated in unoccupied buildings may be temporarily shut down to conserve energy. In such instances the exhaust pipes from the shut down units are to be capped until it is re-started. If any such buildings become re-occupied, the SSD units in those building shall be re-started and be in continuous operation for no less than two weeks prior to re-occupying the building.

Until such time that final remediation efforts are able to eliminate concerns related to the presence of VOCs in soil and/or groundwater, operation of the existing SSD system must continue as needed for occupied buildings. Once the SSD system is no longer required, the vapor mitigation system may be shut down and/or removed and operation, monitoring and maintenance requirements would cease, pending Agency approval and in accordance with applicable regulations. Until the system is shut down, site management activities as detailed in this OM&M Plan shall continue.

3 MONITORING AND INSPECTION

To confirm continued effectiveness of the facility-wide SSD system installed at the Carlson Park facility, appropriate monitoring must be conducted and components of the system inspected on a routine basis as discussed below. These activities shall be documented and the records filed for future reference and possible Agency review.

3.1 QUARTERLY MONITORING

The vent pipe on each SSD unit has been outfitted with U-tube type oil-filled manometers (RADONAWAY "Easy Read Dynameter™ Manometers"). Observations made on these devices will be used to verify the continued presence of a negative pressure field below the building foundation. These pressure gauges in actively operating units must be checked on a quarterly basis by facility personnel and the findings documented in Table 2. Overall, the monitoring activities shall include the following:

- For each operating SSD unit, inspect the manometer by observing the level of colored fluid and note the reading.
- Compare the reading to the mark on the gauge indicating the initial reading and also the initial reading noted in Table 2. Identify whether any gauge reading deviates 0.25 wci or more from its initial reading and its historical average thereafter, and follow-up by investigating possible causes.

3.2 ANNUAL INSPECTION

On an annual basis, an inspection of the entire SSD system (including unoccupied areas) should be performed by, or under the direction of, a Professional Engineer or a Qualified Environmental Professional (QEP) as defined in the New York State Department of Environmental Conservation, Division of Environmental Remediation DER-10/ *Technical Guidance for Site Investigation and Remediation*. Inspections of the SSD system will also be performed whenever the building undergoes any significant alteration. The inspection should include the following activities, at a minimum and be documented in Table 3:

- Record any changes in site conditions (e.g. building modifications), or building usage structure, HVAC systems, slab conditions, etc., so that the change can be evaluated for impact on the function of the SSD systems.
- Inspect the exhaust or discharge point of each exhaust fan to verify that the outlets are not blocked and that no air intakes have been located within 10 feet of the exhaust or discharge points.
- Check the integrity and condition of the visible SSD components including: vent pipe sections, exterior piping, vent discharges, roof penetrations, fan mounting seals and all joints throughout all the vent piping (e.g., vent fan, piping, warning device or indicator, labeling on individual units, sealing, caulking, etc.) to confirm that the system is operating properly, has not been modified, and that components have not degraded.
- Check to see that the pipes and the circuit breakers controlling the circuits on which the SSD vent fans operate are still properly labeled.
- Check the three operating ventilation exhaust fans to confirm that all components are operating properly.

3.3 MONITORING AND INSPECTION DOCUMENTATION

Monitoring and testing of the various components of the facility-wide SSD system will be documented and shall include: inspection reports and other readings taken, records of problems and/or malfunctions identified, records of repairs or modifications to the system, and records of observations reported by building occupants.

The document shall include a summary of findings per the sections above, a summary of system outages, replaced components (including fan replacements), etc. These reports shall remain on-site with copies sent to representatives of the NYSDEC and/or NYSDOH. Quarterly monitoring shall be documented on Table 2 and the annual inspections on Table 3.

3.4 PERIODIC REVIEW REPORT

Since mitigation systems are considered engineering controls, submission of an annual certification to the State is required per DER-10 (NYSDEC, 2010). A Periodic Review Report (PRR) is to be prepared for the certification period which summarizes compliance with the OM&M plan, based on the inspections performed at the facility over the past year. The PRR must be submitted to the NYSDEC 45 days prior to period end. The PRR must be prepared and submitted by a Professional Engineer or QEP (as defined in DER-10) and must affirm that the engineering controls are in place, are performing properly and remain effective. Specifically, the PRR must certify that for the SSD system, all of the following statements are true:

- The SSD system is unchanged from the date the system was put in place, or last approved by NYSDEC;
- Nothing has occurred that would impair the SSD system to be protective of public health and the environment;
- Nothing has occurred that would constitute a violation or failure to comply with the Site Management Plan (if one is put in place) for this Site; and
- Access to the site will continue to be provided to DER to evaluate the Site, including access to evaluate the continued maintenance of the SSD System.

This requirement of certification remains in effect until the State provides notification, in writing, that this certification is no longer needed.

4 MAINTENANCE

The mitigation system is designed to operate continuously for many years with preventative and routine maintenance expected to increase the life expectancy of the system. These routine activities include quarterly and annual inspections and preventive maintenance of the mitigation system. Each routine maintenance inspection will assess the system's performance with respect to its prior performance as well as a visual inspection of the structure, both indoors and outdoors. For each of the SSD units installed as part of the facility-wide SSD system, the routine and non-routine maintenance protocols described below shall be followed. Maintenance activities performed will be documented and the records maintained at the facility.

4.1 ROUTINE MAINTENANCE

Appropriate maintenance (e.g., replacing improperly operating vent fans), repairs and/or adjustments shall be made to the system to facilitate its continued effectiveness. Components will be replaced upon findings of damage or failure. The need for repairs and/or adjustments may be influenced by changes in conditions from those present when system operations were initiated. If significant changes are made to the premises, or if the system's performance is determined to be unacceptable, the system may need to be adjusted or modified. The extent of such activities will primarily depend upon the reason for the changes and any significant changes in manometer readings. These activities will be performed at the direction of a New York State Licensed Professional Engineer.

Routine maintenance will be conducted periodically as required and will generally include the following activities:

- In the event of unusual fan noise, failure to start, physical damage, or repeated circuit breaker failure the fan should be turned off at the designated circuit breaker as indicated on Table 1 and an arrangement for outside service made.
- Identification and repair of any leaks in vent pipes, roof vents, caulking, sealing, floor and/or tunnel cracks, concrete cracks, floor joints, and at the extraction points.
- Repair of any leaks in accordance with Sections 4.3.1(a) and 4.3.4(a) of the NYS DOH VI Guidance and confirmation of a successful repair. Following any leak repair and with the system running, use smoke sticks to check whether the leaks were properly repaired. Any identified leaks will be re-sealed until smoke is no longer observed flowing through the opening.

The fans are the only components of the system that are anticipated to wear out over time. Under current operating conditions the typical fan life is between 5 and 7 years. Therefore, as preventive maintenance for the system, it is anticipated in-line system fans will be replaced at a frequency of once per 7 years. However, fans may be replaced sooner than 7 years if fan degradation (that is, gradual decline in vacuum pressure and/or flow rate) is observed through the annual inspections. All fan replacement shall be properly recorded and tracked to identify any excessive rate of fan replacements.

4.2 NON-ROUTINE MAINTENANCE

Non-routine maintenance may also become necessary during the ongoing operation of the SSD system. This would be when a problem with the mitigation system is perceived during routine monitoring of the mitigation system. Examples of such situations when non-routine maintenance may be warranted include the following:

- It is determined through inspection, or notification by others that a manometer indicates that a particular SSD unit is not operating properly.
- The mitigation system becomes damaged.
- Building renovations result in a reduction in the effectiveness of the SSD system.
- The building and/or piping systems undergo renovations that may reduce the effectiveness of the SSD system.

Activities conducted during non-routine maintenance visits will vary depending upon the reason for the visit. In general, building-related activities may include examining the building for structural or HVAC system changes, or other changes that may affect the performance of the depressurization system (e.g., new combustion appliances, deterioration of the concrete slab, or other significant changes).

Activities related to the evaluation of sub-slab depressurization status may include examining the operation of the manometer and the vent fan, or measurement of the extent of current sub-slab depressurization. In such situations, repairs or adjustments should be made to the system as appropriate.

Repairs or adjustments should be made to the system if the operation of the indicator gauge and the vent fan, or measurement of the extent of sub-slab depressurization is compromised. The design of the SSD system is modular so that failure of a given unit or component should not significantly affect the overall benefit of the facility-wide system. However, any substantial component failure should be communicated to the Agencies, who will also be kept informed of appropriate corrective actions being taken.

5 HEALTH AND SAFETY PLAN

DER-10 (NYSDEC, 2010) states that any person conducting investigation or remediation activities is required to prepare and implement a site-specific health and safety plan (HASP) which will be adhered to by all personnel involved in the investigation and/or remediation at the site. The HASP is a requirement of the federal Occupational Safety and Health Administration (OSHA) and is not subject to the approval of NYSDEC.

The plan will be prepared by a qualified person in accordance with the most recently adopted and applicable general industry (29 CFR 1910) and construction (29 CFR 1926) standards of OSHA, the U.S. Department of Labor, as well as any other applicable federal, state or local statutes or regulations. The contractor selected to perform the OM&M at this facility will prepare the required plan.

6 CONTACT LIST

To facilitate access to information and key individuals, a list of key contacts is presented below.

Name: **Ken Smith**
Title: Building Maintenance Supervisor
Company: Carlson Park Associates
Phone: (585) 281-3337
Fax: (585) 428-0387
Email: ***ken_smith@frontiernet.net***

Name: **Nick Mouganis**
Title: SSD Installation Contractor
Company: Mitigation Tech
Phone: (585) 637-7430
Fax: (585) 637-7430
Email: ***nmouganis@mitigationtech.com***

Name: **Gregory B. MacLean, P.E.**
Title: Environmental Engineer II
Company: NYS Dept. of Environmental Conservation
Phone: (585) 226-5356
Fax: (585) 226-8696
Email: ***gbmaclea@gw.dec.state.ny.us***

Name: **Jeffrey M. Kosmala, P.E.**
Title: Senior Public Health Engineer
Company: Monroe County Dept. of Health
Phone: (585) 753-5470
Fax: (585) 753-5498
Email: ***jkosmala@monroecounty.gov***

Name: **Deborah A. McNaughton**
Company: NYS Dept. of Health
Phone: (585) 423-8069
Fax: (585) 423-8022
Email: ***dam20@health.state.ny.us***

Name: **Kendrick Jaglal, P.E.**
Company: O'Brien & Gere Engineers, Inc.
Phone: (315) 956-6100
Fax: (315) 463-7554
Email: ***kendrick.jaglal@obg.com***

New York State Department of Health
Center for Environmental Health
Bureau of Environmental Exposure Investigation
Toll-free Information Line: 1-800-458-1158, ext. 27850

7 REFERENCES

ASTM. *Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings,* (ASTM E 2121-03, EPA 402-K-03-007). American Society for Testing and Materials. May 2006.

Carlson Park, LLC. *Interim Remedial Measure (IRM) Work Plan for the Installation of a Sub-slab Vapor Mitigation System – Carlson Park, Rochester, New York,* December 26, 2006.

NYSDEC. *DER-10/ Technical Guidance for Site Investigation and Remediation*. New York State Department of Environmental Conservation, May 3, 2010.

NYSDOH. *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York.* New York Department of Health, October 2006.

O'Brien & Gere Engineers, Inc. *Sub-slab Vapor Mitigation Construction Completion Report - Carlson Park Facility, Rochester, New York.* December 2013.

U. S. EPA. *Radon Prevention in the Design and Construction of Schools and Other Large Buildings*. (EPA/625/R-92/016). United States Environmental Protection Agency, June 1994.

