BOILER UPGRADES TO

GLENDALE SECONDARY SCHOOL

145 RAINBOW DRIVE, HAMILTON, ON

ARCHITECTURAL SPECIFICATIONS

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Boiler Upgrades to GLENDALE SECONDARY SCHOOL
145 Rainbow Drive, Hamilton, ON

HAMILTON-WENTWORTH DISTRICT SCHOOL BOARD *March 2025*

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1.1 Description of Work

.1 Work under this Contract in general covers, but is not limited to, Boiler upgrades and associated works to Glendale Secondary School for the Hamilton-Wentworth District School Board.

a) The project includes new boilers and pumps all in accordance with the Contract Documents.

1.2 Documents Required

.1 Maintain at job site, one copy each of following:

a) Contract drawings
b) Specifications
c) Addenda
d) Reviewed shop drawings
e) Change Orders and Contemplated Change Notices
f) Site/Field Instructions
g) Other modifications to contract
h) Field test reports
i) Copy of approved work schedule
j) Manufacturers' installation and application instructions.
k) List of Sub-contractors
l) As-built Drawings
m) Minutes of Site Meetings

1.3 Specifications

.1 Portions of Specifications are written in short form. Therefore, it shall be understood that where item of Work is stated in heading followed by material, equipment, component, or operation, words "shall be", "shall consist of" or similar words or phrases are implied which denote supply, fabricate and supply, install, provide or commission of such materials, equipment or operations for component of Work designated by heading.

.2 Whenever used in Specifications following definitions shall apply:

a) SUPPLY - Procurement or fabrication of standard components not to special design of materials, equipment, or components, or performance of services to extent indicated. Where used with respect to materials, equipment, or components, term shall include delivery to Site but is not intended to include installation of item, either temporary or final.

b) FABRICATE AND SUPPLY - Fabrication of materials, equipment or component, to special customized design to extent indicated including delivery to Site, assisting in form of supervision to those Section(s) installing materials, equipment or component. Term does not include installation of item either temporary or final.

c) INSTALL - Placement of materials, equipment, or components, including receiving, unloading, transporting, storage, uncrating and installing, and performance of such testing and finish work as is compatible with degree of installation specified complete ready for use.

d) PROVIDE - To Supply and Install, compete and in place, including accessories, finishes, tests and services as required to render item so specified complete ready for use.

e) COMMISSION - Startup and initial operation of equipment as required and/or as specified in respective Sections, to demonstrate satisfactory operation of components and entire system including calibration of any control instrumentation as required to maintain operations.

.3 Drawings, Lists or Schedules of Items are intended to show scope and arrangement of work. For location of item described refer to such Drawings, Lists or Schedules unless location stipulated in Specifications.

.4 Wherever words "acceptable", "approved", "reviewed", "satisfactory", "selected", "directed", "designated", "permitted", "inspected", "instructed", "clarification", "required", "report", "submit", "obtain", "consult", "advise", or similar words or phrases are used in Standards or in Contract Documents, it shall be understood that, unless context provides otherwise words "by/to/with/from the Architect shall follow them as applicable.

1.4 Work Schedule .1 No work shall commence on the project or portion of the project without assurance that the delivery of critical materials to complete the project is in place.
It is the expectation of the Hamilton Wentworth District School Board (HWDSB) that the Contractor will order the necessary materials upon award of the Contract.

.2 Provide within 10 working days after Contract award, schedule showing anticipated progress stages and final completion of work within time period stated on the Tender Form.

.3 In accordance with schedule and in form acceptable to the Architect provide within (14) working days after contract award, schedule showing dates for:

a) Submission of shop drawings, material lists, and samples.
b) Delivery of the following items of equipment and materials (as required for project)

.3 Interim reviews of work progress on work schedule will be conducted as described by Architect and schedule updated by Contractor in conjunction with and with approval of Architect.

1.5 Contractor's Use

.1 USE OF SITE: Limit to those areas of the site designated by the Owner. Operators and activities should allow for storage, parking, deliveries, exits, fire safety and construction.

.2 Do not unreasonably encumber site with materials or equipment.

.3 Obtain and pay for use of additional storage or work areas needed for operations.

1.6 Partial Occupancy of Use

.1 Contractor to coordinate the Work with the continuing use of the remainder site.

1.7 Standards

.1 Where reference is made to specification standards produced by various organizations, conform to edition of standards specified or, if not specified, to latest edition as amended and revised to date of Contract.
.2 If requested provide copy on Site of such standard(s).

.3 Where standard designated authorities such as "Engineer", Designer", "Purchaser" or some other such designation, these designations shall be taken to mean "Architect".

1.8 Building Code

.1 Comply with The Building Code Act, as amended; and the Building Code, as amended; and Regulations and by-laws of other authorities having jurisdiction including latest amendments thereto: all hereafter referred to as Code where Code or Contract Documents do not cover particular requirement which is covered by National Building Code, 2005 conform to requirements of NBC including its related supplements. Where Drawings and/or Specifications exceed Code requirements satisfy such additional requirements.

.2 Where material is designated in Contract Documents for certain application, unless otherwise specified, that material shall conform to standards designated in Code and in absence of more restrictive requirement comply with "Housing and Small Buildings Part 9" of Code. Similarly, unless otherwise specified, and not required otherwise by Code, installation methods and standards of workmanship shall also conform to standards of

Part 9. Where specific requirements for a material are not specified for certain use select from choice offered in Part 9.

1.9 Project Meetings

.1 Hold project meetings at times and locations requested by the Architect. Allow for bi-weekly meetings during construction.

.2 Notify all parties concerned of meetings.

.3 Record minutes of meetings, and distribute to all parties within 72 hours of meeting.

1.10 Setting Out of Work

.1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.

.2 Provide devices needed to lay out and construct work.

.3 Supply such devices as ladders, measuring tapes, straight edges and templates required to facilitate Architect's inspection of work.

.4 Supply stakes and other survey markers required for laying out work.

.5 Any deviation from line and level shall be corrected without additional cost, to the Architect's satisfaction.

1.11 Location of Equipment and Fixtures

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate. Do not scale drawing for locating of position. Obtain Architect's direction.

.2 Locate equipment, fixtures, and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access, and maintenance.

.3 Inform Architect of impending installation and obtain his approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Architect.

1.12 Concealment

.1 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.13 Cutting, Fitting, Patching

.1 Execute cutting including excavation, fitting, and patching required to make work fit properly together.

.2 Obtain Engineer's approval before cutting, boring or sleeving load-bearing members.

.3 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.

.4 Fit work airtight to pipes, sleeves, ducts, and conduits.

.5 Cutting and patching to be by tradesmen qualified in the respective sections of the work.

1.14 Existing Services

.1 Before commencing Work, establish location and extent of existing services in area of Work and notify Architect.

.2 Whenever it is necessary to cut, interfere with, or connect to existing services or facility do so at hours and times recommended by governing authorities and approved by Architect; and with minimum disturbance to occupants, pedestrian and vehicular traffic and public and private property.

.3 Submit schedule to and obtain approval from Architect for each proposed shut-down of active service or facility. Adhere to approved schedule and provide notice to affected parties.

.4 If unknown services are encountered, immediately notify Architect and confirm findings in writing and/or on Drawings. Obtain Architect's written direction if such services require cutting, capping or relocation to do Work.

.5 Remove abandoned service lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by Architect.

.6 Protect and record locations of maintained or rerouted service lines. Record locations of abandoned service lines.

1.15 Additional Drawings

.1 Architect may furnish additional drawings to assist proper execution of work. These drawings will be issued for clarification only. Such drawings shall have same meaning and intent as if they were included with plans referred to in Contract Documents.

1.16 Relics and Antiquities

.1 Relics and antiquities and items of historical or scientific interest such as cornerstones and contents commemorative plaques, inscribed tablets, and similar objects found on site or in buildings to be demolished, shall remain property of Owner. Protect such articles and request directives from Architect.

1.17 Coordination

.1 The Contractor will coordinate the work of all sub-contractors, including mechanical and electrical trades.

.2 Coordinate work of each Section as required for satisfactory and expeditious completion of Work. Take field dimensions. Take into account existing installations to assure best arrangements of components in available space. Consult before commencing Work in critical locations. Fabricate and erect Work to suit field dimensions and field conditions.

.3 Provide forms, templates, anchors, sleeves, inserts and accessories or other components required to be fixed to or inserted in Work. As applicable set them in place or instruct related Sections as to their location.

.4 Pay cost of extra work caused by, and make up time lost as result of failure to comply with these requirements at proper time.

.5 Cutting and patching as specified in sub-section above.

1.18 Modular Coordination

.1 Where work incorporates metric modular components following rules apply:

a) Actual opening dimensions in masonry including doors, windows, walls, louvres and actual room sizes are 10 mm (3/8") greater than nominal dimensions given on Drawings. Actual thicknesses of walls, piers and overall lengths of walls or buildings are 10 mm (3/8") less than nominal dimensions given on Drawings unless indicated otherwise.

b) Unless indicated otherwise Drawing details at scales of 1:10 and less indicate "actual" rather than "nominal" dimensions.

1.19 Examination

.1 Examine work upon which your work depends. Report in writing defects in such work. Application of your work shall be deemed acceptance of work upon which your work depends.

.2 Drawings are, in part, diagrammatic and are intended to convey scope of Work and indicate general and approximate location, arrangement and sizes of fixtures, equipment, ducts, piping, conduit and outlets and similar items. Obtain more accurate information about locations, arrangement and sizes from study and coordination of Drawings, including shop drawings and manufacturers' literature and become familiar with conditions and spaces affecting these matters before proceeding with Work.

.3 Where job conditions require reasonable changes in indicated locations and arrangements, make such changes with approval of Architect at no additional cost to Client. Similarly, where existing conditions interfere with new installation and require relocation, such relocation is included in Work.

.4 Install and arrange fixtures, equipment, ducts, piping and conduit to conserve as much headroom and space as possible, and avoid interference and obstruction of access. Observe good installation practice for safety, access, maintenance and follow manufacturer's recommendations. Make changes requested to comply with these requirements at no additional cost to Client.

.5 If requested by Architect, and before installation, relocate equipment, services, doors, openings, furring and other work at no additional cost to Client; providing such relocation involves only reasonable minor adjustments and reasonable advance notice is given in writing.

1.20 Cold Weather Work

.1 Construction to continue work including winter months, if applicable, until Work is completed and accepted to meet the schedule. No additional costs for cold weather heating will be entertained.

1.21 Materials, Plant and Equipment

.1 Materials, plant and equipment specified shall form basis of Bid and Contract. Where more than 1 brand or manufacturer is named in Specifications, or on Drawings, choice is Bidders/Contractors provided requirements of Drawings and Specifications are met.

.2 Refer to front end for substitution or alternate requirements.

.3 Materials, plant and equipment shall not be damaged or defective and shall be of quality compatible with Specifications for purpose intended. If requested provide evidence as to type, source and quality. Remove and replace defective products, at
own expense, regardless of previous inspections, and be responsible for delays and expenses caused thereby.

.4 Replace factory finished equipment, or parts thereof, whose paint finish is damaged and cannot be reasonably remedies by paint touch-up.

1.22 Material Storage and Handling

.1 Store packaged materials in original, undamaged containers with manufacturer's labels and seals intact. Handle and store materials in accordance with manufacturer's and suppliers' recommendations and in manner to prevent damage to materials during storage and handling.

1.23 Concealment of Work

.1 Conceal pipes, ducts conduits, tubing, wiring and other items requiring concealment in floor, wall and ceiling construction of finished areas except where indicated or specified otherwise. If in doubt as to method of concealment, or intention of Contract Documents in this connection, request clarification from Architect before proceeding with work in question.

.2 Lay out mechanical and electrical work in advance of concrete placement and furring installation to allow for its proper concealment.

.3 Test and inspect work before applying pipe covering and before Work is concealed.

1.24 Lines, Levels and Dimensions

.1 Have registered Ontario Land Surveyor establish 1 permanent bench marks on Site, referenced to established bench marks by survey control points. Provide and maintain control lines and level required.

.2 Lay out work in accordance with lines. levels and dimensions indicated and/or provided on bench marks established by survey.

.3 Verify lines, levels and dimensions. Report errors or inconsistencies in Drawings and obtain direction before commencing Work.

.4 Except as provided by survey, provide lines, levels and dimensions necessary to relate your work to work of other Sections.

1.25 General Workmanship

.1 Do Work in accordance with industry practice for type of work unless Contract Documents stipulate more precise requirements.

.2 Do Work in neat and careful manner to retain Work plumb, square and straight.

.3 Ensure Work is properly related to form close joints and appropriately aligned junctions, edges and surfaces and is free of warp, twist, wind, wave or other irregularities.

.4 When required by Specifications or by manufacturer's recommendations, have manufacturer, supplier or accredited agent, inspect work which incorporates their products.

.5 Do not permit materials to come in contact with other materials whether in presence of moisture or otherwise if conditions will result in corrosion, stain or discolouration or deterioration of completed Work. Provide compatible, durable separators

where such contact is unavoidable.

1.26 Fasteners

.1 Supply appropriate fasteners, anchors, accessories and adhesives required for fabrication and erection of Work.

.2 Unless specified otherwise use exposed metal fasteners and accessories of same texture, colour and finish as product being fastened.

.3 Use metal fasteners of same material as metal component being fastened, or of metal which will not generate electrolytic action and cause damage to fastener or metal component under moist conditions. In general use noncorrosive or hot dip galvanized steel anchors occurring on or in exterior wall, slab or other exterior locations, unless higher standard is indicated or specified.

.4 Fastening devices or adhesives shall be of appropriate type, used in sufficient quantity and in such manner to provide positive, permanent fastening which will not shift, work loose or fail during occupancy of building due to vibration or other causes resulting from normal use of building. Install anchors at spacing to provide required load/stress carrying capacity. Do not use wood plugs.

.5 Lay out fasteners neatly, evenly spaced and aligned. Keep exposed fasteners to minimum.

.6 Supply adequate instructions and templates and, if necessary supervise installation, where fasteners or accessories for your Section are required to be built into work of other Sections.

.7 Do not use fasteners which will cause spalling, cracking, or deformation or deterioration of material being fastened by or to.

.8 Do not use powder actuated fastening devices, which are used in tension, without approval. Take stringent safety precautions when using powder actuated fasteners. Use only low velocity plunger-type devices.

.9 Use adhesives specified, or if not specified, those recommended by manufacturer of materials involved, compatible with materials to be joined, and effective in forming permanent joint of adequate strength.

.10 Use screws, nails, staples and other similar, driven fasteners suitable to materials to be joined and to conditions under which they are installed and used. Ensure that in finished work, fasteners are sized to take durable hold under stress to be

encountered without damage to, or weakening of, elements secured together, and that fastenings will not corrode or cause staining of exposed surfaces.

.11 Do brazing or soldering to form durable connections of strength adequate to resist stresses to be encountered without deformation of elements joined. Prepare base metals and use methods and materials to ensure clean joint, and to prevent staining, corrosion, discolouration, deformation or other damage to finished Work.

.12 Do welding to CSA W59-M89 (for steel) or CSA W59.2-M91 (for aluminum) for material and methods, unless specified otherwise. Have welding performed by industry certified operatives to CSA W47.1-83 or CSA W47.2-M87.

1.27 Accessories

.1 Provide accessory items or materials required, such as brackets, cleats, connectors, sealants, lubricants, cleaners, protection, and similar items, whether specified or not, so that Work is complete and will perform as required.

1.28 Design and Safety Requirements for Temporary Work

.1 Be responsible for design, erection, operation, maintenance and removal of temporary structural and other temporary facilities. Engage and pay for registered Professional Engineering personnel skilled in appropriate disciplines to perform these functions where required by law or by the Contract Documents; and in cases where such temporary facilities and their method of construction are of such nature that Professional Engineering skill is required to produce safe and satisfactory results.

1.29 Protection and Safety

.1 Comply with requirements of Acts and Regulations with respect to health and safety including Occupational Health and Safety Act, as amended, and Workplace Hazardous Materials Information System (WHIMIS) Regulation, including following:

a) Before commencement of Work, and throughout Contract, maintain on Site, and readily accessible to all those who may be exposed to hazardous materials, list of hazardous materials proposed for use on Site or Workplace together with current Materials Safety Data Sheet (SDS).
b) Ensure hazardous materials used and/or supplied on Site are labelled in accordance with WHIMIS requirements.

c) Know and be aware of the procedures for safe handling, storage and use of such hazardous materials including special precautions, safe clean-up and disposal procedures. Conform to Environmental Protection Act for disposal requirements.

d) ensure that those who handle, and/or are exposed to, or are likely to handle or be exposed to, hazardous materials are fully instructed and trained in accordance with WHIMIS requirements.

2. Protect excavation, trenches and building from damage from rainwater, ground water, backing up of drains or sewers and other water, frost and other weather conditions. Provide sheeting, piling, shoring, pumps, equipment, temporary drainage, protective covering and enclosures. Provide necessary pumps including spare pump for keeping project free of water throughout construction period.

.3 Protect, relocate and maintain existing, active services wherever they are encountered. Wherever inactive services are encountered, cap them off and remove unwanted portion, with approval of authorities having jurisdiction or public utility concerned in manner approved by them.

.4 Load no part of structure during construction with load greater than it is calculated to bear safely when completed. Make every temporary support as strong as permanent support. Place no load on concrete structure until it has sufficient strength to safely carry such load.

.5 Adequately protect floors and roofs from damage. Take special measures when moving heavy loads or equipment on them.

.6 Keep floors free of oils, grease or other materials likely to discolour them or affect bond of applied surfaces including fumes generated by temporary heating devices. Take care not to spill or allow oil, grease, gasoline, diesel and fuel oil, chemicals and other substances to contaminate soil or water on or adjacent to Site. Should such contamination accidentally occur report it immediately and clean up to satisfaction of Architect.

.7 Protect work of other Sections from damage resulting from your work.

.8 Damaged work shall be made good wherever possible by Section whose work is damaged but at expense of those causing damage.

.9 Protect glass and other finishes against heat, slag and weld splatter using suitable protective shields or covers.

.10 Prior to beginning of construction, design fire safety plan in conjunction with local Fire Chief. Post fire plan throughout construction and recommended. Do not allow accumulation of waste that may constitute fire hazard.

.11 Conform to Construction Safety Association of Ontario's manual on Propane in construction. Watch work area for minimum of 30 minutes after hot work is completed. Provide Site fire security when required by local building department and/or municipal fire department. Ensure that water supply is adequate for fire fighting.

.12 Provide and maintain in working order, suitable Underwriters' labelled fire extinguishers and locate in suitable positions, to approval of authorities having jurisdiction.

.13 Provide minimum of 3 safety helmets for Architect and any other authorized visitors to Site if required.

.14 Protect public and those employed on Work from injury. Equipment (mobile) when not in use shall have keys removed and locked up in secure location.

1.30 Scaffolding

.1 Erect scaffolding independent of walls. Use it in manner as to interfere as little as possible with other Sections. When not in use, move it as necessary to permit installation of other work. Construct and maintain scaffolding in rigid, secure and safe manner. Remove it promptly when no longer required

1.31 Temporary Cleaning

.1 Keep Site and building, including concealed spaces, free from accumulation of dirt, debris, garbage and excess material. Remove oily rags and waste from premises at close of each day, or more often if required.

1.32 Manufacturers Directions

.1 Except where specified otherwise, use each product in accordance with manufacturer's published or written instructions, specifications or recommendations regarding handling, storage, preparation, Site conditions, ancillary products or accessories, methods of installation, protection and cleaning. Submit coy of such instructions, and indicate if and where there is discrepancy between them and requirements of Specifications and obtain direction.

1.33 Spare Products

.1 Where specified in other Sections, provide spare materials and products for future repair and replacement.

.2 Ensure such materials are of same production run as those incorporated in Work.

.3 Deliver quantities required, in separate labelled containers, and store where directed.

.4 Labels shall state material description, colour, pattern and location of installation.

1.34 Environmental Practices

.1 Take active role in implementing environmentally sound business practices and producing goods and services that lessen burden on environment in production, use and final disposition. Support implementation of reduction, reuse and recycling strategies and use of environmentally sound products. Reduce or eliminate excessive packaging and promote use of environmentally responsible packaging practices.

a)Environmentally Sound Products: Product that is made, used and disposed of in a manner that significantly reduces harm it would otherwise cause the environment. Product may be certified as environmentally sound because it is made in a way that improves energy efficiency, reduces hazardous by-products, uses recycled material, or because the product itself can be recycled or reused, or in some way is environmentally benign.

b) Packaging requirements: Implement waste reduction by reducing or eliminating excessive packaging practices.

c) Use, where appropriate, combination of packaging materials such as re-usable containers, blanket wrap or cushioning material provided that all reasonable requirements of materials handling, transportation and storage are observed.

d) Packaging materials such as kraft paper and corrugated cartons shall be made from reclaimed products to facilitate recycling of secondary materials.

e) Packaging material shall be clearly labelled to display their recycled content and recyclability.

f) Ensure that packaging materials are removed from Site and disposed of in environmentally responsible manner.

1.35 Waste Disposal

.1 Do not burn rubbish on Site. Obtain approval and use following off-Site disposal alternatives, depending upon materials involved; burying, composting, Municipal collection or local dump or sanitary landfill site.

1.36 Polychlorinated Biphenyl (PCB's)

.1 In event of unexpected discovery of PCB's immediately notify Architect and Owner orally and in writing and do not handle, disturb or remove items containing PCB's. Architect will authorize remedial work, if any, in writing. Do such remedial work as addition to Contract.

1.37 Spill Response Procedures

.1 The Contractor shall have written spill response procedures and material on-site to respond to pollutants and contaminants Into the natural environment in excess of levels permitted in regulations or cause or are likely to cause an adverse effect.

1.38 Silica

.1 The general contractor and sub-trades are required to ensure all work is performed in accordance with the Silica on Construction Projects guideline, as published on the Province of Ontario's website.
https://www.ontario.ca/document/silicaconstruction-projects#

End of Section 01005

1.1 Samples

.1 **Mandatory Sample Approval:**
Submit samples in sizes and quantities specified in all related sections as noted elsewhere herein. Samples are to be submitted for all interior and exterior building finishes unless noted otherwise. All samples are to be approved by the Architect before the related items are ordered and put into production as applicable. No items are to be installed on site without prior sample approvals by the Architect's office. Any installed items (not previously approved by sample submittal to the Architect) are subject to full rectification (to all aspects of the drawings, specifications, schedules and related Contract Documents) at no additional expense.

.2 **Verification of Product Names and Codes:**
All trades and sub-trades are responsible to verify that supplied and specified product *names* and *colour names* reconcile to the *numeric product codes* also provided throughout. All discrepancies between product names and codes (i.e. written description and product ordering numbers) are to be reported to the Architect prior to product ordering, fabrication and installation.

1.2 Co-ordination Submissions

.1 **Prior to first draw for payment being processed, the full list of all shop drawings for the project shall be submitted and approved by all consultants. Updated shop drawing schedule to be submitted with each draw until all shop drawings have been processed.**

.2 Review shop drawings, product data and of samples prior to submission.

.3 Verify:
(a) Field measurements
(b) Field Construction Criteria
(c) Catalogue numbers and similar data

.4 Co-ordinate each submission with requirements of work and Contract documents. Individual shop drawings will not be reviewed until all related drawings are available.

.5 Contractor's responsibility for errors and omissions in submission is not relieved by Architect's review of submittals.

.6 Contractor's responsibility for deviations in submission from requirements of contract documents is not relieved by Architect's review of submission, unless Architect gives written acceptance of specified deviations.

.7 Notify Architect, in writing at time of submission, of deviation from requirements of Contract documents.

.8 After Architect's review, distribute copies.

1.3 Submission Requirements

.1 Schedule submissions at least twenty-one (21) days before dates reviewed submissions will be needed.

.2 Submit shop drawings via pdf document for consultant review.

.3 Accompany submissions with transmittal letter, containing:
- (a) Date
- (b) Project title and number
- (c) Contractor's name and address
- (d) Number of each shop drawing, product data and sample submitted.

.4 Where additional copies of shop drawings or product data are required for distribution, they shall be marked by the Contractor to accord with the copies reviewed by Consultants.

.5 Submissions shall include:

(a) Date and revision dates
- (b) Project title and number
- (c) Name of:
  - (i) Contractor
  - (ii) Sub-contractor
  - (iii) Supplier
  - (iv) Manufacturer
- (d) Identification of product or material
- (e) Relation to adjacent structure or materials
- (f) Field Dimensions, clearly identified as such
- (g) Specification Section number
- (i) Contractor's stamp, initialed or signed, certifying review of submission, verification of field measurements and compliance with Contract documents.

.6 Final copy of shop drawings to the Client for record purposes.

.7 Shop Drawings not stamped with the Contractor's "Approved" stamp will be rejected.

.8 Shop Drawings requested to have Engineer’s seal submitted without said seal will be rejected.

End of Section 01340

1.1 Access

.1 Provide and maintain adequate access to project site.

.2 Do not encumber corridors with materials and keep clean.

1.2 Contractor's Site Offices

.1 The General Contractor shall provide for their own site offices and workshops for the entire length of Construction if required. Areas of work within the school are not available.

.2 Maintain in clean condition. Sweep daily.

.3 This facility not to be used for material storage.

1.3 Sanitary Facilities

.1 Sanitary facilities will not be designated for contractor's use within the school.

.2 It is the Contractor's full responsibility to ensure it is secured to avoid damage and vandalism. The Owner will not be held liable for any damage and/or vandalism.