TABLE 1
CARLSON PARK - Rochester, New York
Sub-slab Vapor Mitigation System Summary

Building	Extraction Point Location	Fan Location	Panel	Circuit	Panel Location
1	A53	A53	MR	39	D52
	C53	C53	1-1-2	9	C55
	B/C50				
	E53	E53	1-1-3	31	E52
	G53	G53	Stockroom #1	18	F54
	D55	D55	1-1-2	9	C55
2	A-B45 U&L	A-B45 U&L	02	41	E45
	C45	C45			
	E45	E45		24	
	G43	G43	RP2-4	2	G45
3	A37	A37	RP6	41	B39
	C36	C36	RP2-3-1	20	C36
	D39				
	F37	F37	RP7-1-3	2	G37
	G38	G38		12	
4	FF29	FF29	RP1-2-4	24	GG25
	NN29	NN29	RP6-2-4	11	NN26
	TT29	TT29	RP9-2-4	19	TT27
	XX29				
5	R32	P34	RP5-2	24	M34
	R40				
	R36				
	N32	O36		30	
	N36				
	N39				
	L34	K34		32	
	K36				
	K40				
	J32				
	J38	G38	RP-7-1-3	12	G37
6	B2	A3	P-1	4	A3
	B3				
	F3				
7	A58	A58	South #2	23A	A58 East wall
	B63	B63	#1 West	20	B63
	B57	B57	#2 West	16	C55
	C59	C59	N.E. Col. 3	41	C59
	E60	E60	Row 3 Col. B East	20	E62
	G60	G61	Café Pnl. #2	29	G60
8	P5	N5	A-4	6	N4 2nd Floor
	N3				
	K8	K9	Equip. Rm Pnl #1	7	Elev. Equip. Rm
	G5	G5	RP5-2-8	26	H5 2nd Floor
	J2				
	D6	A1	RP10-2-4	42	Bldg. 4-2 WW28
	B4				
	A8				
9	C67	C67	PP1I Sect.2	34	D67
	F66	F66	PP1L Sect. 2	28	G67
10A	F6	F7	LQ	8	10B Penthouse
10B	X14	X14	RP1-2-10B	7	E16
10C	U23	X23	LL	8	Z24
10C	W21				

TABLE 2
CARLSON PARK - Rochester, New York
Quarterly Manometer Readings Form

Bldg	Location		Manometer Reading in water column inch (Year _____)				
	Extraction Points	Fan	Initial	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1	A53	A53	3.6				
	C53, B/C50	C53	3.6				
	E53	E53	2.8				
	G53	G53	1.4				
	D55	D55	0.5				
2	A-B45 U&L	A-B45 U&L	2				
	C45	C45	2.5				
	E45	E45	3.6				
	G43	G43	1.3				
3	A37	A37	3.1				
	C36, D39	C36	3.1				
	F37	F37	3.4				
	G38	G38	3.5				
4	FF29	FF29	3.6				
	NN29	NN29	3.2				
	TT29, XX29	TT29	1.8				
5	R32, R40, R36	P34	3.2				
	N32, N36, N39	O36	2.3				
	L34, K36, K40, J32	K34	2.4				
	J38	G38	3.5				
6	B2, B3, F3	A3	1.7				
7	A58	A58	3.5				
	B63	B63	3.5				
	B57	B57	2.9				
	C59	C59	3.2				
	E60	E60	3.5				
	G60	G61	3.8				
8	P5, N3	N5	3.9				
	K8	K9	3.5				
	G5, J2	G5	3.7				
	D6, B4, A8	A1	2.3				
9	C67	C67	3.3				
	F66	F66	3.5				
10A	F6	F7	2.1				
10B	X14	X14	3.7				
10C	U23,W21	X23	3.4				
Date							
Inspector's Initials							

TABLE 3
CARLSON PARK - Rochester, New York
Record of SSD System Checks

Bldg	Location		System Inspected (checked)			
	Extraction Points	Fan	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1	A53	A53				
	C53, B/C50	C53				
	E53	E53				
	G53	G53				
	D55	D55				
2	A-B45, U&L	A-B45, U&L				
	C45	C45				
	E45	E45				
	G43	G43				
3	A37	A37				
	C36, D39	C36				
	F37	F37				
	G38	G38				
4	FF29	FF29				
	NN29	NN29				
	TT29, XX29	TT29				
5	R32, R40, R36	P34				
	N32, N36, N39	O36				
	L34, K36, K40, J32	K34				
	J38	G38				
6	B2, B3, F3	A3				
7	A58	A58				
	B63	B63				
	B57	B57				
	C59	C59				
	E60	E60				
	G60	G61				
8	P5, N3	N5				
	K8	K9				
	G5, J2	G5				
	D6, B4, A8	A1				
9	C67	C67				
	F66	F66				
10A	F6	F7				
10B	X14	X14				
10C	U23	X23				
Date						
Inspector Initials						

TABLE 3 Cont'd
Carlson Park – Rochester, New York
Record of SSD System Checks

Date_____ Inspector _____

Observe the following items and confirm observations on page 1. Record any issues identified with specific items and the resolution employed.

- Check the ventilation fans in Buildings 4, 6 and 10 to confirm that all components are operating properly and note any changes.
- Record any changes in site conditions, buildings structure, building usage or slab conditions, etc.
- For each in-line vent fan verify that air intakes have not been located within 10 feet of the discharge. Record date and location of any fan replacement.
- Observe all visible components of the SSD system for proper operation, to confirm that modifications have not been made and that components have not degraded. These include visible vent pipe sections, exterior piping, vent discharges, roof penetrations, fan mounting seals and all joints throughout all the vent piping.
- Check to see that the pipes and the circuit breakers controlling the circuits on which the soil vapor vent fans operate are labeled "Soil Vapor System."

Observations

Issue Identified, by Whom and Date	Issue Resolution, by Whom and date

S_2 C_2 inc.

Building Slab Layout

Carlson Park
Rochester, New York

Figure 1

DRAWN BY	SCALE	DATE	DWG. NO.
JCR	1:1,500	8/17/06	IRM-01

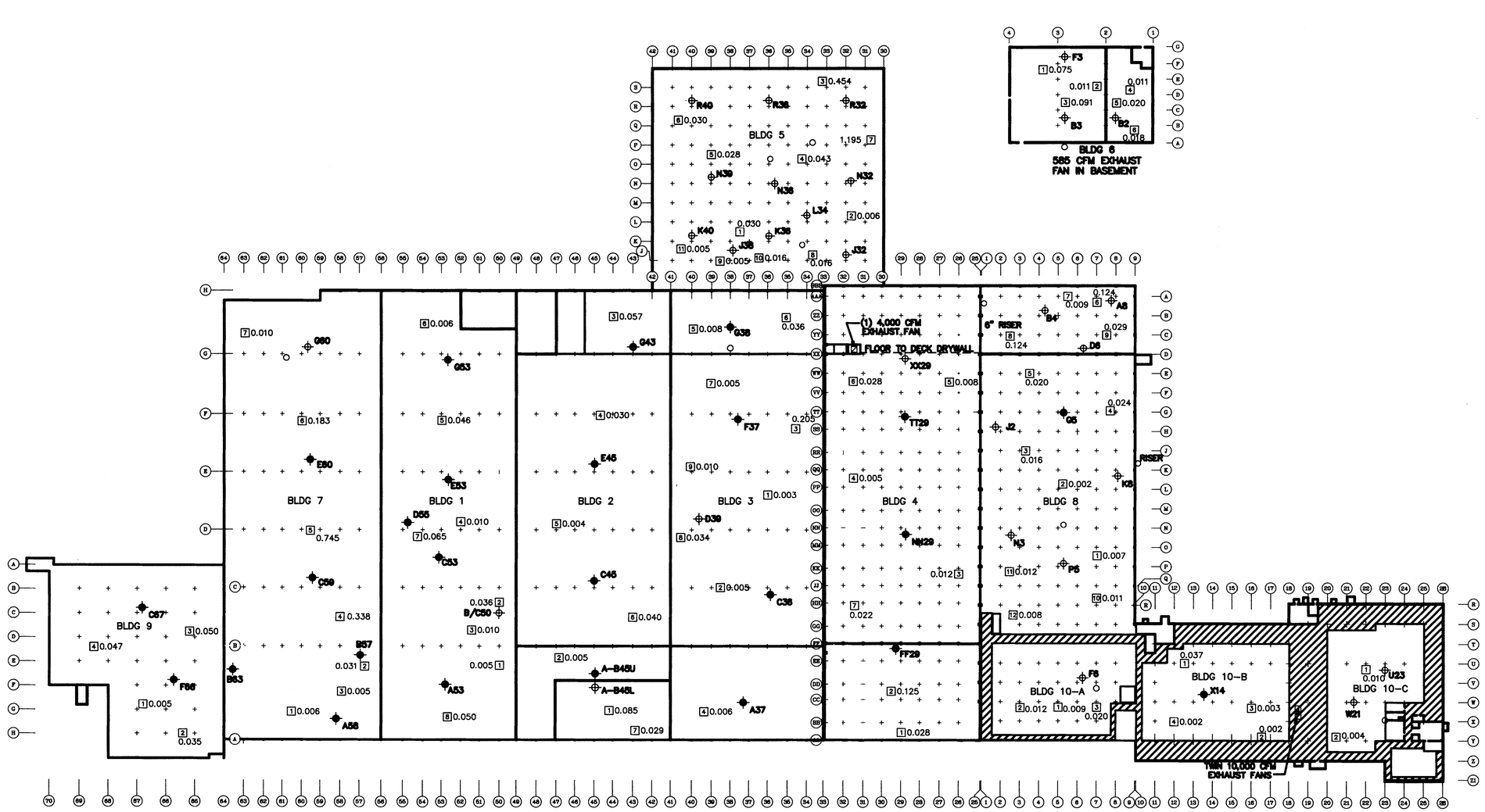
FIGURE 2

CARLSON PARK
100 CARLSON ROAD
ROCHESTER, NEW YORK

SITE LOCATION

20207.50098-001
DECEMBER 2013

O'BRIEN & GERE



LEGEND:

- [1] TEST POINT
- ⊕ EXTRACTION POINT
- ○ FAN LOCATION
- ◆ EXTRACTION POINT AND FAN LOCATION
- 0.024 NEGATIVE VACUUM PRESSURE IN WATER COLUMN INCH
- A37 SUB–SLAB DEPRESSURIZATION SYSTEM LOCATION CODE
- CFM CUBIC FEET PER MINUTE
- UTILITY TUNNEL

NOTE:

BASE MAP OBTAINED FROM TIMOTHY J. FORWARD, ARCHITECT, IN 2009

NOTE:

FLOOR PLAN AND TEST POINT LOCATIONS OBTAINED FROM DRAWING: 09005CLP SET 01 V01_FIG3_053112.DWG, DATED 05/31/2012 CREATED BY AECOM.

RECORD DRAWINGS

To the best of our knowledge, information and belief, based on information provided by others, these record drawings substantially represent the project as constructed.

O'BRIEN & GERE ENGINEERS, INC.

By: _____

STATE OF NEW YORK · DOUGLAS M CRAWFORD · 065643 · LICENSED PROFESSIONAL ENGINEER

IN CHARGE OF DWC

DESIGNED BY NM CHECKED BY KJ

DRAWN BY SED

1/64"=1'–0" 64 32 0 64 128

NO.	DATE	REVISION	INIT.
0	03/28/2013	RECORD DRAWING	

O'BRIEN & GERE

CARLSON PARK
100 CARLSON ROAD
ROCHESTER, NEW YORK

GENERAL
SUB–SLAB DE–PRESSURIZATION SYSTEM AND TEST POINT LOCATIONS

FILE NO. 20207.50098–002

DATE DECEMBER 2013

FIG–3

Radonaway GP Series Fan Installation Instructions

RadonAway™
The World's Leading Radon Fan Manufacturer

GP Series

Radon Mitigation Fans

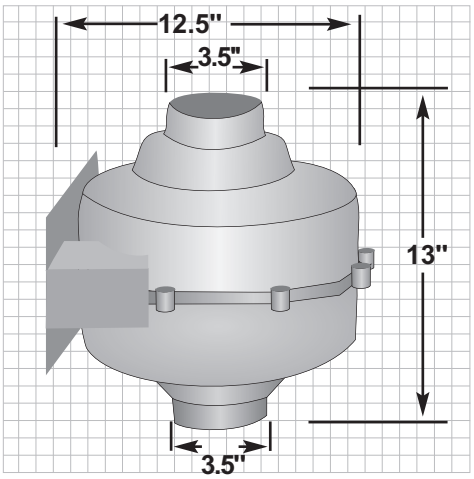
All RadonAway fans are specifically designed for radon mitigation. GP Series Fans provide a wide range of performance that makes them ideal for most sub-slab radon mitigation systems.