1.6 Parking

.1 The parking lot is at full capacity during school hours most days and parking can not be guaranteed. Contractor to arrange for their own off-site parking if applicable.

.2 Do not interfere with adjacent and local existing traffic patterns including such items as bus routes, drop-off/pick-up lanes, etc.

1.7 Enclosure of Structure

.1 Provide temporary weather tight enclosures and protection for exterior openings until permanently enclosed.

.2 Provide and maintain dustproof and sound resistant barriers or partitions between the Work and existing occupied building.

1.8 Power

.1 Existing electrical power and lighting systems may be used for construction requirements with prior approval of Owner provided that guarantees are not affected. Make good damage. Replace lamps which have been used over a period of 3 months.

1.9 Water Supply

.1 Water supply is available.

1.10 Heating and ventilation

.1 Provide temporary heat and ventilation in enclosed areas as required to:

(a) Facilitate progress of work.
(b) Protect work and products against dampness and cold.
(c) Prevent moisture condensation on surfaces.

(d) Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
(e) Provide adequate ventilation to meet health regulations for safe working environment.

.3 Maintain minimum temperature of 10°C or higher where specified as soon as finishing work is commenced and maintain until acceptance of structure by Architect.

.4 Ventilating:
(a) Prevent hazardous accumulations of dust, fumes, mists, vapours, or gases, in areas occupied during construction.
(b) Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
(c) Provide mechanical ventilation to accelerate drying out of building if necessary to maintain schedule.
(d) Ventilate storage spaces containing hazardous or volatile materials.
(e) Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful elements.

.5 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
(a) Conform with applicable codes and standards
(b) Enforce safe practices
(c) Prevent abuse of services
(d) Prevent damage to finishes
(e) Vent direct-fired combustion units to outside.

1.11 Site Signs and Notices

.1 Only project identification and approved job sign and notices for safety or instruction are permitted on site.

.2 Signs and notices for safety or instructions to be in the English language, or commonly understood graphic symbols.

.3 Maintain sign and notices for duration of project. Remove sign and deliver to Owner off site on completion of project.

1.12 Scaffolding

.1 Construct and maintain scaffolding in rigid, secure and safe manner.

.2 Erect scaffolding independent of walls. Remove promptly when no longer required. Refer to Section 01545 for safety requirements for scaffolding.

End of Section 01500

1.1 Construction Safety Measures

.1 Observe and enforce construction safety measures required by the Ontario Building Code, Provincial Government, Worker's Compensation Board and Municipal Statutes and authorities.

.2 In event of conflict between any provision of the above authorities the most stringent provision will apply.

1.2 Fire Safety Requirements

.1 Provide and maintain in good working order, sufficient fire fighting equipment, tools, and extinguishers to contain an outbreak of fire.

.2 Comply with all requirements of the local authorities having jurisdiction in the storage and handling of flammable materials.

.3 Ensure all persons working at the site are conversant with action to be taken in the event of an outbreak of fire at the Work.

1.3 Overloading

.1 Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.

1.4 Falsework

.1 Design and construct falsework in accordance with CSA S269.1-1975.

1.5 Scaffolding

.1 Design and construct scaffolding in accordance with CSA S269.2-M1980.

1.6 Smoking

.1 Smoking or vaping is not permitted anywhere on School Board Property.

End of Section 01545

1.1 General

.1 Use new material and equipment unless otherwise specified or directed in writing by the Architect.

.2 Within (7) days of written request by Architect, submit the following information for any or all material and products proposed for supply:

(a) Name and address of manufacturer
(b) Trade name, model, and catalogue number
(c) Performance, descriptive and test data
(d) Manufacturer's installation or application instructions
(e) Evidence of arrangements to procure

.3 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.

.4 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.

1.2 Manufacturer's Instructions

.1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.

.2 Notify Architect in writing of any conflict between these specifications and manufacturers' instructions. Architect will designate which document is to be followed.

1.3 Fasteners - General

.1 Provide metal fasteners and accessories in same texture, colour and finish as base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use non-corrosive fasteners, anchors and spacers for securing exterior work.

.2 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage. Wood plugs not acceptable.

.3 Keep exposed fasteners to minimum, space evenly and lay out neatly.

.4 Fasteners which cause spalling or cracking of material to which anchorage is made are not acceptable.

.5 Obtain Architect's approval before using explosive actuated fastening devices. If approval is obtained comply with CSA Z166-1975.

.6 Use fasteners of standard commercial Equipment sizes and patterns with material and finish suitable for service.

.7 Use heavy hexagon heads, semi-finished unless otherwise specified. Use no. 304 stainless steel for exterior areas.

.8 Bolts may not project more than one diameter beyond nuts.

.9 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur and resilient washers with stainless steel.

1.4 Delivery and Storage

.1 Deliver, store and maintain packaged material and equipment with manufacturers' seals and labels intact.

.2 Prevent damage, adulteration and soiling of material and equipment during delivery, handling and storage. Immediately remove rejected material and equipment from site.

.3 Store material and equipment in accordance with suppliers' instructions and Section 01500.

.4 Touch-up damaged factory finished surfaces to Architect's satisfaction. Use primer or enamel to match original. Do not paint over name plates.

1.5 Substitution

.1 Refer to front end of specifications.

1.6 Construction Equipment and Plant

.1 On request, prove to the satisfaction of Architect that the construction equipment and plant are adequate to manufacture, transport, place and finish work to quality and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.

.2 Maintain construction equipment and plant in good operating order.

1.7 Work Surfaces

Millwork or other similar permanent surfaces, including loose or fixed and installed furniture and equipment are not to be used as work surfaces. Contractors and Subcontractors shall provide their own temporary work surfaces as required.

End of Section 01600

1.1 General

.1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

.2 Store volatile wastes in covered metal containers and remove from premises daily.

.3 Prevent accumulations of wastes which create hazardous conditions.

.4 Provide adequate ventilation during use of volatile or noxious substances.

.5 Contractors shall shift items (furniture or misc. items) that would otherwise impede or obstruct work area to provide space for completion of work. Tarp areas, including fixed and loose furniture accordingly to protect from dust and debris. Items to be placed back into original locations after work complete in that area.

1.2 Materials

.1 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

1.3 Cleaning During Construction

.1 On a daily basis maintain premises free from debris and waste material.

.2 Maintain project site and public properties free from accumulations of waste materials and rubbish.

.3 Provide on-site container for collection of waste materials and rubbish.

.4 Remove waste materials, and rubbish from site at regular intervals, or when container is full.

.5 Vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning on an as-needed basis until building is ready for substantial completion or occupancy.

.6 Schedule cleaning operations so that resulting dust and other contaminants will not fall on areas prepared for finishes and/ or wet, newly painted surfaces.

.7 Exterior areas of building must be free of any construction debris including all sharp items (nails, glass, etc..) Pathways used to access exterior waste bins for demolition should take precautions to ensure routes are protected and clear of debris.

1.4 Final Cleaning

.1 In preparation for substantial completion or occupancy, conduct inspection of sight-exposed interior surfaces.

.2 Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from sight-exposed interior finished surfaces including glass and other polished surfaces, resulting from own work.

.3 Broom clean paved surfaces; rake clean other surfaces of grounds.

.4 Remove debris and surplus materials from accessible concealed spaces.

.5 Replace broken, damaged or scratched glass and mirrors, which are part of the Work.

.6 Use appropriate apparatus and cleaning materials. Clean Work in accordance with applicable Sections and/or manufacturer's directions.

.7 Upon completion of final cleaning, remove cleaning equipment, materials and debris from building and Site.

End of Section 01700

1.1 Record Drawings

.1 Contractor will provide site with two sets of white prints at the outset of construction for the progressive recording of items deviating from the drawings. At the completion of construction, this set of record drawings should reflect final 'as-built' conditions.

.2 Maintain project record drawings by accurately and progressively recording deviations from Contract documents caused by site conditions, and changes subsequent to Tender.

.3 Mark changes in coloured (red) ink.

.4 Record following information:

(a) Location and nature of mechanical and electrical building systems and related components not otherwise shown on the drawings.
(b) Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
(c) Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
(d) Field changes of dimension and detail.
(e) All changes made by Change Order.

.5 At completion of project and prior to final inspection, neatly transfer notations from the original working set of drawings to the second final set. Submit both sets to Architect.

.6 The General Contractor and Mechanical Contractor shall each note a $2,000.00 Hold Back value (to be identified in all draws) to cover final submission and of as-built drawings and Operation and Maintenance Manuals. Hold back values will be released upon consultant review and approval of completed submittal requirements.

END OF SECTION 01720

1.1 Maintenance

.1 On completion of project submit to Architect 1 digital copy of Operating and Maintenance Manuals in English, made up as follows:

a) Enclose title sheet, labeled "Operating and Maintenance Data Manual", project name, date and list of contents.

b) Organize contents into applicable sections of work to parallel project specification breakdown. Mark each section by labeled tabs projected and celluloid covers fastened to hard paper dividing sheets.

.2 Include the following information:

a) Maintenance instruction for finished surfaces and materials.

b) Copy of hardware and Paint Schedules, paint layout drawings, Interior and Exterior Colour and Finish Schedules

c) Description, operation and maintenance instructions for equipment and systems, including complete list of equipment and parts list. Indicate nameplate information such as make, size, capacity and serial number.

d) Names, addresses and phone numbers of Sub-contractors and Suppliers.

e) Guarantees, warranties and bonds showing:
   i) Name and address of projects
   ii) Guarantee commencement date (date of Final Certificate of Completion).
   iii) Duration of guarantee.
   iv) Clear indication of what is being guaranteed and what remedial action will be taken under guarantee.
   v) Signature and seal of Contractor.

.3 Neatly type all information. Use clear diagrams or manufacturer's literature.

.4 Final payments will not be made until complete packages, as described at 1.1.1. to 1.1.3, are received by the Board. Promptness and completeness of these packages will be taken into account as part of pre-qualification applications for future Board projects regarding the 'past performance' criteria.

.5 *The General Contractor Mechanical Contractor shall each note a* ***$2,000.00 Hold Back value*** *(to be identified in all draws) will be retained to cover final submission and approval of as-built drawings and Operation and Maintenance Manuals. Hold back values will be released upon consultant review and approval of completed submittal requirements.*

END OF SECTION 01730

1.1 General

.1 Work of this Section includes demolition and removal from site of materials, finishes, fixtures, equipment etc., [related to the proposed scope of work] which may or may not be specifically spelled out on drawings.

.2 Division One [General Requirements] applies as if repeated herein.

1.2 Description

.1 Work included in this section but not limited to may involve the following:

- the demolition of portions of the existing building items, related services and associated features as noted on drawings and/or as required for completion of the scope of work outlined in the Contract Documents
- the salvaging of items (denoted for removal not intended for re-integration into the project) to be offered to Owner for first right of refusal prior to discarding
- the removal of items from site and subsequent discard at an approved sanitary landfill site, recycling depot or similar approved facility suited to the nature of materials being removed

The work of this division shall include all temporary and permanent service disconnects required by items being demolished and/or disconnected as part of the scope of work illustrated in the Contract Documents.

.2 Clarify all unclear and ambiguous items with Architect immediately prior to demolition and construction.

1.3 Relocation

.1 Ensure that all items to be relocated (as per drawings), are carefully removed and stored on site for future relocation complete with all related components and accessories integral to their operation. Protect items during the course of construction to ensure their safety.

.2 Clarify all items, which may be ambiguous or unclear with the Architect and/or respective Engineer prior to any removal activity on the site.

1.4 Examination

.1 Examine site and premises and be satisfied as to condition of premises and means of access to same, and nature and quantity of work required.

.2 Examine drawings and documents and report ambiguous items and/or possible errors or omissions to the Architect immediately for clarification.

1.5 Coordination

.1 Coordinate all demolition activities with Building Owner relative to hours of operation and acceptable level of impact on ongoing building operations (as/if applicable). Work cooperatively with Owner and/or Occupants to determine acceptable hours and activities.

1.6 Protection

.1 Protect building occupants from demolition activities via construction hoarding or other means deemed acceptable to the Owner. Hoarding provisions to conform to related specification sections elsewhere herein.

.2 Throughout demolition, protect all existing building items and areas adjacent to demolition as required to prevent or minimize adverse impact on materials otherwise to remain. Repair and make good all existing finishes damaged throughout the course of construction to pre-construction condition and/or as designated by the Architect.

1.7 Utilities

.1 Where required, ensure that water, sewer, mechanical and electrical services are cut off and properly capped before commencing remainder of work, and notify appropriate authorities, building owner, building occupants etc. as required.

1.8 Removal of Debris

.1 All debris from the site and structure demolition, shall be removed from site immediately. There shall be no accumulation of demolished materials any shape or form in any location. All debris shall be removed in accordance with Section 01005 and related divisions as prescribed elsewhere herein.

1.9 Hazardous Materials

.1 (IF APPLICABLE) All hazardous materials shall be removed from the facilities prior to demolition otherwise required for the scope of work. Refer to related Specifications and Appendix items contained herein for Designated Substances, Hazardous Materials Abatement and associated items.

END OF SECTION 02100

PART 1 - GENERAL

1.1 General

Division One, General Requirements, is part of this section and shall apply as if repeated here.

1.2 Description of Work

Provide all labour, materials, and equipment required or called for in this specification, and as shown on drawings or which is necessary, to complete the work without any extra cost. This work may require any or all, but not be limited to any of the following:

.1 Firestop and smoke seal at:
- i) Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
- ii) Top of fire-resistance rated masonry and gypsum board partitions.
- iii) Intersection of fire-resistance rated masonry and gypsum board partitions.
- iv) Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
- v) Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
- vi) Openings and sleeves installed for future use through fire separations.
- vii) Around mechanical and electrical assemblies penetrating fire separations.
- viii) Rigid ducts: greater than 129 cm^2: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

1.3 Related Work

.1 Fire stopping and smoke seals within mechanical assemblies (ie. Inside ducts, dampers) and electrical assemblies (ie. Inside cable trays) are specified in Division 15 and 16 respectively.

1.4 References

.1 CAN4-S115-M85, Standard Method of Fire Tests of Firestop Systems.

1.5 Samples

.1 Submit samples in accordance with General Conditions.

PART 2 – PRODUCTS

2.1 Materials

.1 Fire stopping and smoke seal systems: in accordance with CAN4-S115.
- i) Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke, and gases in compliance with requirements of CAN4-S115 and not to exceed opening sizes for which they are intended and conforming to special requirements specified in 3.5.
- ii) Firestop system rating: 2hr & 1hr.
- iii) Fire Rated Joints for Concrete Steel Fluted Decks to Concrete Walls Assemblies using TREMstop Acrylic. This detail is to be used for **all** rated walls throughout scope of project.

.2 Service penetration assemblies: certified by ULC in accordance with CAN4-S115 and listed in ULC Guide NO. 40 U19.

.3 Service penetration firestop components: certified by UlC in accordance with CAN4-S115 M85.

.4 Fire-resistance rating of installed fire stopping assembly not less than the fire-resistance rating of surrounding floor and wall assembly.

.5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.

.6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.

.7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.10 Sealants for vertical joints: non-sagging.

.11 Acceptable material: Tremco, "TREMstop Acrylic".

PART 3 – EXECUTION

3.1 Preparation

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.

.2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.2 Installation

.1 Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions.

.2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Tool or trowel exposed surfaces to a neat finish.

.5 Remove excess compound promptly as work progresses and upon completion.

3.3 Inspection

.1 Notify consultant when ready for inspection and prior to concealing or enclosing fire-stopping materials and service penetration assemblies.

3.4 Clean Up

.1 Remove excess materials and debris and clean adjacent surfaces immediately after application.

.2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

END OF SECTION 07270

ECOH
Environmental Consulting
Occupational Health

PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY

GLENDALE SECONDARY SCHOOL
145 RAINBOW DRIVE
HAMILTON, ONTARIO

Prepared for:
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Attention: Jillian McCardle, Project Supervisor

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ECOH Project No.: 28228

December 1, 2023

EXECUTIVE SUMMARY

ECOH Management Inc. (ECOH) was retained by the Hamilton Wentworth District School Board (HWDSB) to conduct a Pre-Renovation Designated Substance and Hazardous Materials Survey in specified areas at Glendale Secondary School, located at 145 Rainbow Drive in Hamilton, Ontario, hereafter referred to as the "Project Area". ECOH understands that various materials of the facility are scheduled to be disturbed or replaced as part of the Boiler and AHU replacement project as detailed in Project Drawings provided by Exp Services Inc. (EXP).

This survey report fulfils requirements set forth within the Ministry of Labour codes and the Ontario Occupational Health and Safety Act to inform workers of the presence of Designated Substances and other hazardous materials prior to renovation or demolition.

Stuti Sathvara were on site on November 24, 2023.This executive summary provides a brief overview of the key survey findings and associated recommendations. Detailed information regarding the findings and recommendations are discussed in the body of the report.

KEY FINDINGS & RECOMMENDATIONS

Asbestos

Asbestos-containing materials were identified within the Project Area as follows:

- Parging cement fittings on straight run pipe was confirmed to be **asbestos-containing (55 –70% Chrysotile).**
- Parging cement on Air handling unit was sampled and confirmed to be **asbestos-containing (55% Chrysotile).**
- Plaster on ceiling and beams was confirmed to be **asbestos-containing (0.5-5% Chrysotile)**.
- Transite panels were previously confirmed to be **asbestos-containing**.
- 9” x 9” Vinyl floor tile (brown with black streaks) was sampled and confirmed to be **asbestos-containing (8% Chrysotile)**
- Flexible duct connectors are **presumed to be asbestos-containing**. This material was not sampled as to avoid damage to material associated with active HVAC system.

As asbestos-containing materials (ACM) are present within the Project Area, ECOH recommends that all workers have asbestos awareness and respirator training before commencing work. Asbestos awareness training will provide on-site workers with the understanding of asbestos-related health and safety issues; the ability to recognize ACM and any situation that may present a potential asbestos exposure, and the ability to respond appropriately to an inadvertent disturbance of ACM in the work area.

Prior to renovation work, asbestos-containing materials should be removed from the Project Area. Removal or disturbance of asbestos-containing materials must be conducted using asbestos safety procedures detailed within Ontario Regulation 278/05, regulation respecting *Asbestos on*

Construction Projects and in Building and Repair Operations – made under the Occupational Health and Safety Act.

The following are classifications of relevant asbestos operations. Classification of work is based on the **total area** in which work is done consecutively in a room or enclosed area, even if the work is divided into smaller jobs:

Regarding the removal or disturbance of non-friable **asbestos-containing** materials (transite panels, vinyl floor tiles, flexible duct connectors), if required:

- Type 1 Asbestos Safety Precautions should be utilized for the disturbance or removal of the aforementioned **asbestos-containing** materials, provided that materials are wetted to control the spread of dust or fibres and work is completed using non-powered hand-held tools.
- Type 2 Asbestos Safety Precautions should be utilized for the disturbance removal of the aforementioned **asbestos-containing** materials, or if the work is done by means of power tools that are attached to dust-collecting devices equipped with HEPA filters.
- Type 3 Asbestos Safety Precautions should be utilized for the disturbance removal of the aforementioned **asbestos-containing** materials, if the work is done by means of power tools that are not attached to dust-collecting devices equipped with HEPA filters.

Regarding the removal or disturbance of friable **asbestos-containing** materials (plaster, parging cement on fittings, parging cement on AHU) if required;

- Type 2 Asbestos Safety Precautions should be utilized for the disturbance or removal of one square meter or less of friable **asbestos-containing** materials, if work is completed using non-powered hand tools.
- Type 2 Glove Bag Asbestos Safety Precautions should be utilized for the disturbance or removal of friable **asbestos-containing materials**.
- Type 3 Asbestos Safety Precautions should be utilized for the disturbance or removal of more than one square meter of friable **asbestos-containing** materials.

Removal or disturbance of materials confirmed to be non-asbestos do not require Asbestos Safety Precautions but should employ other appropriate health and safety precautions, which may include dust suppression methods.

During work of the project, if additional materials are revealed beyond what are described in this report, or as described in the existing inventory of asbestos-containing materials (i.e., materials not identified or materials that are not homogenous to those identified or materials that become revealed during the work), additional testing for asbestos-content should be completed immediately and prior to disturbance of the material. Alternatively, materials can be assumed to contain asbestos, if not sampled and analyzed, and the appropriate level of asbestos safety precautions must be implemented.

Lead

Although no regulations exist in Ontario, guidelines indicate that paints and surface coatings that contain 0.5% lead concentration by dry weight (i.e. concentrations of lead at or above 0.5%, or 5000 parts per million (ppm), which is comparable to 1 milligram per square centimetre (mg/cm^2) when using an XRF analyzer) is considered to be a "lead-based paint or surface coating". Paints or surface coatings that contain concentrations of lead greater than 0.1% by dry weight (1000 ppm), and less than 0.5% by dry weight (5000 ppm), is considered to be a "lead-containing paint or surface coating". Paints or surface coatings that contain concentrations of lead at, or below, 0.1% by dry weight (1000 ppm) is considered to be a "low-level lead paint or surface coating".

The presence of lead in paint and in mortar was assessed by the collection and submission of bulk material samples to a professional laboratory for analysis by flame atomic absorption spectroscopy.

Three (3) of the sampled materials (paints) were determined to be lead-containing or lead-based:

- Yellow paint on gas pipe – **30,000 ppm**
- Blue paint on floor – **1400 ppm**
- Grey paint on ducts and AHU – **6400 ppm**

No other major sources of lead or lead-containing products were observed during the survey; however, lead may be present in:

- Internal batteries associated with emergency lighting system,
- Wiring connectors and electric cable sheathing,
- Piping and solder joints on piping, and
- Cast iron pipe joint packing.

Any work involving the disturbance of building materials confirmed or assumed to contain lead (e.g. wiring connectors, ceramic tiles or electric cable sheathing), should be conducted following recommendations detailed within the Ministry of Labour document Guideline - Lead on Construction Projects, dated April 2011, and the Environmental Abatement Council of Canada (EACC) Lead Guideline, dated October 2014.

Work shall be classified as follows, as per the EACC Lead Guideline:

- Removal of lead-containing or lead-based paints and surface coatings with a chemical gel/stripper or paste is a Class 1 lead operation.
- Removal of lead-containing or lead-based paints and surface coatings with a heat gun is a Class 1 lead operation.
- Removal of materials coated with lead-containing or lead-based paints and surface coatings, using non-powered hand tools, where the material remains chiefly intact and is not crumbled, pulverized or powdered is a Class 1 lead operation.
- Removal of lead-containing coatings or materials using a power tool that has an effective dust collection system equipped with a HEPA filter is a Class 2a lead operation.

- Removal of lead-containing or lead-based paints or materials by scraping or sanding using non-powered hand tools is a Class 2a lead operation.
- Manual demolition of lead-painted plaster walls (or similar building components that will crumble, pulverize, or powder) when striking with a sledgehammer or similar tool is a Class 2a lead operation.
- Removal of lead-containing coatings or materials using power tools without an effective dust collection system equipped with a HEPA filter is a Class 3a lead operation,
- Abrasive blasting of lead-containing coatings or materials is a Class 3b lead operation.

Renovation, demolition or general construction work involving the removal of materials containing only trace concentrations of lead (i.e. lead concentrations below 0.1% by dry weight, or 1000ppm) can be completed without lead specific safety precautions provided that:

a) Work does not include 'fume generating activities' (heat producing) such as welding, torching, burning, high temperature cutting, etc.,
b) Work does not include dust-generating activities such as grinding, cutting or chemical stripping,
c) Dust levels are maintained below 3 mg/m^3, and

General health and safety construction procedures are implemented, which would include dust suppression methods, proper respiratory protection (minimum of a ½-face respirator) and protective clothing, as is appropriate for the work being completed.

Mould

Mould was not observed in project area during the survey.

Mercury

Mercury may be present in minor quantities within the Project Area in the forms below. Items suspected to contain mercury were noted to be in good condition.

- As a vapour within fluorescent tubes lights or compact fluorescent lamp (CFL) bulbs,
- As a possible constituent of thermostats, and
- As a possible constituent of paints and adhesives.

The presence of mercury within assembled units (e.g., fluorescent light bulbs and thermostat bulbs) should not be considered a hazard provided that the assembled units remain sealed and intact. Avoid direct skin contact with mercury and avoid inhalation of mercury vapour. Dispose of mercury following applicable legislative requirements.

Polychlorinated Biphenyls (PCBs)

The presence of Polychlorinated Biphenyl (PCBs) in caulking was assessed by the collection and submission of bulk material to a professional laboratory for analysis. PCB Regulations, SOR/2008-273, stipulates that any solid material that contains 50 parts per million (ppm) PCBs shall be treated as a PCB-containing material. None of the sampled materials were determined to contain PCB concentrations exceeding 50 ppm. Laboratory analysis results for PCB sampling completed during this assessment are presented in Appendix 3.

Silica

Free Crystalline Silica in the form of common construction sand is present in all concrete and masonry products within the Project Area. Any work involving the disturbance of materials that may contain silica should be conducted following recommendations detailed in the Ministry of Labour document "*Guideline - Silica on Construction Projects*", dated April 2011.

Other Designated Substances and Hazardous Materials

Arsenic, Acrylonitrile, Benzene, Coke Oven Emissions, Ethylene Oxide, Isocyanates, Ozone Depleting Substances, and Vinyl Chloride Monomer were not noted in significant quantities or forms, if at all, during this survey.

Complete commentary on each of the designated substances in the project area can be found in the body of this report. The executive summary is not intended to substitute for the complete report, nor does it discuss some of the specific issues documented in the report.