Features:

- Five-year hassle-free warranty
- Mounts on duct pipe or with integral flange
- 3.5" diameter ducts for use with 3" or 4" pipe
- Electrical box for hard wire or plug in
- ETL Listed - for indoor or outdoor use
- Meets all electrical code requirements
- Thermally protected
- Rated for commercial and residential use.

Model	Watts	Max. Pressure "WC	Typical CFM vs. Static Pressure WC						
			1.0"	1.5"	2.0"	2.5"	3.0"	3.5"	4.0"
GP201	40-60	2.0	82	58	5	-	-	-	-
GP301	55-90	2.6	92	77	45	10	-	-	-
GP401	60-110	3.4	93	82	60	40	15	-	-
GP501	70-140	4.2	95	87	80	70	57	30	10

Choice of model is dependent on building characteristics including sub-slab materials and should be made by a radon professional.



For Further Information Contact:

10/08
P/N 02002

RadonAway Ward Hill, MA IN014 Rev F

XP/GP/XR Series Fan Installation Instructions

Please Read And Save These Instructions.

DO NOT CONNECT POWER SUPPLY UNTIL FAN IS COMPLETELY INSTALLED. MAKE SURE ELECTRICAL SERVICE TO FAN IS LOCKED IN "OFF" POSITION. DISCONNECT POWER BEFORE SERVICING FAN.

1. **WARNING!** Do not use fan in hazardous environments where fan electrical system could provide ignition to combustible of flammable materials.

2. **WARNING!** Do not use fan to pump explosive or corrosive gases.

3. **WARNING!** Check voltage at the fan to insure it corresponds with nameplate.

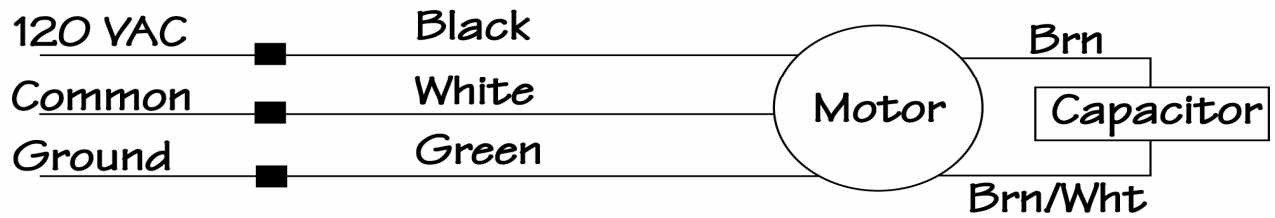
4. **WARNING!** Normal operation of this device may affect the combustion airflow needed for safe operation of fuel burning equipment. Check for possible backdraft conditions on all combustion devices after installation.

5. **NOTICE!** There are no user serviceable parts located inside the fan unit. **Do NOT attempt to open.** Return unit to the factory for service.

6. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician.

7. **WARNING!** Do not leave fan unit installed on system piping without electrical power for more than 48 hours. Fan failure could result from this non-operational storage.

DynaVac GP/XP/XR/RP Series Fan Wiring Diagram



DynaVac - XP/XR Series		DynaVac - GP Series	
XP101	p/n 23008-1,-2	GP201	p/n 23007-1
XP151	p/n 23010-1,-2	GP301	p/n 23006-1,-2
XP201	p/n 23011-1,-2	GP401	p/n 23009-1
XR161	p/n 23018-1,-2	GP501	p/n 23005-1,-2
XR261	p/n 23019-1,-2		

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The DynaVac GP/XP/XR Series Radon Fans are intended for use by trained, professional Radon mitigators. The purpose of this instruction is to provide additional guidance for the most effective use of a DynaVac Fan. This instruction should be considered as a supplement to EPA standard practices, state and local building codes and state regulations. In the event of a conflict, those codes, practices and regulations take precedence over this instruction.

1.2 ENVIRONMENTALS

The GP/XP/XR Series Fans are designed to perform year-round in all but the harshest climates without additional concern for temperature or weather. For installations in an area of severe cold weather, please contact RadonAway for assistance. When not in operation, the fan should be stored in an area where the temperature is never less than 32 degrees F. or more than 100 degrees F.

1.3 ACOUSTICS

The GP/XP/XR Series Fan, when installed properly, operates with little or no noticeable noise to the building occupants. The velocity of the outgoing air should be considered in the overall system design. In some cases the "rushing" sound of the outlet air may be disturbing. In these instances, the use of a RadonAway Exhaust Muffler is recommended.

1.4 GROUND WATER

In the event that a temporary high water table results in water at or above slab level, water may be drawn into the riser pipes thus blocking air flow to the GP/XP/XR Series Fan. The lack of cooling air may result in the fan cycling on and off as the internal temperature rises above the thermal cutoff and falls upon shutoff. Should this condition arise, it is recommended that the fan be turned off until the water recedes allowing for return to normal operation.

1.5 SLAB COVERAGE

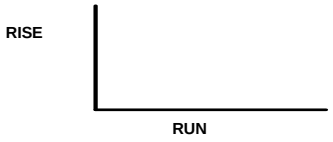
The GP/XP/XR Series Fan can provide coverage up to 2000+ sq. ft. per slab penetration. This will primarily depend on the sub-slab material in any particular installation. In general, the tighter the material, the smaller the area covered per penetration. Appropriate selection of the GP/XP/XR Series Fan best suited for the sub-slab material can improve the slab coverage. The GP & XP series have a wide range of models to choose from to cover a wide range of subslab material. The higher static suction fans are generally used for tighter subslab materials. The XR Series is specifically designed for high flow applications such as stone/gravel and drain tile. Additional suction points can be added as required. It is recommended that a small pit (5 to 10 gallons in size) be created below the slab at each suction hole.

1.6 CONDENSATION & DRAINAGE

Condensation is formed in the piping of a mitigation system when the air in the piping is chilled below its dew point. This can occur at points where the system piping goes through unheated space such as an attic, garage or outside. The system design must provide a means for water to drain back to a slab hole to remove the condensation. The GP/XP/XR Series Fan **MUST** be mounted vertically plumb and level, with the outlet pointing up for proper drainage through the fan. Avoid mounting the fan in any orientation that will allow water to accumulate inside the fan housing. The GP/XP/XR Series Fans are **NOT** suitable for underground burial.

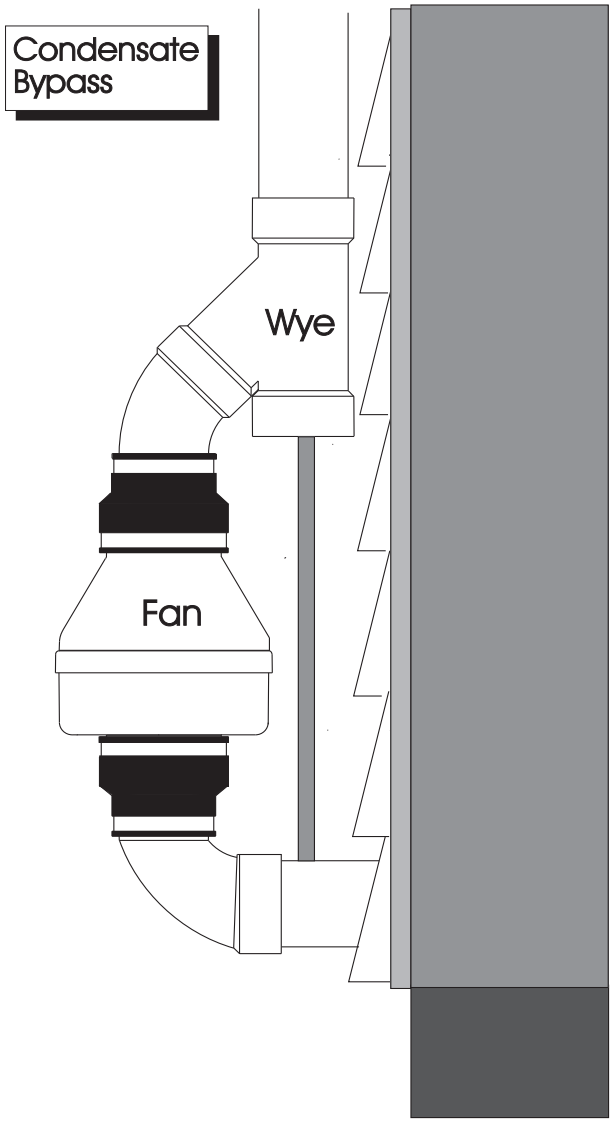
For GP/XP/XR Series Fan piping, the following table provides the minimum recommended pipe diameter and pitch under several system conditions.

Pipe Dia.	Minimum Rise per Foot of Run* @25 CFM	@50 CFM	@100 CFM
4″	1/8″	1/4″	3/8″
3"	1/4"	3/8"	1 1/2"



*Typical GP/XP/XR Series Fan operational flow rate is 25 - 90 CFM. (For more precision, determine flow rate by using the chart in the addendum.)

Under some circumstances in an outdoor installation a condensate bypass should be installed in the outlet ducting as shown. This may be particularly true in cold climate installations which require long lengths of outlet ducting or where the outlet ducting is likely to produce large amounts of condensation because of high soil moisture or outlet duct material. Schedule 20 piping and other thin-walled plastic ducting and Aluminum downspout will normally produce much more condensation than Schedule 40 piping.



The bypass is constructed with a 45 degree Wye fitting at the bottom of the outlet stack. The bottom of the Wye is capped and fitted with a tube that connects to the inlet piping or other drain. The condensation produced in the outlet stack is collected in the Wye fitting and drained through the bypass tube. The bypass tubing may be insulated to prevent freezing.

1.7 "SYSTEM ON" INDICATOR

A properly designed system should incorporate a "System On" Indicator for affirmation of system operation. A manometer, such as a U-Tube, or a vacuum alarm is recommended for this purpose.

1.8 ELECTRICAL WIRING

The GP/XP/XR Series Fans operate on standard 120V 60 Hz. AC. All wiring must be performed in accordance with the National Fire Protection

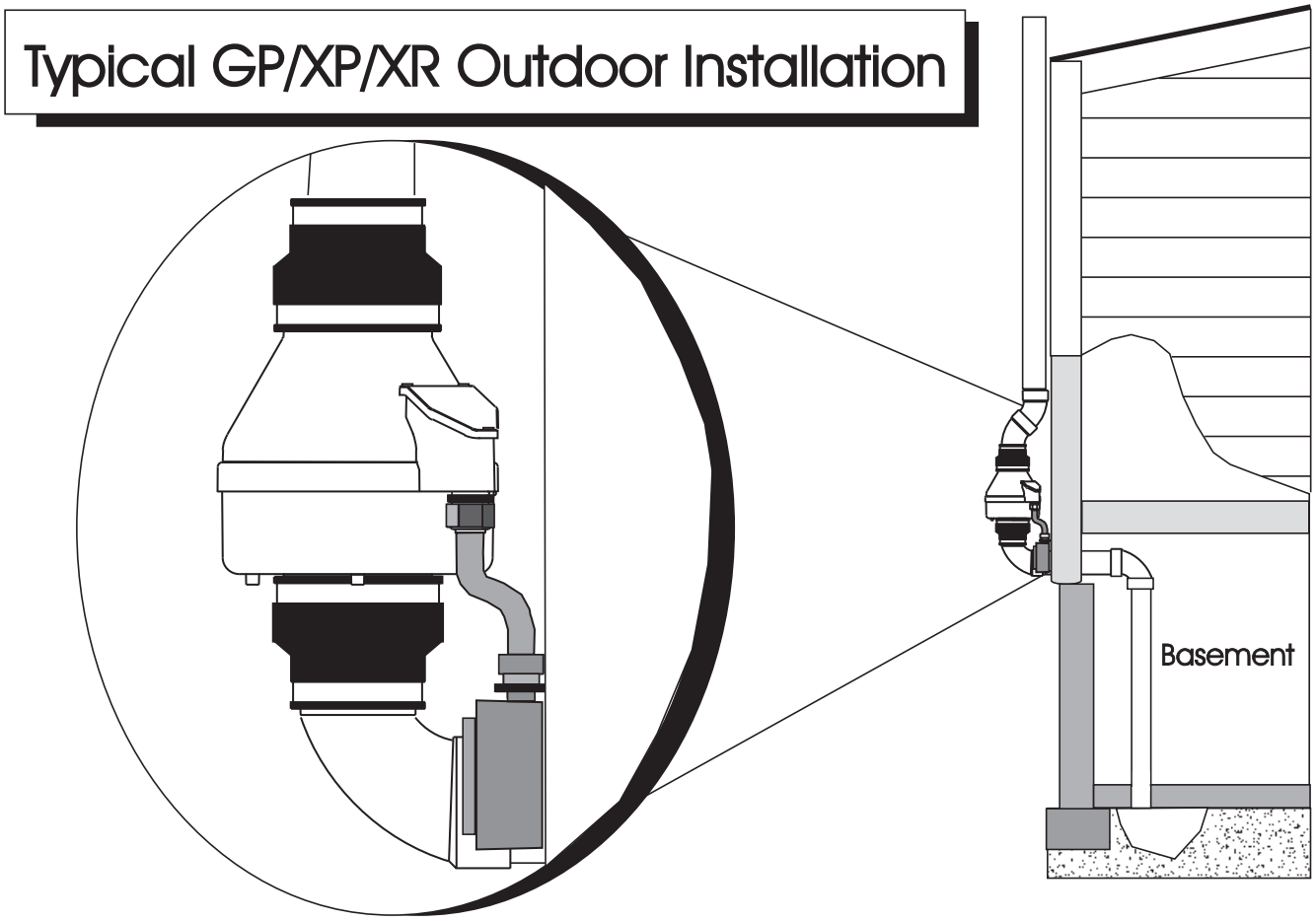
Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a U.L. listed watertight conduit.

1.9 SPEED CONTROLS

The GP/XP/XR Series Fans are rated for use with electronic speed controls ,however, they are generally not recommended.

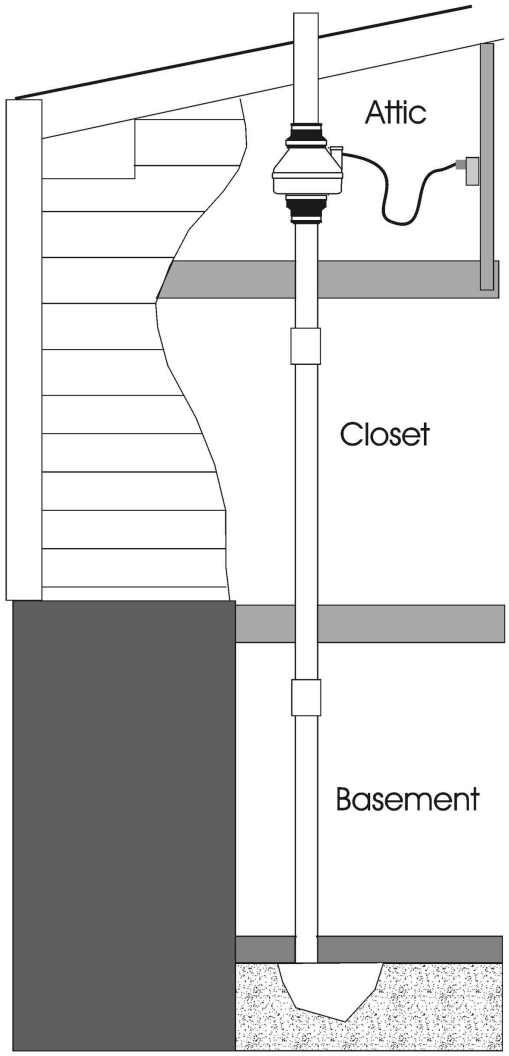
2.0 INSTALLATION

The GP/XP/XR Series Fan can be mounted indoors or outdoors. (It is suggested that EPA recommendations be followed in choosing the fan location.) The GP/XP/XR Series Fan may be mounted directly on the system piping or fastened to a supporting structure by means of optional mounting bracket.



2.1 MOUNTING

Mount the GP/XP/XR Series Fan vertically with outlet up. Insure the unit is plumb and level. When mounting directly on the system piping assure that the fan does not contact any building surface to avoid vibration noise.



2.2 MOUNTING BRACKET (optional)

The GP/XP/XR Series fan may be optionally secured with the integral mounting bracket on the GP Series fan or with RadonAway P/N 25007-2 mounting bracket for an XP/XR Series fan. Foam or rubber grommets may also be used between the bracket and mounting surface for vibration isolation.

2.3 SYSTEM PIPING

Complete piping run, using flexible couplings as means of disconnect for servicing the unit and vibration isolation.

2.4 ELECTRICAL CONNECTION

Connect wiring with wire nuts provided, observing proper connections:

Fan Wire	Connection
Green	Ground
Black	AC Hot
White	AC Common

2.5 VENT MUFFLER (optional)

Install the muffler assembly in the selected location in the outlet ducting. Solvent weld all connections. The muffler is normally installed at the end of the vent pipe.

2.6 OPERATION CHECKS

_____ **Verify** all connections are tight and **leak-free**.

_____ **Insure** the GP/XP/XR Series Fan and all ducting is secure and vibration-free.

_____ **Verify** system vacuum pressure with manometer. **Insure** vacuum pressure is **less than** maximum recommended operating pressure

(Based on sea-level operation, at higher altitudes reduce by about 4% per 1000 Feet.)
(Further reduce Maximum Operating Pressure by 10% for High Temperature environments)
See Product Specifications. If this is exceeded, increase the number of suction points.

_____ **Verify Radon levels by testing to EPA protocol.**

XP/XR SERIES PRODUCT SPECIFICATIONS

The following chart shows fan performance for the XP & XR Series Fan:

Typical CFM Vs Static Suction "WC									
	0"	.25"	.5"	.75"	1.0"	1.25"	1.5"	1.75"	2.0"
XP101	125	118	90	56	5	-	-	-	-
XP151	180	162	140	117	78	46	10	-	-
XP201	150	130	110	93	74	57	38	20	-
XR161	215	175	145	105	75	45	15	-	-
XR261	250	215	185	150	115	80	50	20	-

Maximum Recommended Operating Pressure*		
XP101	0.9" W.C.	(Sea Level Operation)**
XP151	1.3" W.C.	(Sea Level Operation)**
XP201	1.7" W.C.	(Sea Level Operation)**
XR161	1.3" W.C.	(Sea Level Operation)**
XR261	1.6" W.C.	(Sea Level Operation)**

**Reduce by 10% for High Temperature Operation*
***Reduce by 4% per 1000 feet of altitude*

Power Consumption @ 120 VAC	
XP101	40 - 49 watts
XP151	45 - 60 watts
XP201	45 - 66 watts
XR161	48 - 75 watts
XR261	65 - 105 watts

XP Series Inlet/Outlet: 4.5" OD (4.0" PVC Sched 40 size compatible)

XR Series Inlet/Outlet: 5.875" OD

Mounting: Mount on the duct pipe or with optional mounting bracket.

Recommended ducting: 3" or 4" Schedule 20/40 PVC Pipe

Storage temperature range: 32 - 100 degrees F.

Normal operating temperature range: -20 - 120 degrees F.

Maximum inlet air temperature: 80 degrees F.

Size: 9.5H" x 8.5" Dia. **Weight**: 6 lbs. (XR261 - 7 lbs)

Continuous Duty **Thermally protected**

Class B Insulation **3000 RPM**

Residential Use Only **Rated for Indoor or Outdoor use**

LISTED Electric Fan ETL® Tested to UL Std. 507

77728

GP SERIES PRODUCT SPECIFICATIONS

The following chart shows fan performance for the GPx01 Series Fan:

Typical CFM Vs Static Suction "WC	1.0"	1.5"	2.0"	2.5"	3.0"	3.5"	4.0"
GP501	95	87	80	70	57	30	5
GP401	93	82	60	38	12	-	-
GP301	92	77	45	10	-	-	-
GP201	82	58	5	-	-	-	-

Maximum Recommended Operating Pressure*		
GP501	3.8" W.C.	(Sea Level Operation)**
GP401	3.0" W.C.	(Sea Level Operation)**
GP301	2.4" W.C.	(Sea Level Operation)**
GP201	1.8" W.C.	(Sea Level Operation)**

**Reduce by 10% for High Temperature Operation*

***Reduce by 4% per 1000 feet of altitude*

Power Consumption @ 120 VAC	
GP501	70 - 140 watts
GP401	60 - 110 watts
GP301	55 - 90 watts
GP201	40 - 60 watts

Inlet/Outlet: 3.5" OD (3.0" PVC Sched 40 size compatible)

Mounting: Fan may be mounted on the duct pipe or with integral flanges.

Weight: 12 lbs.

Size: 13H" x 12.5" x 12.5"

Recommended ducting: 3″ or 4" Schedule 20/40 PVC Pipe

Storage temperature range: 32 - 100 degrees F.

Normal operating temperature range: -20 - 120 degrees F.

Maximum inlet air temperature: 80 degrees F.

Continuous Duty

Class B Insulation

3000 RPM

Thermally protected

Rated for Indoor or Outdoor Use

GP301C / GP501C Rated for Commercial Use

LISTED Electric Fan ETL® Tested to UL Std. 507

77728

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the GPx01/XP/XR Series Fan for shipping damage within 15 days of receipt. Notify RadonAway of any damages immediately. Radonaway is not responsible for damages incurred during shipping. However, for your benefit, Radonaway does insure shipments.

There are no user serviceable parts inside the fan. **Do not attempt to open.** Return unit to factory for service.

Install the GPx01/XP/XR Series Fan in accordance with all EPA standard practices, and state and local building codes and state regulations.

WARRANTY

Subject to any applicable consumer protection legislation, RadonAway warrants that the GPX01/XP/XR/RP Series Fan (the "Fan") will be free from defects in materials and workmanship for a period of 90 days from the date of purchase (the "Warranty Term").

RadonAway will replace any Fan which fails due to defects in materials or workmanship. The Fan must be returned (at Owner's cost) to the RadonAway factory. Any Fan returned to the factory will be discarded unless the Owner provides specific instructions along with the Fan when it is returned regardless of whether or not the Fan is actually replaced under this warranty. Proof of purchase must be supplied upon request for service under this Warranty.

This Warranty is contingent on installation of the Fan in accordance with the instructions provided. This Warranty does not apply where any repairs or alterations have been made or attempted by others, or if the unit has been abused or misused. Warranty does not cover damage in shipment unless the damage is due to the negligence of RadonAway.

5 YEAR EXTENDED WARRANTY WITH PROFESSIONAL INSTALLATION.

RadonAway will extend the Warranty Term of the fan to 5 years from date of manufacture if the Fan is installed in a professionally designed and professionally installed radon system or installed as a replacement fan in a professionally designed and professionally installed radon system. Proof of purchase and/or proof of professional installation may be required for service under this warranty. Outside the Continental United States and Canada the extended Warranty Term is limited to one (1) year from the date of manufacture.

RadonAway is not responsible for installation, removal or delivery costs associated with this Warranty.

EXCEPT AS STATED ABOVE, THE GPx01/XP/XR/RP SERIES FANS ARE PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL RADONAWAY BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR RELATING TO, THE FAN OR THE PERFORMANCE THEREOF. RADONAWAY'S AGGREGATE LIABILITY HEREUNDER SHALL NOT IN ANY EVENT EXCEED THE AMOUNT OF THE PURCHASE PRICE OF SAID PRODUCT. THE SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR OR REPLACEMENT OF THE PRODUCT, TO THE EXTENT THE SAME DOES NOT MEET WITH RADONAWAY'S WARRANTY AS PROVIDED ABOVE.