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APPENDICES

1. INTRODUCTION AND REGULATORY REQUIREMENTS

1.1 Introduction and Scope

ECOH Management Inc. (ECOH) was retained by the Hamilton Wentworth District School Board (HWDSB) to conduct a Pre-Renovation Designated Substance and Hazardous Materials Survey in specified areas at Glendale Secondary School, located at 145 Rainbow Drive in Hamilton, Ontario, hereafter referred to as the "Project Area". ECOH understands that various materials of the facility are scheduled to be disturbed or replaced as part of the Boiler and AHU replacement Project as detailed in Project Drawings provided by EXP Services Inc. (EXP).

This survey report fulfils requirements set forth within the Ministry of Labour codes and the Ontario Occupational Health and Safety Act to inform workers of the presence of Designated Substances and other hazardous materials prior to renovation or demolition.

Stuti Sathvara visited the site on November 24, 2023. The survey included an investigation for the presence of designated substances, namely:

- Asbestos
- Lead
- Mould
- Mercury
- Polychlorinated Biphenyls (PCB)s
- Silica

And, in addition, investigation for:

- Acrylonitrile
- Arsenic
- Benzene
- Coke Oven Emissions
- Ozone Depleting Substances (ODS)s
- Ethylene Oxide
- Isocyanates
- Vinyl Chloride Monomer
- UFFI

1.2 Building Description

Glendale Secondary School is a two-story building with a basement. The building was originally constructed in 1960 with additional construction in 1963.

1.3 Regulatory Requirements

A Designated Substances and Hazardous Materials Report were completed to fulfil the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act. Prior to tendering project work in a building, the building owner must provide this report to contractors tendering on the work.

Ministry of Labour Regulation 278/05, *Regulation respecting Asbestos on Construction Projects and in Buildings and Repair Operations*, controls the disturbance of asbestos materials on construction projects. Ministry of Environment Regulation, R.R.O. 347, controls the disposal of asbestos waste. The Ministry of Labour has also issued guidelines for the control of Lead and

Silica on construction projects, these entitled, *Guideline - Lead on Construction Projects* and *Guideline - Silica on Construction Projects*.

There are no specific Ministry of Labour regulations for control of the remaining Designated Substances on construction projects. However, the Ministry of Labour actively enforces the general duty clause of the Occupational Health and Safety Act which protects workers and provides guidance on exposure monitoring, permissible exposure levels, medical monitoring, etc., for all Designated Substances in an occupational setting.

2. SURVEY METHODOLOGY

2.1 General Approach

Where available, facility records were reviewed to identify the known asbestos-containing materials present within the facility prior to conducting the survey. During the survey, the surveyor looked for the most common applications of building materials made with Designated Substances based on historical applications. The investigation performed was generally non-intrusive in nature (i.e. no test-cuts, the investigation did not include demolition of building systems to verify concealed conditions).

Existing facility records should be updated with additional information provided in this report.

2.2 Asbestos Survey Methodology

2.2.1 Asbestos Sampling Strategy and Analytical Methods

Where sampling was required, bulk samples of potential asbestos containing materials collected for analysis during the designated substances and hazardous materials survey were collected as per the requirements of Ontario Regulation 278/05; multiple samples (ranging from 1 to 7 depending on quantity and type of material) are required to confirm the absence of asbestos. Only one positive result (i.e., confirming the presence of asbestos) is required to classify a material as asbestos-containing. Therefore, ECOH's sampling strategy involves the collection of sufficient numbers of samples to meet regulatory requirements, followed by instructions to the laboratory to cease analysis when one sample within a series has already proven positive for asbestos.

Sampling required a small volume of material to be removed either from a damaged section of suspect material or cut from intact material and then repaired by sealing with tape to prevent fibre release. The collected samples were placed in plastic bags and sealed during shipment to an independent laboratory. A formal chain of custody procedure was maintained between ECOH and the sub-contract laboratory during sample transport. Samples were then analysed following the analytical procedure prescribed by the Regulation 278/05 U.S. Environmental Protection Agency Test Method EPA/600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials. June 1993. Although not required by provincial regulation, all

laboratories used by ECOH are accredited under the U.S. National Voluntary Laboratory Accreditation Program (NVLAP) to ensure consistent, accurate and defendable results.

The Chain of Custody and the Certificate of Analysis, which details analytical results referenced in the findings section, for all asbestos bulk sampling is presented within Appendix II.

2.2.2 Asbestos Survey Omissions from Scope

When conducting an asbestos survey, it is standard practice to assume that certain building materials potentially contain asbestos. Depending on the material, this assumption is undertaken for one or more of the following reasons:

- The material is inaccessible (i.e., underground piping, between piping systems, etc.).
- There is an inherent danger in sampling the material (i.e., high voltage wires).
- Sampling will compromise the integrity of the building structure or envelope (i.e., window / door caulking).

Therefore, for the purpose of this survey, ECOH has assumed that the following materials, if present, are asbestos containing:

- High voltage wiring
- Underground services or piping
- Gaskets

In addition, no identification was made of asbestos products used in manufacturing processes or operations (i.e., manufacturing equipment, laboratories, etc.).

2.3 Lead Methodology

The presence of lead in materials was assessed by the collection of bulk samples of potential lead-based materials identified during the survey. Samples were analysed by Flame Atomic Absorption Spectroscopy, EPA SW-846 3050B/6010C/7420 method. Lead-based materials are considered to have concentrations of lead equal to or greater than 0.5%, or 5000 ppm by dry weight, whereas lead-containing materials have concentrations of lead equal to or greater than 0.1%, or 1000 ppm by dry weight.

The Chain of Custody and the Certificate of Analysis, which details analytical results referenced in the findings section, for all lead bulk sampling is presented within Appendix II.

2.4 Mould Assessment

Mould assessment of the Project Area was conducted in accordance with industry-accepted protocols. Protocols include:

- Canadian Construction Association, Standard Construction Document CCA 82, 2004; "*Mould Guidelines for the Canadian Construction Industry*".
- ASTM D7338 – 10; Standard Guide for Assessment of Fungal Growth in Buildings.
- New York City Department of Health and Mental Hygiene: Bureau of Environmental &
- Occupational Disease Epidemiology; "Guidelines on Assessment and Remediation of Fungi in Indoor Environments", 2008.
- Institute of Inspection Cleaning and Restoration (IICRC): S520, December 2003; "*Standard and Reference Guide for Professional Mould Remediation*".

Although there are no regulatory requirements or guidelines in Ontario for such an assessment, the preceding protocols have become accepted as the industry standard by most experts, consultants, and the Ontario Ministry of Labour.

2.5 Survey of Other Hazardous Materials

Materials or equipment suspected of containing ODS, UFFI and other Designated Substances are identified by appearance, age, and knowledge of historic applications.

3. FINDINGS AND DISCUSSION

3.1 Asbestos

The following outlines the extent to which asbestos-containing materials (ACM) were identified in the Project Area. The discussion is organized under the headings of materials that are generally suspected of containing asbestos. Please refer to Table 1 for sample details and laboratory analysis results. As per *Ontario Regulation 278/05*, only materials containing 0.5% or more asbestos by dry weight are considered to be asbestos-containing.

Table 1: Summary of Analysis of Asbestos Bulk Samples			
Sample Number	**Sample Location**	**Sample Description**	**Results**
28228-ASB-01A	Vestibule (Loc. 1045)	Brick mortar on wall	None Detected
28228-ASB-01B	Vestibule (Loc. 1045)	Brick mortar on wall	None Detected
28228-ASB-01C	Vestibule (Loc. 1045)	Brick mortar on wall	None Detected
28228-ASB-02A	Storage Room 1050B (Loc.4047)	9” x 9” Vinyl floor tile – Brown with black streaks	**8% Chrysotile**
		Black mastic	None Detected
28228-ASB-02B	Storage Room 1050B (Loc.4047)	9” x 9” Vinyl floor tile – Brown with black streaks	**Not Analyzed (Stop positive)**
		Black mastic	None Detected
28228-ASB-02C	Storage Room 1050B (Loc.4047)	9” x 9” Vinyl floor tile – Brown with black streaks	**Not Analyzed (Stop positive)**
		Black mastic	None Detected
28228-ASB-03A	Mechanical Room (Loc. 2090A)	Parging cement on air handling unit	**55% Chrysotile**
28228-ASB-03B	Mechanical Room (Loc. 2090A)	Parging cement on air handling unit	**Not Analyzed (Stop positive)**
28228-ASB-03C	Mechanical Room (Loc. 2090A)	Parging cement on air handling unit	**Not Analyzed (Stop positive)**
28228-ASB-04A	Mechanical Room (Loc. 1027)	Block Fill	None Detected
		Concrete block mortar on walls	None Detected
28228-ASB-04B	Mechanical Room (Loc. 2091)	Concrete block mortar on walls	None Detected
28228-ASB-04C	Office 1058A (Loc. 4063)	Concrete block mortar on walls	None Detected
28228-ASB-05A	Roof 504	Dark red caulking on metal support	None Detected
28228-ASB-05B	Roof 504	Dark red caulking on metal support	None Detected
28228-ASB-05C	Roof 504	Dark red caulking on metal support	None Detected
28228-ASB-06A	Roof 503	Off-white caulking on metal support	None Detected
28228-ASB-06A	Roof 503	Off-white caulking on metal support	None Detected
28228-ASB-06A	Roof 503	Off-white caulking on metal support	None Detected
28228-ASB-07A	Roof 402	Light grey caulking on vent	None Detected
28228-ASB-07B	Roof 402	Light grey caulking on vent	None Detected
28228-ASB-07C	Roof 402	Light grey caulking on vent	None Detected

Table 1: Summary of Analysis of Asbestos Bulk Samples			
Sample Number	**Sample Location**	**Sample Description**	**Results**
28228-ASB-08A	Roof 503	Light brown/silver caulking on metal support	None Detected
28228-ASB-08B	Roof 503	Light brown/silver caulking on metal support	None Detected
28228-ASB-08C	Roof 503	Light brown/silver caulking on metal support	None Detected
28228-ASB-09A	Roof 402	White caulking on vent	None Detected
28228-ASB-09B	Roof 402	White caulking on vent	None Detected
28228-ASB-09C	Roof 402	White caulking on vent	None Detected
28228-ASB-10A	Office 1054A (Loc. 4058)	Drywall joint compound on ceiling	None Detected
28228-ASB-10B	Office 1054A (Loc. 4058)	Drywall joint compound on ceiling	None Detected
28228-ASB-10C	Office 1054A (Loc. 4058)	Drywall joint compound on ceiling	None Detected
28228-ASB-11A	Storage Room 1057 (Loc. 4064)	Sweat wrap insulation on ducts – Wrap	None Detected
		Sweat wrap insulation on ducts - Tar	None Detected
		Sweat wrap insulation on ducts - Insulation	None Detected
28228-ASB-11B	Storage Room 1057 (Loc. 4064)	Sweat wrap insulation on ducts – Wrap	None Detected
		Sweat wrap insulation on ducts - Tar	None Detected
		Sweat wrap insulation on ducts - Insulation	None Detected
28228-ASB-11C	Storage Room 1057 (Loc. 4064)	Sweat wrap insulation on ducts – Wrap	None Detected
		Sweat wrap insulation on ducts - Tar	None Detected
		Sweat wrap insulation on ducts - Insulation	None Detected
28228-ASB-12	Roof 402	Roofing material – Tar paper	None Detected
		Roofing material – Foam	None Detected
		Roofing material – Tar	None Detected
		Roofing material – Tar felt	None Detected

Table 1: Summary of Analysis of Asbestos Bulk Samples			
Sample Number	**Sample Location**	**Sample Description**	**Results**
28228-ASB-13	Roof 501	Roofing material – Tar	None Detected
		Roofing material – Tar Felt	None Detected
		Roofing material - Fiberboard	None Detected
		Roofing material – Tar paper	None Detected
		Roofing material – Tar dot	None Detected
		Roofing material – Foam	None Detected
28228-ASB-14	Roof 701	Roofing material – Tar	None Detected
		Roofing material – Tar felt	None Detected
		Roofing material – Fiberboard	None Detected
		Roofing material – Tar paper	None Detected
		Roofing material – Foam	None Detected
28228-ASB-15	Roof 503	Roofing material – Shingle	None Detected
		Roofing material – Tar	None Detected
		Roofing material – Fiberboard	None Detected
		Roofing material – Tar dot	None Detected
		Roofing material - Foam	None Detected
		Roofing material – Tar paper	None Detected
28228-ASB-16	Roof 601	Roofing material – Shingle	None Detected
		Roofing material – Tar	None Detected
		Roofing material – Tar felt	None Detected
		Roofing material - Fiberboard	None Detected
		Roofing material - Foam	None Detected
	- shading indicates sample result positive for asbestos (if applicable)		

3.1.1 Thermal Mechanical Insulation (Friable)

Non-asbestos and **asbestos-containing** mechanical insulations are present in the Project Area. The following presents a brief description of the mechanical insulations and the systems to which they are applied.