For service under this Warranty, contact RadonAway for a Return Material Authorization (RMA) number and shipping information. No returns can be accepted without an RMA. If factory return is required, the customer assumes all shipping cost to and from factory.

RadonAway
3 Saber Way
Ward Hill, MA 01835
TEL. (978) 521-3703
FAX (978) 521-3964

Record the following information for your records:

Serial No._____
Purchase Date_____

Radonaway RP Series Fan Installation Instructions

RadonAway™
The World's Leading Radon Fan Manufacturer

RP Series

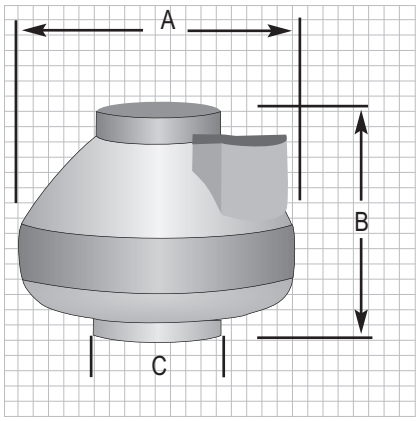
Radon Mitigation Fans

All RadonAway fans are specifically designed for radon mitigation. RP Series Fans provide superb performance, run ultra-quiet and are attractive. They are ideal for most sub-slab radon mitigation systems.

Features:

- Five-year hassle-free warranty
- Quiet and attractive
- Thermally protected
- Motorized impeller
- ETL Listed - for indoor or outdoor use
- Meets all electrical code requirements
- Rated for commercial and residential use

Model	Watts	Max. Pressure "WC	Typical CFM vs. Static Pressure WC					A"	B"	C"
			0"	.5"	1.0"	1.5"	2.0"			
RP140	14-20	0.8	134	68	-	-	-	9.7	7.9	4
RP145	37-71	2.1	173	132	94	55	11	9.7	7.9	4
RP260	52-72	1.8	275	180	105	20	-	11.8	9.9	6
RP265	86-140	2.5	327	260	207	139	57	11.8	9.9	6
RP380	103-156	2.3	510	393	268	165	35	13.41	10.53	8



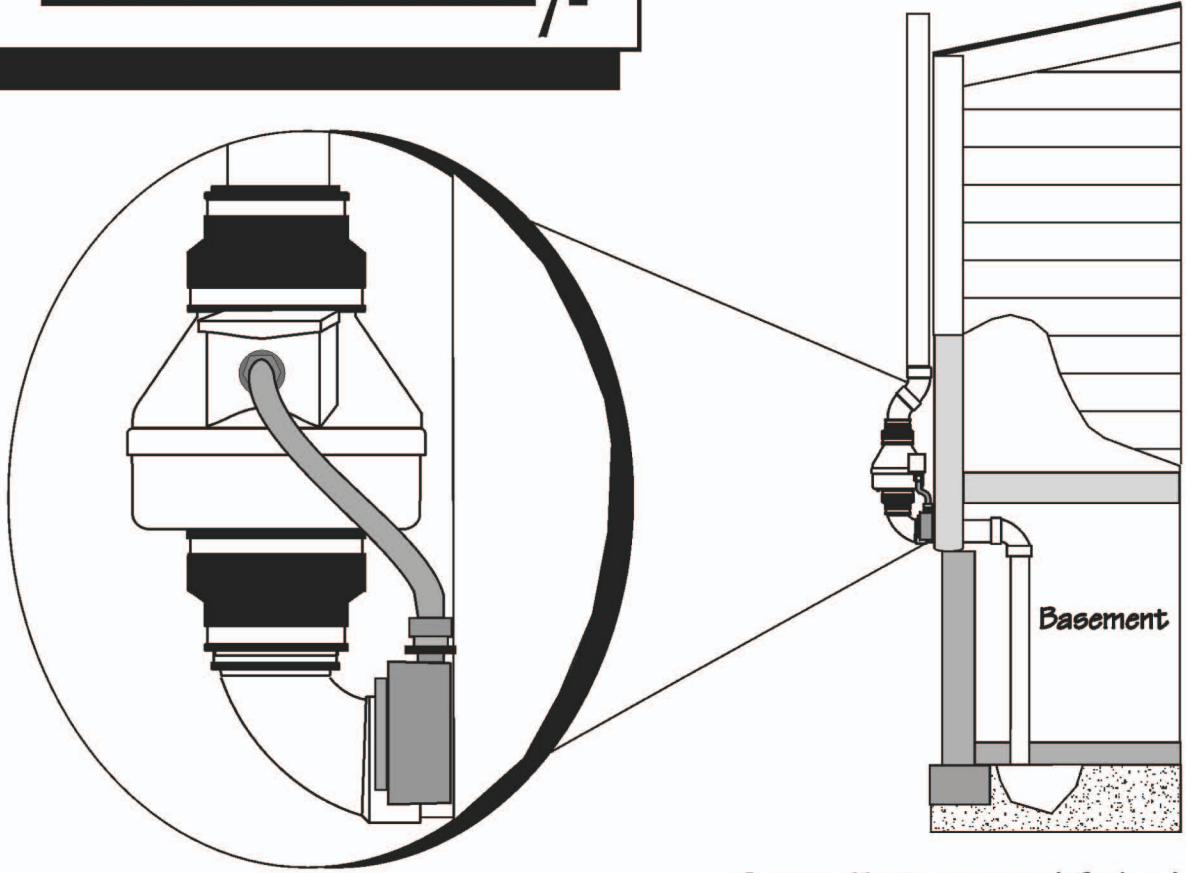
Choice of model is dependent on building characteristics including sub-slab materials and should be made by a radon professional.

For Further Information Contact:

4/09
P/N 02008

RP Series Installation Instructions

By RadonAway™



Spruce Environmental Technologies, Inc.
Ward Hill, MA P/N IN020 Rev J

RadonAway™

Series Fan Installation Instructions

Please Read and Save These Instructions.

DO NOT CONNECT POWER SUPPLY UNTIL FAN IS COMPLETELY INSTALLED.
MAKE SURE ELECTRICAL SERVICE TO FAN IS LOCKED IN "OFF" POSITION.
DISCONNECT POWER BEFORE SERVICING FAN.

1. **WARNING!** Do not use fan in hazardous environments where fan electrical system could provide ignition to combustible or flammable materials.

2. **WARNING!** Do not use fan to pump explosive or corrosive gases.

3. **WARNING!** Check voltage at the fan to insure it corresponds with nameplate.

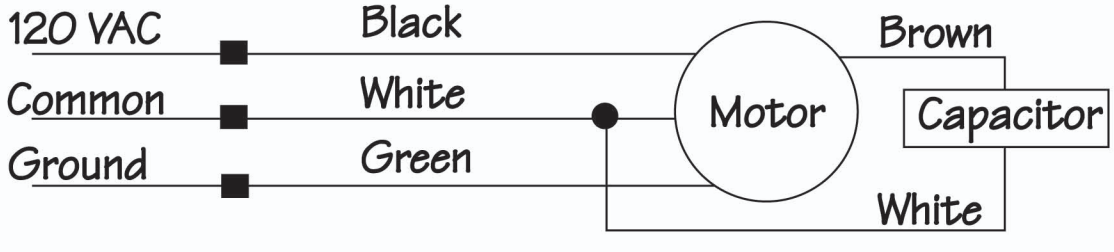
4. **WARNING!** Normal operation of this device may affect the combustion airflow needed for safe operation of fuel burning equipment. Check for possible backdraft conditions on all combustion devices after installation.

5. **NOTICE!** There are no user serviceable parts located inside the fan unit.
Do NOT attempt to open. Return unit to the factory for service.

6. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician

7. **WARNING!** Do not leave fan unit installed on system piping without electrical power for more than 48 hours. Fan failure could result from this non-operational storage.

DynaVac RP Series Fan Wiring Diagram



INSTALLATION INSTRUCTIONS IN020 Rev I

DynaVac - RP Series
RP140 p/n 23029-1
RP145 p/n 23030-1
RP260 p/n 23032-1
RP265 p/n 23033-1
RP380 p/n 28208

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The DynaVac RP Series Radon Fans are intended for use by trained, professional Radon mitigators. The purpose of this instruction is to provide additional guidance for the most effective use of a DynaVac Fan. This instruction should be considered as a supplement to EPA standard practices, state and local building codes and state regulations. In the event of a conflict, those codes, practices and regulations take precedence over this instruction.

1.2 ENVIRONMENTALS

The RP Series Fans are designed to perform year-round in all but the harshest climates without additional concern for temperature or weather. For installations in an area of severe cold weather, please contact RadonAway for assistance. When not in operation, the fan should be stored in an area where the temperature is never less than 32 degrees F. or more than 100 degrees F.

1.3 ACOUSTICS

The RP Series Fan, when installed properly, operates with little or no noticeable noise to the building occupants. The velocity of the outgoing air should be considered in the overall system design. In some cases the "rushing" sound of the outlet air may be disturbing. In these instances, the use of a RadonAway Exhaust Muffler is recommended.

1.4 GROUND WATER

In the event that a temporary high water table results in water at or above slab level, water may be drawn into the riser pipes thus blocking air flow to the RP Series Fan. The lack of cooling air may result in the fan cycling on and off as the internal temperature rises above the thermal cutoff and falls upon shutoff. Should this condition arise, it is recommended that the fan be turned off until the water recedes allowing for return to normal operation.

1.5 SLAB COVERAGE

The RP Series Fan can provide coverage up to 2000+ sq. ft. per slab penetration. This will primarily depend on the sub-slab material in any particular installation. In general, the tighter the material, the smaller the area covered per penetration. Appropriate selection of the RP Series Fan best suited for the sub-slab material can improve the slab coverage. The RP140/145/155 are best suited for general purpose use. The RP260 can be used where additional airflow is required and the RP265/380 is best suited for large slab, high airflow applications. Additional suction points can be added as required. It is recommended that a small pit (5 to 10 gallons in size) be created below the slab at each suction hole.

1.6 CONDENSATION & DRAINAGE

Condensation is formed in the piping of a mitigation system when the air in the piping is chilled below its dew point. This can occur at points where the system piping goes through unheated space such as an attic, garage or outside. The system design must provide a means for water to drain back to a slab hole to remove the condensation. The RP Series Fan **MUST** be mounted vertically plumb and level, with the outlet pointing up for proper drainage through the fan. Avoid mounting the fan in any orientation that will allow water to accumulate inside the fan housing. The RP Series Fans are **NOT** suitable for underground burial.

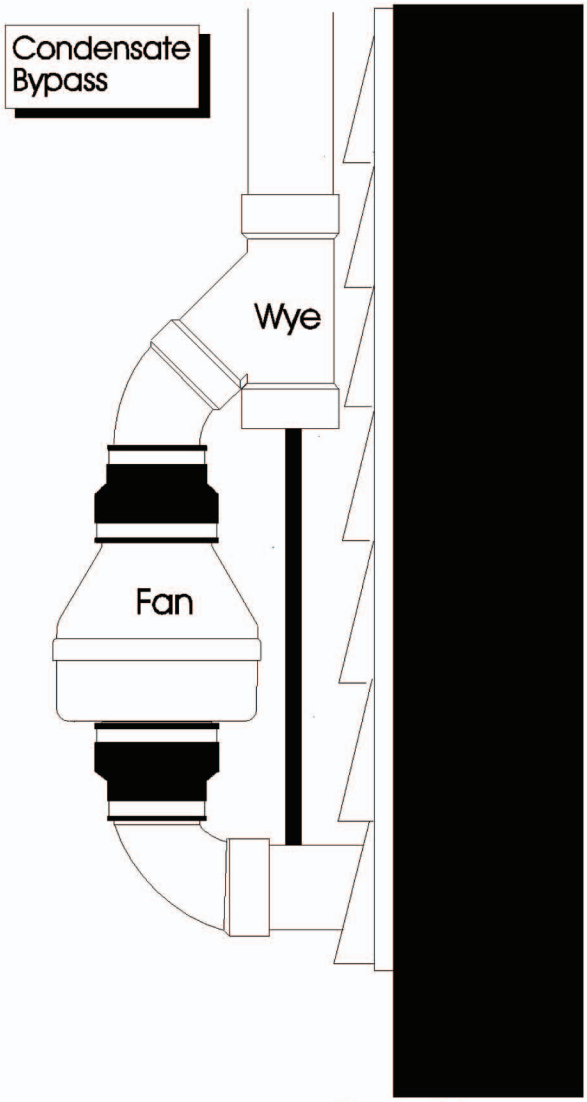
For RP Series Fan piping, the following table provides the minimum recommended pipe diameter and pitch under several system conditions.