3.1.1.1 Piping systems

Pipe fittings/systems are present throughout the Project Area and are either not insulated, insulated with non-asbestos materials (i.e. fiberglass), or insulated with **asbestos-containing materials.**

- Parging cement on pipe fittings were observed within Mechanical room 2090A and Mechanical Room 2091. This material was previously sampled, reflected in the "Glendale Secondary School Asbestos Inventory" dated April 2023, prepared by the Regulated Substance Team, and determined to be **asbestos-containing (50-75% Chrysotile)**. This material may be disturbed during upcoming renovations.

Piping with **asbestos-containing** materials may be present throughout the Project Area in concealed areas such as above solid ceilings, within wall cavities, below floor slab, and other inaccessible areas. If suspect piping materials are encountered during demolition, stop work in the area and contact ECOH to assess.

3.1.1.2 Duct Systems

Duct systems observed throughout the Project Area were either not insulated, or were insulated with non-asbestos materials (i.e. fiberglass, sweat wrap).

- Sweat wrap insulation on ducts was observed in various locations of the Project Area. Three (3) representative samples (Sample ID: 28228-ASB-11A-C) of this material were collected from Storage Room 1057 (Loc. 4064) and determined by laboratory analysis to be non-asbestos. This material is expected to be disturbed during upcoming renovations.

- Flexible duct connectors were observed within the Project Area. This material is **presumed to be asbestos-containing.** This material was not sampled as to avoid damage to material associated with active HVAC system. This material is expected to be disturbed during upcoming renovations.

Additional ductwork with asbestos containing materials (insulation, mastic, etc.) may be present throughout the Project Area in concealed areas such as above ceilings, within wall cavities, and other inaccessible areas.

3.1.1.3 Mechanical Equipment

Mechanical equipment observed throughout the Project Area were either not insulated or were insulated with **asbestos-containing** materials.

- Parging cement was observed on air handling unit (AHU) within Mechanical Room 2090A of the Project Area. Three (3) representative samples (Sample ID: 28228-ASB-03A-C) of this material were collected from Mechanical Room 2090A and determined by laboratory analysis to be **asbestos-containing (55% Chrysotile).** This material is expected to be disturbed during upcoming renovations.

- Boilers were observed within Mechanical Room 1027 (Loc. 4026) of the Project Area. Due to manufacture date for all boilers (1985), friable asbestos-containing materials are not suspected to be present as a component of internal insulation.

3.1.2 Spray Fireproofing (Friable)

Sprayed fireproofing was not observed in the Project Area during this survey.

3.1.3 Texture Coat (Friable)

Texture coat was not observed in the Project Area during this survey.

3.1.4 Vermiculite Insulation (Friable)

Vermiculite insulation was not observed during this survey, however intrusive testing was not completed, and vermiculite insulation may be present in concealed areas such as wall cavities and above solid ceilings.

3.1.5 Plaster (Potentially Friable)

Plaster was observed on beam enclosures and ceiling within the Project Area during the survey. This material was previously sampled, reflected in the "Glendale Secondary School Asbestos Inventory" dated April 2023, prepared by the Regulated Substance Team, and determined to be **asbestos-containing (0.5-5% Chrysotile)**. This material is expected to be disturbed during upcoming renovations.

3.1.6 Drywall Joint Compound (DJC) (Non-Friable)

Drywall Joint Compound was observed within the Project Area. Three (3) representative samples (Sample ID: 28228-ASB-10A-C) of this material were collected from Office 1054A (Loc. 4058) and determined by laboratory analysis to be non-asbestos. This material is expected to be disturbed during upcoming renovations.

3.1.7 Mortar (Non-Friable)

Two (2) visually distinct types of mortar were observed within the Project Area:

- Concrete block mortar was observed within the Project Area. Three (3) representative samples (Sample ID: 28228-ASB-04A-C) of this material were collected from various locations within the project Area and determined by laboratory analysis to be non-asbestos. This material is expected to be disturbed during upcoming renovations.

- Brick mortar was observed within the Project Area. Three (3) representative samples (Sample ID: 28228-ASB-01A-C) of this material were collected from Vestibule 1045 of the Project Area and determined by laboratory analysis to be non-asbestos. This material is expected to be disturbed during upcoming renovations.

3.1.8 Acoustic Ceiling Tiles (Non-Friable)

Various types of acoustic ceiling tiles were observed within the Project Area. These materials were previously sampled, reflected in the "Glendale Secondary School Asbestos Inventory" dated April 2023, prepared by the Regulated Substance Team, and determined to be non-asbestos. This material is expected to be disturbed during upcoming renovations.

3.1.9 Asbestos Cement (Non-Friable)

Transite panels were observed within Corridor 1048 (Loc. 4049) of the Project Area. This material was previously sampled, reflected in the "Glendale Secondary School Asbestos Inventory" dated April 2023, prepared by the Regulated Substance Team, and determined to be **asbestos-containing.** This material is expected to be disturbed during upcoming renovations.

3.1.10 Vinyl Floor Tile (VFT) (Non-Friable)

Vinyl floor tiles were observed within the Project Area during this survey.

- 9" x 9" Vinyl floor tile (brown with black streaks) was observed within Storage Room 1050B (Loc. 4047). Three (3) representative samples (Sample ID: 28228-ASB-02A-C) of this material were collected from Storage Room 1050B (Loc. 4047) within the project Area and determined by laboratory analysis to be **asbestos-containing (8% Chrysotile)**. This material is expected to be disturbed during upcoming renovations.

3.1.11 Roofing Materials

Roofing materials are present within the Project Area.

- Roofing materials scheduled for disturbance are present on Roof Sections 402, 501, 701, 503, 601 within the Project Area. Representative samples of these material (28228-ASB-12-16) were collected from the Project Area and determined by laboratory analysis to be non-asbestos. These materials are expected to be disturbed during upcoming renovations.

3.1.12 Other Materials (Non-Friable)

<u>Caulking</u>

Five (5) distinct types of caulking were observed in the Project Area during this survey.

- Dark red caulking on metal support was observed in the Project Area. Three (3) representative samples (Sample ID: 28228-ASB-05A-C) of this material were collected from the project Area and determined by laboratory analysis to be non-asbestos. This material is expected to be disturbed during upcoming renovations.
- Off-white caulking on metal support was observed in the Project Area. Three (3) representative samples (Sample ID: 28228-ASB-06A-C) of this material were collected

from the project Area and determined by laboratory analysis to be non-asbestos. This material is expected to be disturbed during upcoming renovations.

- Light grey caulking on vent was observed in the Project Area. Three (3) representative samples (Sample ID: 28228-ASB-07A-C) of this material were collected from the project Area and determined by laboratory analysis to be non-asbestos. This material is expected to be disturbed during upcoming renovations.
- Light brown/silver caulking on metal support was observed in the Project Area. Three (3) representative samples (Sample ID: 28228-ASB-08A-C) of this material were collected from the project Area and determined by laboratory analysis to be non-asbestos. This material is expected to be disturbed during upcoming renovations.
- White caulking on vent was observed in the Project Area. Three (3) representative samples (Sample ID: 28228-ASB-09A-C) of this material were collected from the project Area and determined by laboratory analysis to be non-asbestos. This material is expected to be disturbed during upcoming renovations.

3.2 Lead

Although no regulations exist in Ontario to define a lead-based paint or lead-containing material, guidelines indicate that paint containing 0.5% lead concentration by dry weight (i.e. concentrations of lead at or above 0.5%, or 5000 parts per million (ppm)) is considered to be a lead-based paint or lead-containing material.

Paints or surface coatings that contain concentrations of lead greater than 0.1% by dry weight (1000 ppm), and less than 0.5% by dry weight (5000 ppm), is considered to be a “lead-containing paint or surface coating”.

Paints or surface coatings that contain concentrations of lead at, or below, 0.1% by dry weight (1000 ppm) is considered to be a “low-level lead paint or surface coating”.

The presence of lead in paint and mortar was assessed by the collection and submission of bulk material samples to a professional laboratory for analysis by flame atomic absorption spectroscopy.

Please refer to Table 2 for sample details and laboratory analysis results for paints scheduled for potential disturbance. Certificates of Analysis and Chains of Custody are presented in Appendix II.

Table 2: Summary of Analysis for Lead Samples

Sample number	Location	Description	Analytical Results	Result
28228-Pb-01	Roof 504	Yellow paint on gas pipe	**30000 ppm**	**Lead-Based**

Table 2: Summary of Analysis for Lead Samples				
28228-Pb-02	Mechanical Room 1027 (4026)	Concrete block mortar	<40mg/Kg	Low-Level Lead
28228-Pb-03	Vestibule 1045	Brick mortar	<40mg/Kg	Low-Level Lead
28228-Pb-04	Mechanical Room 1027 (Loc. 4026)	Light blue paint on boiler	<480 ppm	Low-Level Lead
28228-Pb-05	Mechanical Room 1027 (Loc. 4026)	Blue paint on floor	**1400 ppm**	**Lead-Containing**
28228-Pb-06	Mechanical Room 2091	Grey paint on ducts and AHU	**6400 ppm**	**Lead-Based**
28228-Pb-07	Mechanical Room 2091	Light yellow paint on walls	540 ppm	Low-Level Lead
28228-Pb-08	Storage Room 1056B (Loc. 4062)	Light pink paint on walls	480 ppm	Low-Level Lead
28228-Pb-09	Mechanical Room 1027 (4026)	Black paint on concrete pads	<80 ppm	Low-Level Lead
	- shading indicates sample result positive for lead (if applicable)			

Three (3) of the sampled materials (paints) were determined to be lead-containing:

- Yellow paint on gas pipe – **30,000 ppm**
- Grey paint on ducts and AHU – **6400 ppm**
- Blue paint on floor **– 1400 ppm**

Additional paints including white paint on ceiling, off-white paint on ducts and ceiling were observed within the Project Area. These materials were previously sampled and reflected in the "Glendale Secondary School Asbestos Inventory" dated April 2023, prepared by the Regulated Substance Team, and determined to be low-level lead. These materials are expected to be disturbed during upcoming renovations.

No other major sources of lead or lead-containing products were observed during this survey. However, lead may be present in:

- Internal batteries associated with emergency lighting system,
- Wiring connectors and electric cable sheathing,
- Piping and solder joints on piping, and
- Cast iron pipe joint packing.

3.3 Mould

Mould was not observed in the Project Area during this survey.

3.4 Mercury

Mercury may be present in minor quantities within the Project Area in the forms below. Items suspected to contain mercury were noted to be in good condition.

- As a vapour within fluorescent tubes lights or compact fluorescent lamp (CFL) bulbs,
- As a possible constituent of thermostats, and
- As a possible constituent of paints and adhesives.

3.5 Silica

Free crystalline silica, in the form of common construction sand, is present in all concrete and masonry products within the Project Area.

3.6 Polychlorinated Biphenyls (PCBs)

The presence of Polychlorinated Biphenyls (PCBs) in materials present in Project Area was assessed by collection and submission of bulk material samples to a professional laboratory analysis. PCB Regulations, SOR/2008-273, stipulates that any solid material that contains 50 parts per million (ppm) PCBs shall be treated as a PCB-containing material.

- One (1) sample of brown/silver caulking on metal was collected from Roof 503 and determined by laboratory to be non-PCB containing. This material is likely to be disturbed during upcoming renovations.
- One (1) sample of white caulking on vent was collected from Roof 402 and determined by laboratory to be non-PCB containing. This material is likely to be disturbed during upcoming renovations.
- One (1) sample of dark-red caulking on metal support was collected from Roof 504 and determined by laboratory to be non-PCB containing. This material is likely to be disturbed during upcoming renovations.
- One (1) sample of off-white caulking on metal support and AHU unit was collected from Roof 503 and determined by laboratory to be non-PCB containing. This material is likely to be disturbed during upcoming renovations.
- One (1) sample of light grey caulking on vent unit was collected from 402 and determined by laboratory to be non-PCB containing. This material is likely to be disturbed during upcoming renovations.

Laboratory analysis determined that all sampled materials are non-PCB-containing materials (i.e. <50 ppm).

3.7 Other Environmental Considerations

The environmental audit also included an investigation for the following compounds, none of which were found to be present:

- Acrylonitrile
- Arsenic
- Benzene
- Coke Oven Emissions
- Ethylene Oxides
- Isocyanates
- Vinyl Chloride Monomer
- Ozone Depleting Substances

Please note: paint, adhesives and plastics present throughout the project area may contain trace amounts of Acrylonitrile, Arsenic, Benzene, Ethylene Oxides, Isocyanates, Lead, Mercury, and Vinyl Chloride Monomer. However, none of these materials were observed in a hazardous or unsafe condition. Dust suppression and personal protection procedures should be implemented during the demolition of materials that may contain any of the above-mentioned substances.