Pipe Dia.	Minimum Rise per Ft of Run*				
	@25 CFM	@50 CFM	@100 CFM	@200 CFM	@300 CFM
6"	-	3/16	1/4	3/8	3/4
4"	1/8	1/4	3/8	2 3/8	-
3"	1/4	3/8	1 1/2	-	-

*Typical RP1xx/2xx Series Fan operational flow rate is 25 - 90 CFM 0n 3" and 4" pipe. (For more precision, determine flow rate by measuring Static Pressure, in WC, and correlate pressure to flow in the performance chart in the addendum.)

Under some circumstances in an outdoor installation a condensate bypass should be installed in the outlet ducting as shown. This may be particularly true in cold climate installations which require long lengths of outlet ducting or where the outlet ducting is likely to produce large amounts of condensation because of high soil moisture or outlet duct material. Schedule 20 piping and other thin-walled plastic ducting and Aluminum downspout will normally produce much more condensation than Schedule 40 piping.

The bypass is constructed with a 45 degree Wye fitting at the bottom of the outlet stack. The bottom of the Wye is capped and fitted with a tube that connects to the inlet piping or other drain. The condensation produced in the outlet stack is collected in the Wye fitting and drained through the bypass tube. The bypass tubing may be insulated to prevent freezing.



1.7 "SYSTEM ON" INDICATOR

A properly designed system should incorporate a "System On" Indicator for affirmation of system operation. A manometer, such as a U-Tube, or a vacuum alarm is recommended for this purpose.

1.8 ELECTRICAL WIRING

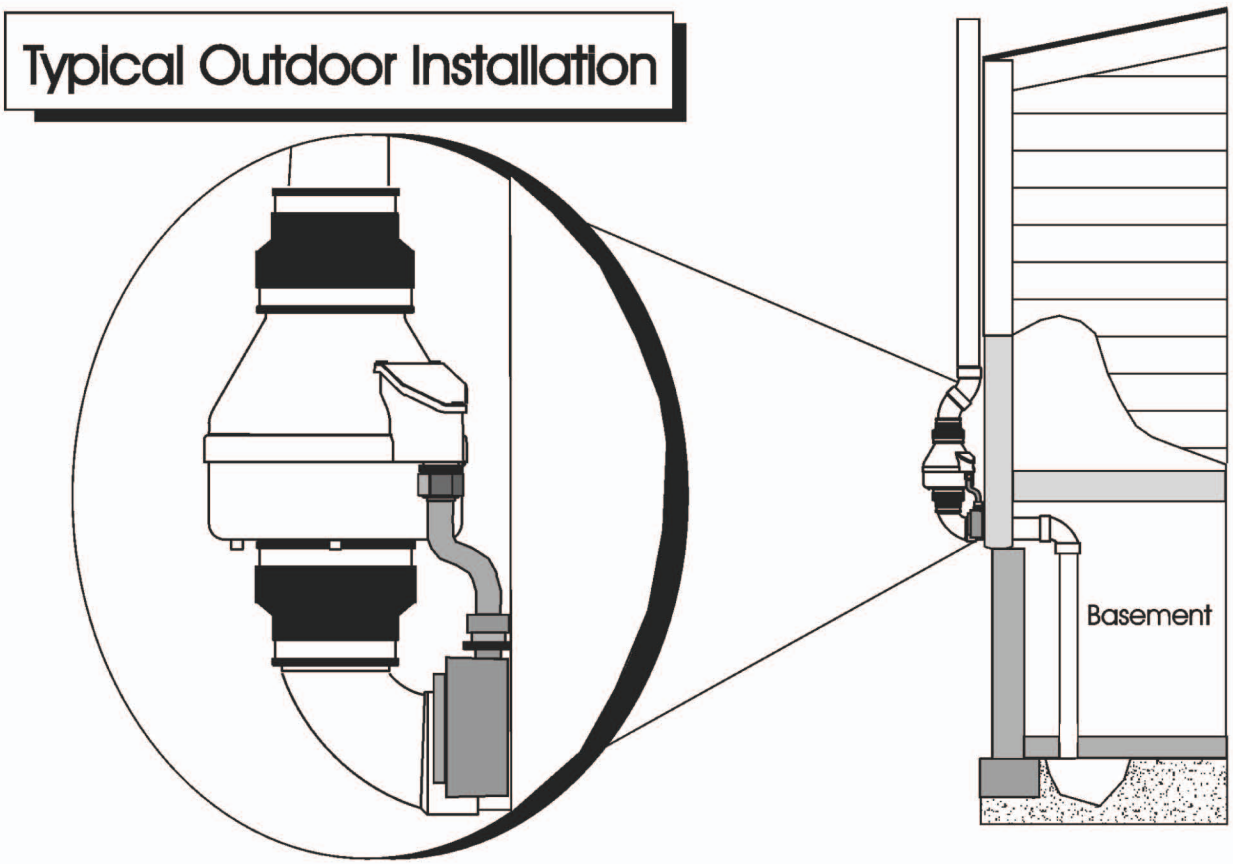
The RP Series Fans operate on standard 120V 60 Hz. AC. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a U.L. listed watertight conduit. Ensure that all exterior electrical boxes are outdoor rated and properly sealed to prevent water penetration into the box. A means, such as a weep hole, is recommended to drain the box.

1.9 SPEED CONTROLS

The RP Series Fans are rated for use with electronic speed controls ,however , they are generally not recommended.

2.0 INSTALLATION

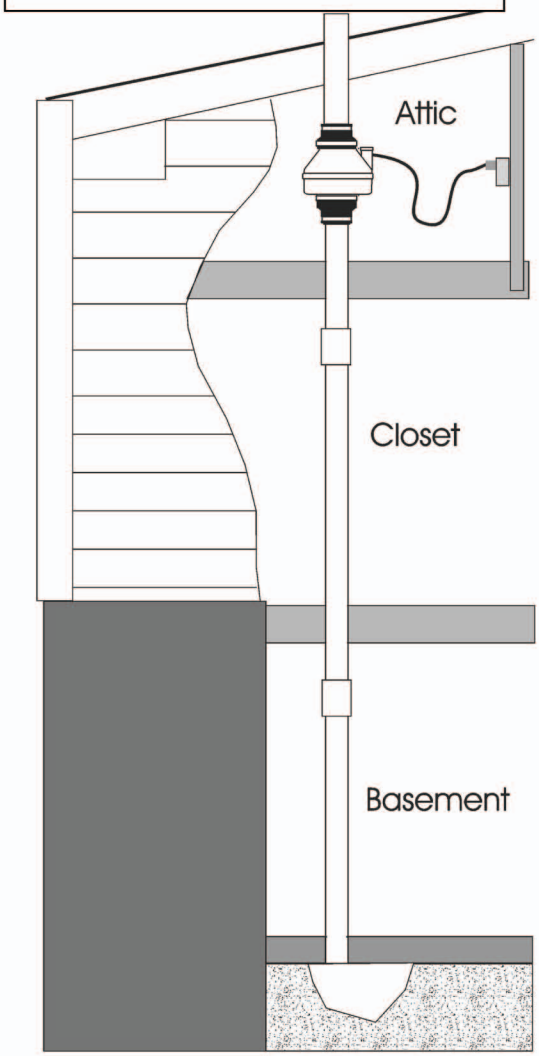
The RP Series Fan can be mounted indoors or outdoors. (It is suggested that EPA recommendations be followed in choosing the fan location.) The RP Series Fan may be mounted directly on the system piping or fastened to a supporting structure by means of optional mounting bracket.



2.1 MOUNTING

Mount the RP Series Fan vertically with outlet up. Insure the unit is plumb and level. When mounting directly on the system piping assure that the fan does not contact any building surface to avoid vibration noise.

Typical Indoor Installation



2.2 MOUNTING BRACKET (optional)

The RP Series fan may be optionally secured with the RadonAway P/N 25007-2 (25033 for RP385) mounting bracket. Foam or rubber grommets may also be used between the bracket and mounting surface for vibration isolation.

2.3 SYSTEM PIPING

Complete piping run, using flexible couplings as means of disconnect for servicing the unit and vibration isolation.

2.4 ELECTRICAL CONNECTION

Connect wiring with wire nuts provided, observing proper connections(See Section 1.8):

Fan Wire	Connection
Green	Ground
Black	AC Hot
White	AC Common

2.5 VENT MUFFLER (optional)

Install the muffler assembly in the selected location in the outlet ducting. Solvent weld all connections. The muffler is normally installed at the end of the vent pipe.

2.6 OPERATION CHECKS

_____ **Verify** all connections are tight and **leak-free**.

_____ **Insure** the RP Series Fan and all ducting is secure and vibration-free.

_____ **Verify** system vacuum pressure with manometer. **Insure** vacuum pressure is **less than** maximum recommended operating pressure

(Based on sea-level operation, at higher altitudes reduce by about 4% per 1000 Feet.)

(Further reduce Maximum Operating Pressure by 10% for High Temperature environments)

See Product Specifications. If this is exceeded, increase the number of suction points.

_____ **Verify Radon levels by testing to EPA protocol.**

RP SERIES PRODUCT SPECIFICATIONS

The following chart shows fan performance for the RP Series Fan:

Typical CFM Vs Static Pressure "WC									
	0"	.25"	.5"	.75"	1.0"	1.25"	1.5"	1.75"	2.0"
RP140	135	103	70	14	-	-	-	-	-
RP145	166	146	126	104	82	61	41	21	3
RP260	272	220	176	138	103	57	13	-	-
RP265	334	291	247	210	176	142	116	87	52
RP380*	497	401	353	281	220	176	130	80	38

* Tested with 6″ inlet and discharge pipe.

Power Consumption 120 VAC, 60Hz 1.5 Amp Maximum			Maximum Recommended Operating Pressure* (Sea Level Operation)**	
RP140	17 - 21	watts	RP140	0.8" W.C.
RP145	41 - 72	watts	RP145	1.7" W.C.
RP260	52 - 72	watts	RP260	1.5" W.C.
RP265	91 - 129	watts	RP265	2.2" W.C.
RP380	95 - 152	watts	RP380	2.0" W.C.

**Reduce by 10% for High Temperature Operation*
***Reduce by 4% per 1000 feet of altitude*

	Size	Weight	Inlet/Outlet
RP140	8.5H" x 9.7" Dia.	5.5 lbs.	4.5" OD (4.0" PVC Sched 40 size compatible)
RP145	8.5H" x 9.7" Dia.	5.5 lbs.	4.5" OD (4.0" PVC Sched 40 size compatible)
RP155	8.5H" x 9.7" Dia.	5.5 lbs.	5.0" OD
RP260	8.6H" x 11.75" Dia.	5.5 lbs.	6.0″ OD
RP265	8.6H" x 11.75" Dia.	6.5 lbs.	6.0″ OD
RP380	10.53H" x 13.41" Dia.	11.5 lbs.	8.0″ OD

Recommended ducting: 3" or 4" RP1xx/2xx, 6″ RP380, Schedule 20/40 PVC Pipe

Mounting: Mount on the duct pipe or with optional mounting bracket.

Storage temperature range: 32 - 100 degrees F.

Normal operating temperature range: -20 - 120 degrees F.

Maximum inlet air temperature: 80 degrees F.

Continuous Duty

Class B Insulation

Thermally protected

3000 RPM

Rated for Indoor or Outdoor Use

LISTED Electric Fan ETL® 77728 Tested to UL Std. 507 ® 2100 HVI CERTIFIED

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the GP/XP/XR/RP Series Fan for shipping damage within 15 days of receipt. Notify **RadonAway of any damages immediately**. Radonaway is not responsible for damages incurred during shipping. However, for your benefit, Radonaway does insure shipments.

There are no user serviceable parts inside the fan. **Do not attempt to open.** Return unit to factory for service.

Install the GP/XP/XR/RP Series Fan in accordance with all EPA standard practices, and state and local building codes and state regulations.

WARRANTY

Subject to any applicable consumer protection legislation, RadonAway warrants that the GPX01/XP/XR/RP Series Fan (the "Fan") will be free from defects in materials and workmanship for a period of 90 days from the date of purchase (the "Warranty Term").

RadonAway will replace any Fan which fails due to defects in materials or workmanship. The Fan must be returned (at Owner's cost) to the RadonAway factory. Any Fan returned to the factory will be discarded unless the Owner provides specific instructions along with the Fan when it is returned regardless of whether or not the Fan is actually replaced under this warranty. Proof of purchase must be supplied upon request for service under this Warranty.

This Warranty is contingent on installation of the Fan in accordance with the instructions provided. This Warranty does not apply where any repairs or alterations have been made or attempted by others, or if the unit has been abused or misused. Warranty does not cover damage in shipment unless the damage is due to the negligence of RadonAway.

5 YEAR EXTENDED WARRANTY WITH PROFESSIONAL INSTALLATION.

RadonAway will extend the Warranty Term of the fan to 5 years from date of manufacture if the Fan is installed in a professionally designed and professionally installed radon system or installed as a replacement fan in a professionally designed and professionally installed radon system. Proof of purchase and/or proof of professional installation may be required for service under this warranty. Outside the Continental United States and Canada the extended Warranty Term is limited to one (1) year from the date of manufacture.

RadonAway is not responsible for installation, removal or delivery costs associated with this Warranty.

EXCEPT AS STATED ABOVE, THE GPx01/XP/XR/RP SERIES FANS ARE PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL RADONAWAY BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR RELATING TO, THE FAN OR THE PERFORMANCE THEREOF. RADONAWAY'S AGGREGATE LIABILITY HEREUNDER SHALL NOT IN ANY EVENT EXCEED THE AMOUNT OF THE PURCHASE PRICE OF SAID PRODUCT. THE SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR OR REPLACEMENT OF THE PRODUCT, TO THE EXTENT THE SAME DOES NOT MEET WITH RADONAWAY'S WARRANTY AS PROVIDED ABOVE.

For service under this Warranty, contact RadonAway for a Return Material Authorization (RMA) number and shipping information. No returns can be accepted without an RMA. If factory return is required, the customer assumes all shipping cost to and from factory.

RadonAway
3 Saber Way
Ward Hill, MA 01835
TEL. (978) 521-3703
FAX (978) 521-3964

Record the following information for your records:

Serial No._____
Purchase Date_____

Exhaust Fan Specifications

Packaged Wall Fan Aluminum Propeller Direct Drive

Description - Fan shall be a wall mounted, direct driven, aluminum propeller exhaust fan with integral housing, shutter, and inlet guard.

Certifications - Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705).

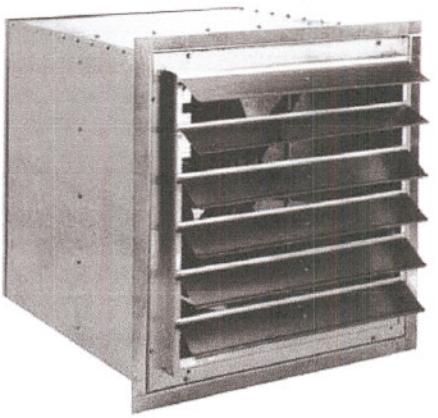
Construction - Fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The motor shall be mounted on a 12 gauge steel wire guard. The wire guard shall be bolted to a minimum 14 gauge wall panel with continuously welded corners and an integral venturi. Fan shall be enclosed in minimum 18 gauge galvanized steel wall housing with factory installed shutter and inlet guard. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM and static pressure. Unit shall be shipped in ISTA Certified Transit Tested Packaging.

Coating - All steel fan components shall be Lorenized™ with an electrostatically applied, baked polyester powder coating. Each component shall be subject to a five stage environmentally friendly wash system, followed by a 1.5 to 2.5 mil thick baked powder finish. Paint must exceed 1,000 hour salt spray under ASTM B117 test method.

Propeller - Propeller shall have aluminum blades riveted to a painted steel hub. The hub shall be securely fastened to the motor shaft utilizing two setscrews. Propeller shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

Motor - Motor shall be 115/1/60, open drip-proof type.

Product - Fan shall be type SPD as manufactured by Loren Cook Company of Springfield, Missouri.



Model SPD and SPD-S are furnished standard with UL 705 listing (Power Ventilator/ZACT) when furnished with factory supplied motor.

Model SPD and SPD-S are furnished standard with cUL listing (Power Ventilator) when furnished with factory supplied motor.

SPD Dimension Data

SIZE	A	B*	C	D*	WALL OPENING	WALL HOUSING GAUGE	SHIPPING WEIGHT
8	15-1/2	13	10	13-3/4	13-1/4	18 GA.	53
10	19-1/2	17	14	17-3/4	17-1/4	18 GA.	65
12	19-1/2	17	14	17-3/4	17-1/4	18 GA.	76
14	23-1/2	21	18	22-1/4	21-1/4	18 GA.	82
16	23-1/2	21	18	22-1/4	21-1/4	18 GA.	95
18	27-1/2	25	22	23-1/4	25-1/4	18 GA.	113
20	27-1/2	25	22	23-1/4	25-1/4	18 GA.	132
24	33-1/2	31	27-1/2	23-1/4	31-1/4	18 GA.	142

All dimensions in inches. Weight in pounds. * B and D dimensions are to the outside of fasteners on wall housing.
**Shipped loose for field mounting.

Cook

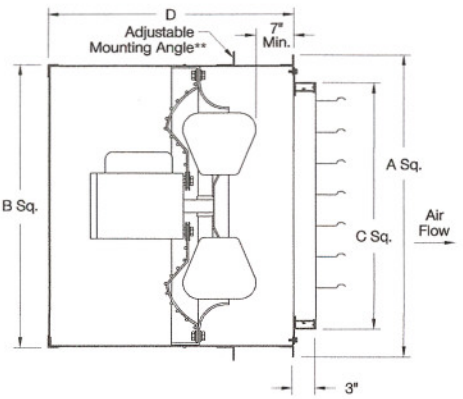
16SP10D

HP .167

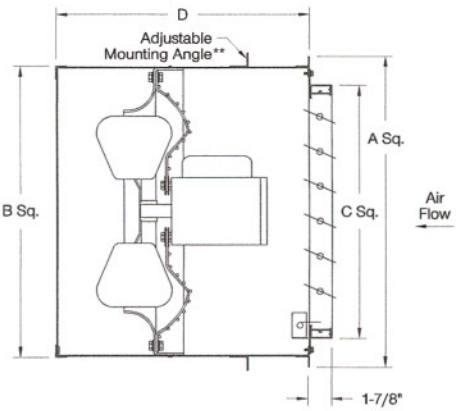
CFM 2,000

RPM 1050

EXHAUST - SPD



SUPPLY - SPD-S



SPD 8-24 Data

SPD - Direct Drive

Fan Size	Catalog Number	Mtr. HP	Max. BHP	RPM	FA Sones	CFM vs. Static Pressure				
						0.000	0.125	0.250	0.375	0.500
8	8SP15D	1/80	0.01	1250	1.7	168				
				1350	2.2	181				
				1450	2.7	195	83			
				1550	3.2	208	97			
				1690	3.8	227	116			
10	10SP15D	1/25	0.10	1050	3.1	591	200			
				1150	3.8	648	263			
				1250	4.6	704	323			
				1350	5.4	760	487			
				1450	6.2	817	604			
				1550	7.1	873	676	320		
12	12SP15D	1/8	0.19	1050	4.9	1006	566			
				1150	5.9	1102	773			
				1250	6.9	1198	903	461		
				1350	8.0	1293	1016	578		
				1450	9.1	1389	1127	725		
				1550	10.4	1485	1245	958	587	
				1615	11.1	1547	1328	1075	662	
14	14SP10D	1/6	0.15	650	2.4	1091				
				750	3.4	1259	607			
				850	4.5	1426	845			
				950	5.7	1594	1143			
				1050	6.9	1762	1382	836		
				1130	7.9	1896	1568	1012		
16	16SP10D	1/6	0.25	650	3.5	1490				
				750	4.8	1720	999			
				850	6.2	1949	1379			
				950	7.8	2178	1689	1007		
				1050	9.1	2408	1976	1362		
				1115	10.1	2557	2156			
18	18SP10D	1/3	0.51	650	4.6	2261	1213			
				750	6.2	2608	1607	706		
				850	7.8	2956	2290	1198		
				950	10.1	3304	2735	1848	1001	
				1050	12.0	3173	2234	1540		
				1095	12.8	3808	3370	2404	1942	1148
20	20SP10D	1/3	0.50	650	5.8	2917	1839			
				750	7.6	3366	2524	1224		
				850	9.8	3815	3129	2006	1059	
				950	12.9	4264	3675	2822	1734	
				1050	15.2	4713	4184	3501		
				1075	15.8	4825	4309	3660		
24	24SP10D	1/2	0.68	650	7.2	4091	3206	1878		
				750	9.2	4721	3986	2941	1928	
				850	11.4	5350	4720	3905	3026	2081
				950	14.0	5979	5429	4785	3868	2975
				1050	16.8	6609	6119	5557		

Performance shown is for Installation Type A: free inlet, free outlet. Performance ratings include the effects of shutter, housing and wire guard in the airstream. The sound ratings shown are loudness values in fan sones at 5 ft. (1.5 m) in a hemispherical free field calculated per AMCA Standard 301. Values shown are for Installation Type A: free inlet fan sone levels. Model SPD is not licensed to bear the AMCA Seal.

Building 6 – Exhaust Fan Specifications

Exhaust Fan, Direct Drive, Shutter Mounted, Speed Controllable, Propeller Dia 10 In, CFM @ 0.000-In SP 585, @ 0.125-In SP 285, Sones @ 0.000-In. SP @ 5 Ft. 6.6, Voltage 115, 60 Hz, Single Phase, Full Load Amps 1.4, HP 1/30, Max Ambient Temp 104 F, Motor Type Shaded Pole, Bearing Type Sleeve, Height 13 1/8 In, Width 13 1/8 In, Max Depth 10 11/16 In, Sq Opening Required 10 1/2 In, Propeller Material Stamped Aluminum, Guard Material Steel, Includes Automatic Shutter

Brand	DAYTON
Mfr. Model #	1HLA1

Item	Exhaust Fan
Type	Direct Drive, Shutter Mounted, Speed Controllable
Propeller Dia. (In.)	10
CFM @ 0.000-In. SP	585
CFM @ 0.125-In. SP	285
Sones @ 0.000-In. SP @ 5 Ft.	6.6
Motor RPM	1550
Voltage	115
Hz	60
Phase	1
Full Load Amps	1.5
HP	1/25
Max. Ambient Temp. (F)	104
Motor Type	Shaded Pole
Motor Enclosure	Totally Enclosed Air-Over
Motor Insulation	Class A
Bearing Type	Sleeve
Height (In.)	13-1/8
Width (In.)	13-1/8
Max. Depth (In.)	10-11/16
Sq. Opening Required (In.)	10-1/2
Frame Material	Cold Rolled Steel
Frame Finish	White Polyester
Propeller Material	Stamped Aluminum
Guard Material	Steel
Wire Guard Finish	Gray Polyester
Speed Control	1DGV1
Number of Blades	5
Thermal Protection	Auto
Agency Compliance	UL Listed for US and Canada
Includes	Automatic Shutter

Upblast Centrifugal Exhaust Ventilator Roof Mounted Belt Drive

Description - Fan shall be a spun aluminum, roof mounted, belt driven, upblast centrifugal exhaust ventilator.