4. RECOMMENDATIONS

The following recommendations meet requirements of the Occupational Health and Safety Act. Asbestos recommendations meet the requirements of the Designated Substance – Regulation respecting *Asbestos on Construction Projects and in Buildings and Repair Operations*, Ontario Regulation 278/05. Based upon the results of ECOH's investigations, ECOH offers the following recommendations:

4.1 Asbestos

As asbestos-containing materials (ACM) are present within the Project Area, ECOH recommends that all workers have asbestos awareness and respirator training before commencing work. Asbestos awareness training will provide on-site workers with the understanding of asbestos-related health and safety issues; the ability to recognize ACM and any situation that may present a potential asbestos exposure, and the ability to respond appropriately to an inadvertent disturbance of ACM in the work area.

Prior to renovation work, asbestos-containing materials should be removed from the Project Area. Removal or disturbance of asbestos-containing materials must be conducted using asbestos safety procedures detailed within Ontario Regulation 278/05, regulation respecting *Asbestos on Construction Projects and in Building and Repair Operations* – made under the Occupational Health and Safety Act.

Regarding the removal or disturbance of non-friable **asbestos-containing** materials (Transite panels, vinyl floor tiles, flexible duct connectors), if required:

- Type 1 Asbestos Safety Precautions should be utilized for the disturbance or removal of the aforementioned **asbestos-containing** materials, provided that materials are wetted to control the spread of dust or fibres and work is completed using non-powered hand-held tools.
- Type 2 Asbestos Safety Precautions should be utilized for the disturbance removal of the aforementioned **asbestos-containing** materials, or if the work is done by means of power tools that are attached to dust-collecting devices equipped with HEPA filters.
- Type 3 Asbestos Safety Precautions should be utilized for the disturbance removal of the aforementioned **asbestos-containing** materials, if the work is done by means of power tools that are not attached to dust-collecting devices equipped with HEPA filters.

Regarding the removal or disturbance of friable **asbestos-containing** materials (plaster, parging cement on fittings, parging cement on AHU) if required;

- Type 2 Asbestos Safety Precautions should be utilized for the disturbance or removal of one square meter or less of friable **asbestos-containing** materials, if work is completed using non-powered hand tools.
- Type 2 Glove Bag Asbestos Safety Precautions should be utilized for the disturbance or removal of friable **asbestos-containing materials**.
- Type 3 Asbestos Safety Precautions should be utilized for the disturbance or removal of more than one square meter of friable **asbestos-containing** materials.

Any demolition, renovation or maintenance activities involving materials found NOT to contain asbestos, should implement general health and safety precautions including, in part, the use of dust suppression techniques and appropriate respiratory protection.

During work, if additional materials are revealed beyond what are described in the existing asbestos survey report or in this report (i.e., materials not identified, materials that are not homogenous to those identified, or materials that become revealed during the work), additional testing for asbestos-content should be completed immediately and prior to disturbance of the material. Alternatively, these materials can be assumed to contain asbestos, and the appropriate level of asbestos safety precautions must be implemented.

Results presented within this report should be used to update facility asbestos inventory data.

4.2 Lead

Any work involving the disturbance of building materials confirmed or assumed to contain lead (e.g. paints etc.), should be conducted following recommendations detailed within the Ministry of Labour document Guideline - Lead on Construction Projects, dated April 2011, and the Environmental Abatement Council of Canada (EACC) Lead Guideline, dated October 2014.

Work shall be classified as follows, as per the EACC Lead Guideline:

- Removal of lead-containing or lead-based paints and surface coatings with a chemical gel/stripper or paste is a Class 1 lead operation.
- Removal of lead-containing or lead-based paints and surface coatings with a heat gun is a Class 1 lead operation.
- Removal of materials coated with lead-containing or lead-based paints and surface coatings, using non-powered hand tools, where the material remains chiefly intact and is not crumbled, pulverized or powdered is a Class 1 lead operation.
- Removal of lead-containing coatings or materials using a power tool that has an effective dust collection system equipped with a HEPA filter is a Class 2a lead operation,
- Removal of lead-containing or lead-based paints or materials by scraping or sanding using non-powered hand tools is a Class 2a lead operation,
- Manual demolition of lead-painted plaster walls (or similar building components that will crumble, pulverize, or powder) when striking with a sledgehammer or similar tool is a Class 2a lead operation,
- Removal of lead-containing coatings or materials using power tools without an effective dust collection system equipped with a HEPA filter is a Class 3a lead operation,
- Abrasive blasting of lead-containing coatings or materials is a Class 3b lead operation.

Renovation, demolition or general construction work involving the removal of materials containing only trace concentrations of lead (i.e. lead concentrations below 0.1% by dry weight, or 1000 ppm) can be completed without lead specific safety precautions provided that:

a) Work does not include 'fume generating activities' (heat producing) such as welding, torching, burning, high temperature cutting, etc.,
b) Work does not include dust-generating activities such as grinding, cutting or chemical stripping,
c) Dust levels are maintained below 3 mg/m^3, and

General health and safety construction procedures are implemented, which would include dust suppression methods, proper respiratory protection (minimum of a ½-face respirator) and protective clothing, as is appropriate for the work being completed.

4.3 Mould

All recommended removal of mould-affected materials (i.e. mould-affected counter tops, wood panelling and wallpaper, wood baseboards etc.) shall be completed following the Canadian Construction Association (CCA) 2004 Mould Guidelines for the Canadian Construction Industry, or Environmental Abatement Council of Canada (EACC) document; “Mould Abatement Guidelines”, Edition 3, 2015.

4.4 Mercury

The presence of mercury within assembled units (e.g., fluorescent light bulbs and thermostat bulbs) should not be considered a hazard provided that the assembled units remain sealed and

intact. Avoid direct skin contact with mercury and avoid inhalation of mercury vapour. Dispose of mercury following applicable legislative requirements.

4.5 Polychlorinated Biphenyls (PCB)

Confirmed or assumed material to contain polychlorinated biphenyls (PCBs) must be disposed of following the requirements of the Ontario Environmental Protection Act, Ontario Regulation 362: PCB Waste Management and Ontario Regulation 347: General-Waste Management (as amended by O. Reg. 558/00).

4.6 Silica

Any work involving the disturbance of materials that may contain silica should be conducted following recommendations detailed in the Ministry of Labour document "*Guideline - Silica on Construction Projects*", dated April 2011.

5. STATEMENT OF LIMITATIONS

Due to the nature of building construction, and on-going building activities, some limitations exist to the thoroughness of a building assessment. The field observations, measurements and analysis are considered sufficient in detail and scope to form a reasonable basis for the findings and conclusions presented in this report. The observations, results and conclusions drawn by ECOH Management Inc. (ECOH) are limited to the specific scope of work for which ECOH was retained and are based solely on information generated as a result of the specific scope of work authorized by the Hamilton Wentworth District School Board. Only those items that are capable of being observed and are reasonably obvious to ECOH personnel or have been identified to ECOH by other parties, can be reported. ECOH has exercised a degree of thoroughness and competence that is consistent with the profession during the execution of this assessment. ECOH considers the opinions and information as they are presented in this report to be factual at the time of the assessment. The conclusions are limited to the specific locations of where testing and/or observations were completed during the course of the assessment.

It is important to note that work was completed with the utmost care and our extensive expertise in carrying out assessments. ECOH believes that the information collected during the assessment concerning the Work Area is reliable. No other warranties are implied or expressed. ECOH, to the best of its knowledge, believes this report to be accurate, however, ECOH cannot guarantee the completeness or accuracy of information supplied to ECOH by third parties. It should also be noted that any investigation regarding the presence of hazardous materials in the work area is based on interpretation of conditions determined at specific sampling locations, and conditions may vary between sampling locations. ECOH is an Environmental Consulting Company and as such any results or conclusions presented in this report should not be construed as legal advice. The material in this report reflects ECOH's professional interpretation of information available at the time of report preparation. Any use

which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. ECOH accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Should additional information become available that suggests other environmental issues of concern beyond that described in this report, ECOH retains the right to review this information and modify conclusions and recommendations presented in this report accordingly.

Should you have any questions, please do not hesitate to contact us at (905) 795-2800.

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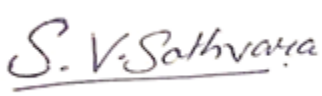
Occupational Health

Prepared by:



Stuti Sathvara, B.Sc. (Env)
Environmental Scientist

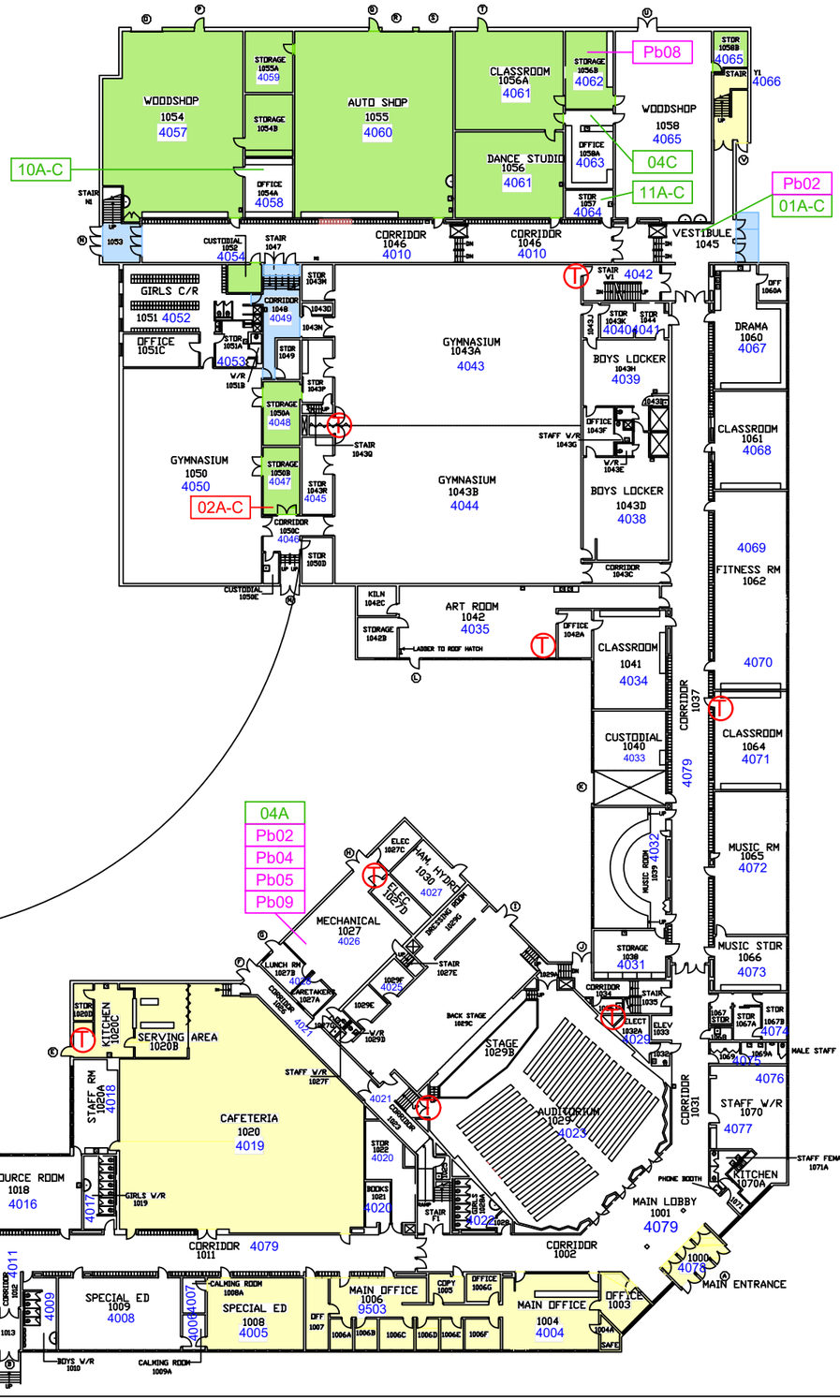
Reviewed by:

Elliot Dametto, B.Sc.
Project Manager

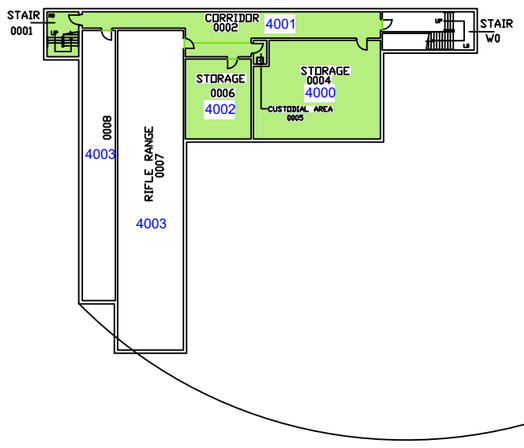
APPENDIX I

Project Drawings

FIRST FLOOR



BASEMENT



Legend

01a	Positive Asbestos Bulk Sample Location (28228-ASB-xx)
01a	Negative Asbestos Bulk Sample Location (28228-ASB-xx)
Pb01	Lead Bulk Sample Location (28228-Pb-xx)
	Asbsestos-Containing Rough Plaster on Walls and Ceiling
	Asbestos-Containing Transite Panels
	Asbestos-Containing Drywall Joint Compound
T	Tunnel Access Restricted to Confined Space Protocol & Type 2 Asbestos Prcedures

All information relating to room size and location is approximate and for visual aid only. ECOH does not guarantee the drawing to be complete, absolute, accurate or current. The drawing should not be used by any party in lieu of obtaining architectural drawings.