Certifications - Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA Certified Ratings Seal for Sound and Air Performance.

Construction - Fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have a one piece inlet spinning and continuously welded curb cap corners for maximum leak protection. The windband shall have a rolled bead for added strength. A two piece top cap shall have stainless steel quick release latches to provide access into the motor compartment without the use of tools. An integral conduit chase shall be provided into the motor compartment to facilitate wiring connections. The motor, bearings and drives shall be mounted on a minimum 14 gauge steel power assembly, isolated from the unit structure with rubber vibration isolators. These components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. Lifting lugs shall be provided to help prevent damage from improper lifting. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure and maximum fan RPM. Unit shall be shipped in ISTA Certified Transit Tested Packaging.

Wheel - Wheel shall be centrifugal backward inclined, constructed of 100 percent aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

Motor - Motor shall be heavy duty type with permanently lubricated sealed ball bearings and furnished at the specified voltage, phase and enclosure.

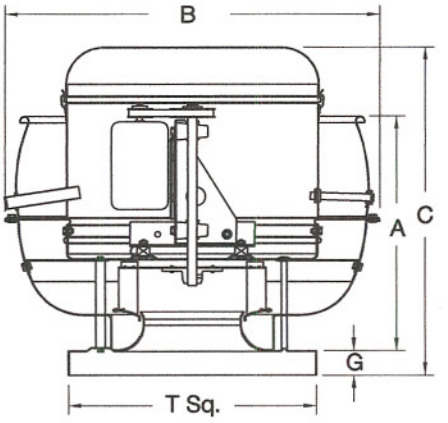
Bearings - Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty regreasable ball type in a cast iron pillowblock housing selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

Belts and Drives - Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150 percent of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.

Product - Fans shall be models ACRUB, ACRUB-HP or ACRUB-XP as manufactured by Loren Cook Company of Springfield, Missouri.

Loren Cook Company certifies that the ACRUB, ACRUB-HP and ACRUB-XP shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Type ACRUB, ACRUB-HP and ACRUB-XP are furnished standard with UL 705 and cUL 705 listings (Power Ventilator/ ZACT) when furnished with factory supplied motor.



ACRUB Dimension Data

Size	A	B	C			G	T Sq.	Roof Opening Square*	Ship. Wt.
			ACRUB	ACRUB-HP	ACRUB-XP				
100	12-1/2	25-1/4	20-3/16	-	-	2	18	13-1/2	30
120	19-1/16	30-3/16	28-1/4	-	-	2	20	15-1/2	61
135	19-1/16	30-3/16	28-5/8	-	-	2	20	15-1/2	66
150	20-15/16	34-11/16	30-1/4	27-1/2	-	2	24	19-1/2	77
165	20-15/16	34-11/16	30-3/4	27-3/4	26-11/16	2	24	19-1/2	83
180	24-13/16	39-7/16	35-7/8	33-3/8	31-9/16	3	30	25-1/2	100
195	24-13/16	39-7/16	36-3/8	33-1/2	32-1/8	3	30	25-1/2	110
210	25-15/16	45-1/4	38-3/8	35-3/8	32-3/4	3	30	25-1/2	220
225	25-15/16	45-1/4	38-1/8	35-1/2	33-5/16	3	30	25-1/2	242
245	28-1/2	49-1/4	41-1/16	37-5/16	34-1/16	3	30	25-1/2	264
270	28-1/2	49-1/4	41-1/16	37-5/16	35	3	36	31-1/2	286
300	33-7/8	54-1/4	49-15/16	45-15/16	41-7/16	3	36	31-1/2	336
330	34-1/8	54-1/4	50-7/16	46-11/16	43-1/8	3	42	37-1/2	374
365	36-3/8	64-1/4	52-7/16	48-7/16	44-1/4	3	42	37-1/2	420
402	37-7/8	64-1/4	54-11/16	-	-	3	48	43-1/2	484
445	31-5/8	76-1/4	57-3/16	-	-	3	54	49-1/2	556
490	33-3/8	76-1/4	58-1/16	-	-	3	54	49-1/2	715

All dimensions in inches. *Roof opening size for curbs supplied by Loren Cook Company only. Weights in pounds, less motor.

330 ACRUB / ACSC

Catalog Number	Mtr. HP/ Drv. Wt.	Fan RPM	Tip Speed	0.000" SP		0.125" SP		0.250" SP		0.375" SP		0.500" SP		0.625" SP		0.750" SP		0.875" SP		1.000" SP		1.250" SP		1.500" SP	
				Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP
330R5B	1/2	341	2946	7650		6920		6050		4379															
330SC5B	23 lbs.			7.0	.45	6.5	.49	5.7	.50	4.9	.44														
330R6B	3/4	393	3395	8817		8189		7512		6630		5013													
330SC6B	31 lbs.			9.2	.68	8.9	.73	8.0	.76	7.3	.76	6.6	.68												
330R7B	1	433	3740	9714		9147		8551		7866		6934													
330SC7B	36 lbs.			11.2	.91	10.9	.97	10.0	1.01	9.2	1.02	8.6	1.01												
330R8B	1-1/2	498	4302	11173		10681		10176		9639		9024		8243		7127									
330SC8B	38 lbs.			14.6	1.39	14.6	1.45	13.7	1.51	12.9	1.55	12.1	1.56	11.5	1.54	10.8	1.49								
330R9B	2	523	4518	11734		11265		10787		10286		9734		9066		8220		6813							
				16.0	1.61	16.0	1.68	15.2	1.74	14.3	1.78	13.6	1.80	12.9	1.79	12.2	1.77	11.7	1.62						
330SC9B	50 lbs.	548	4734	12294		11848		11394		10922		10416		9831		9115		8190							
				17.1	1.85	17.1	1.92	16.4	1.99	15.6	2.04	14.9	2.07	14.2	2.07	13.6	2.05	13.0	2.02						
330R10B	3	588	5079	13192		12776		12354		11921		11468		10974		10400		9711		8849					
				19.0	2.29	19.0	2.36	18.4	2.43	17.8	2.49	17.1	2.54	16.5	2.56	15.8	2.55	15.2	2.53	14.6	2.50				
330SC10B	74 lbs.	629	5434	14112		13723		13331		12930		12516		12079		11598		11046		10395		8382			
				21	2.80	21	2.88	21	2.96	20	3.03	19.4	3.08	18.8	3.12	18.1	3.14	17.6	3.12	17.0	3.10	15.9	2.86		
330R11B	5	689	5952	15458		15103		14746		14384		14014		13632		13231		12798		12312		11122		9180	
				25	3.68	25	3.77	25	3.85	24	3.93	23	4.00	23	4.06	22	4.10	21	4.12	21	4.12	19.6	4.06	18.5	3.76
330SC11B	98 lbs.	748	6462	16781		16455		16127		15795		15459		15114		14761		14391		13997		13086		11937	
				28	4.71	28	4.80	28	4.90	28	4.99	27	5.07	26	5.14	26	5.20	25	5.25	25	5.27	24	5.25	22	5.19

330 ACRUB-HP / ACSC-HP

Catalog Number	Mtr. HP/ Drv. Wt.	Fan RPM	Tip Speed	0.250" SP		0.375" SP		0.500" SP		0.750" SP		1.000" SP		1.250" SP		1.500" SP		1.750" SP		2.000" SP		2.250" SP		2.500" SP	
				Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP
330RH5B	1/2	416	3593	5392		4522																			
330SCH5B	23 lbs.			8.0	.49	7.2	.50																		
330RH6B	3/4	479	4138	6641		5951		5189																	
330SCH6B	31 lbs.			10.7	.72	9.9	.75	9.1	.77																
330RH7B	1	528	4561	7553		6985		6319		4552															
330SCH7B	36 lbs.			13.0	.95	12.2	.99	11.5	1.02	10.0	1.00														
330RH8B	1-1/2	567	4898	8259		7756		7173		5850															
				15.0	1.16	14.2	1.21	13.5	1.24	12.0	1.27														
330SCH8B	38 lbs.	606	5235	8953		8498		7990		6818		5091													
				17.1	1.40	16.3	1.45	15.6	1.50	14.3	1.55	12.7	1.51												
330RH9B	2	668	5771	10037		9640		9212		8210		7104													
330SCH9B	50 lbs.			19.9	1.85	19.5	1.91	18.8	1.96	17.5	2.05	16.1	2.08												
330RH10B	3	718	6203	10900		10537		10153		9286		8292		7157											
				22	2.27	22	2.34	21	2.40	20	2.51	18.9	2.57	17.5	2.57										
330SCH10B	74 lbs.	767	6626	11738		11402		11052		10285		9385		8439		7220									
				25	2.75	25	2.82	24	2.89	23	3.01	22	3.10	20	3.14	19.1	3.11								
330RH11B	5	839	7248	12958		12654		12343		11680		10930		10083		9215		8146							
				28	3.56	28	3.64	28	3.72	27	3.87	26	3.99	25	4.07	24	4.12	22	4.09						
330SCH11B	98 lbs.	912	7879	14186		13908		13626		13036		12395		11673		10888		10091		9164		7774			
				33	4.55	33	4.63	33	4.72	32	4.88	30	5.04	29	5.16	28	5.24	27	5.28	26	5.27	25	5.17		

330 ACRUB-XP / ACSC-XP

Catalog Number	Mtr. HP/ Drv. Wt.	Fan RPM	Tip Speed	1.000" SP		1.250" SP		1.500" SP		1.750" SP		2.000" SP		2.250" SP		2.500" SP		3.000" SP		3.500" SP		4.000" SP		4.500" SP	
				Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP
330RX7B	1	684	5909	3521		2913																			
330SCX7B	36 lbs.			13.3	1.01	12.8	1.03																		
330RX8B	1-1/2	735	6349	4058		3615		2932																	
				15.6	1.23	15.1	1.27	14.5	1.26																
330SCX8B	38 lbs.	786	6790	4558		4163		3739		3040															
				17.0	1.46	17.1	1.52	16.5	1.56	16.1	1.54														
330RX9B	2	826	7136	4922		4580		4187		3731		3045													
				18.0	1.65	18.4	1.74	18.0	1.79	17.6	1.81	17.4	1.76												
330SCX9B	50 lbs.	866	7481	5266		4976		4613		4236		3699		3092											
				19.3	1.86	19.4	1.96	19.5	2.03	19.1	2.07	18.9	2.08	18.7	2.02										
330RX10B	3	930	8034	5798		5560		5269		4925		4576		4124		3496									
				22	2.24	22	2.35	22	2.45	21	2.52	21	2.57	21	2.58	21	2.53								
330SCX10B	74 lbs.	994	8587	6317		6104		5870		5588		5263		4937		4557		3487							
				24	2.66	24	2.79	24	2.90	24	3.01	24	3.08	24	3.13	24	3.15	23	3.04						
330RX11B	5	1057	9131	6822		6623		6419		6190		5918		5611		5305		4463							
				26	3.13	26	3.26	26	3.39	27	3.52	27	3.62	27	3.70	26	3.75	26	3.78						
		1120	9676	7325		7132		6945		6748		6525		6265		5976		5389		4434					
330SCX11B	98 lbs.			29	3.65	29	3.79	29	3.94	29	4.07	29	4.20	29	4.31	29	4.40	29	4.49	28	4.46				
		1182	10211	7817		7629		7451		7272		7082		6865		6618		6069		5476		4502			
				32	4.22	31	4.37	31	4.52	32	4.67	32	4.82	32	4.95	32	5.07	32	5.23	31	5.30	31	5.21		

Performance certified is for Installation Type A: free inlet, free outlet. Power rating (BHP) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories) in the airstream. The sound ratings shown are loudness values in fan sones at 5 ft. (1.5m) in a hemispherical free field calculated per AMCA Standard 301. Values shown are for Installation Type A: free inlet fan sone levels. **Shaded area indicates reinforced wheel required.**