Figure 1

Basement & First Floor Plan

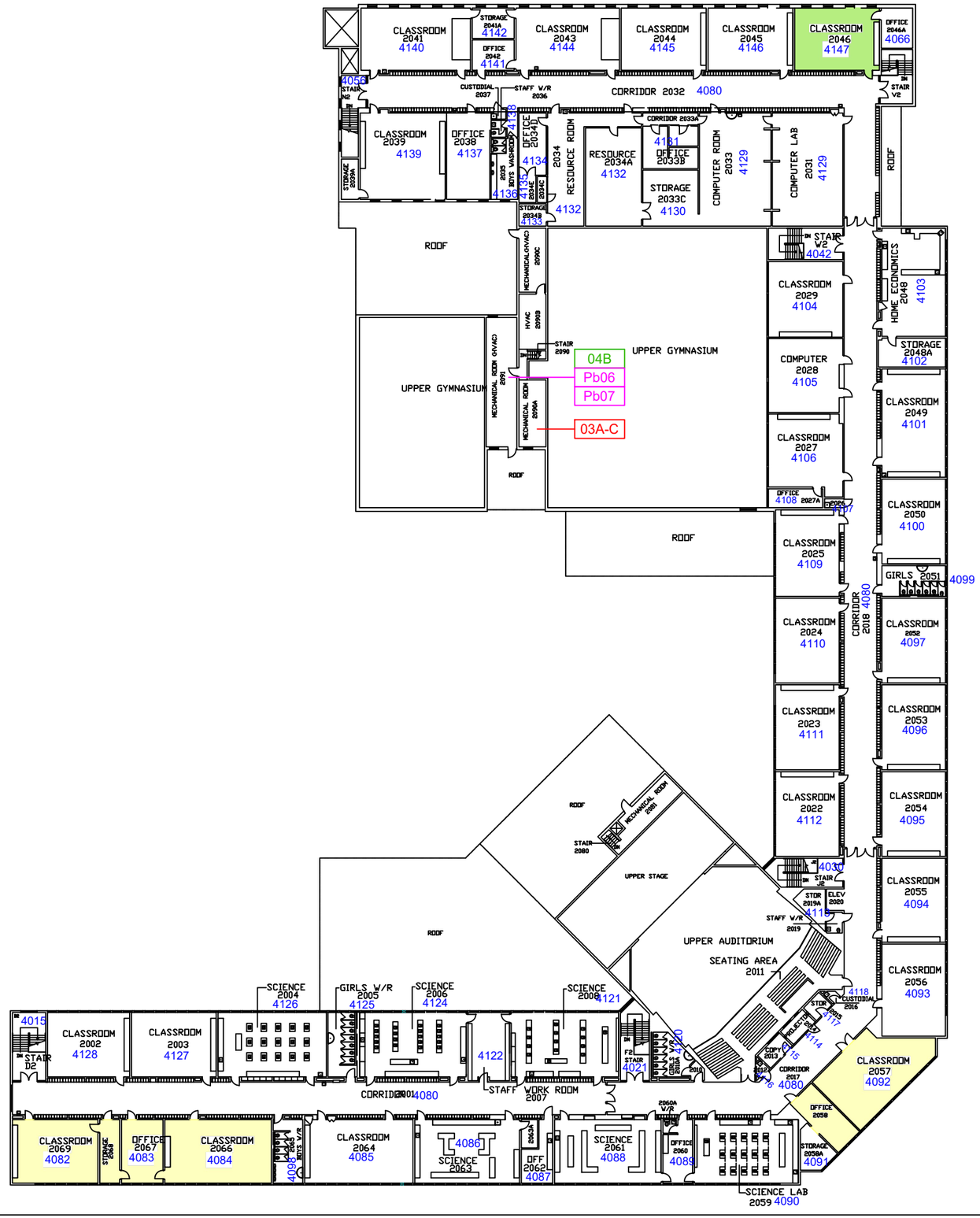
BUILDING NAME:
Glendale Secondary School

LOCATION:
145 Rainbow Drive,
Hamilton, Ontario

PROJECT:
Pre-Renovation Designated Substances Survey

CLIENT: Hamilton-Wentworth Disctrict School Board			
PROJECT NUMBER: 28228	DATE: Dec. 2023	DRW BY: EM	
CAD FILE: FIGS P28228 HWDSB Glendale SS DSS	SCALE: Not to Scale	CHK BY: SS	

P:\28200 - 28299\28228 - HWDSB, Glendale SS, Boiler and AHU Replacement - DSS\CAD\CAD File



P:\28200 - 28299\28228 - HWDSB, Glendale SS, Boiler and AHU Replacement - DSS\CAD\CAD File

Legend

01a	Positive Asbestos Bulk Sample Location (28228-ASB-xx)
01a	Negative Asbestos Bulk Sample Location (28228-ASB-xx)
Pb01	Lead Bulk Sample Location (28228-Pb-xx)
	Asbsestos-Containing Rough Plaster on Walls and Ceiling
	Asbestos-Containing Transite Panels
	Asbestos-Containing Drywall Joint Compound
T	Tunnel Access Restricted to Confined Space Protocol & Type 2 Asbestos Prcedures

All information relating to room size and location is approximate and for visual aid only. ECOH does not guarantee the drawing to be complete, absolute, accurate or current. The drawing should not be used by any party in lieu of obtaining architectural drawings.

Figure 2

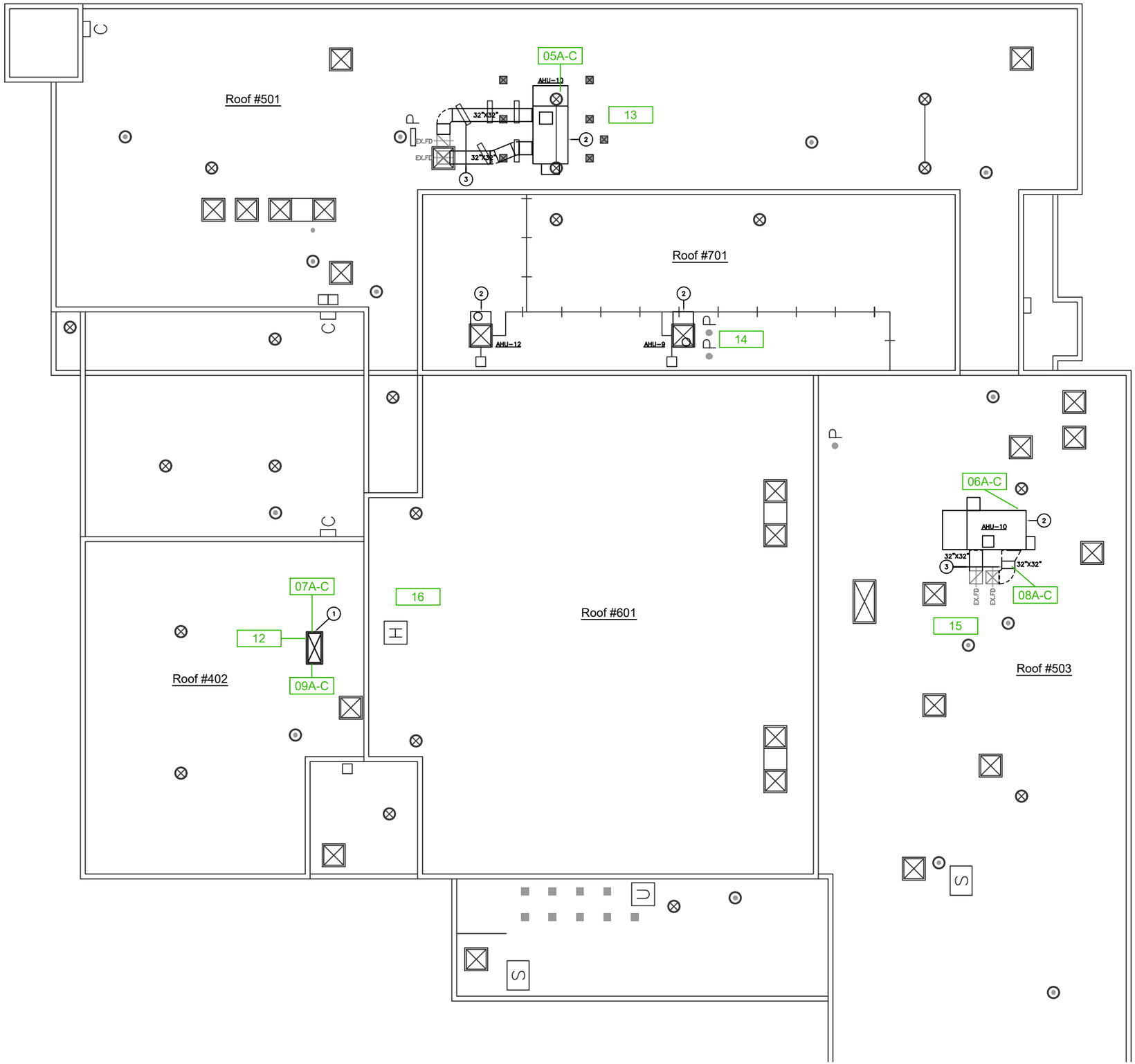
Second Floor Plan

BUILDING NAME:
Glendale Secondary School

LOCATION:
145 Rainbow Drive,
Hamilton, Ontario

PROJECT:
Pre-Renovation Designated Substances Survey

CLIENT: Hamilton-Wentworth Disctrict School Board			
PROJECT NUMBER: 28228	DATE: Dec. 2023	DRW BY: EM	
CAD FILE: FIGS P28228 HWDSB Glendale SS DSS	SCALE: Not to Scale	CHK BY: SS	



Legend

- 01a — Positive Asbestos Bulk Sample Location (28228-ASB-xx)
- 01a — Negative Asbestos Bulk Sample Location (28228-ASB-xx)
- Pb01 — Lead Bulk Sample Location (28228-Pb-xx)
- Asbsestos-Containing Rough Plaster on Walls and Ceiling
- Asbestos-Containing Transite Panels
- Asbestos-Containing Drywall Joint Compound
- Ⓣ — Tunnel Access Restricted to Confined Space Protocol & Type 2 Asbestos Prcedures

All information relating to room size and location is approximate and for visual aid only. ECOH does not guarantee the drawing to be complete, absolute, accurate or current. The drawing should not be used by any party in lieu of obtaining architectural drawings.

Figure 3

Roof Plan

BUILDING NAME:
Glendale Secondary School

LOCATION:
145 Rainbow Drive,
Hamilton, Ontario

PROJECT:
Pre-Renovation Designated Substances Survey

CLIENT: Hamilton-Wentworth Disctrict School Board			
PROJECT NUMBER: 28228	DATE: Dec. 2023	DRW BY: EM
CAD FILE: FIGS P28228 HWDSB Glendale SS DSS	SCALE: Not to Scale	CHK BY: SS

P:\28200 - 28299\28228 - HWDSB, Glendale SS, Boiler and AHU Replacement - DSS\CAD\CAD File

APPENDIX II

Results of Bulk Sample Analysis

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Tel/Fax: (289) 997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order:	552318509
Customer ID:	55ECOH45
Customer PO:	28228
Project ID:	

Attention:	Stuti Sathvara	**Phone:**	(905) 795-2800
	ECOH Management, Inc.	**Fax:**	(905) 795-2870
	75 Courtneypark Drive West	**Received Date:**	11/27/2023 12:56 PM
	Unit 1	**Analysis Date:**	11/30/2023
	Mississauga, ON L5W 0E3	**Collected Date:**	11/24/2023
Project:	28228 / Glendale SS - Boiler and AHU Replacement DSS		

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
28228-ASB- 01 A *552318509-0001*	Brick Mortar - Vestibule (Loc. 1045)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 01 B *552318509-0002*	Brick Mortar - Vestibule (Loc. 1045)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 01 C *552318509-0003*	Brick Mortar - Vestibule (Loc. 1045)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 02 A-Floor Tile *552318509-0004*	9" x 9" Vinyl Floor Tiles - Brown with Black Streaks - Storage Room (Loc. 1050B)	Tan Non-Fibrous Homogeneous		92% Non-fibrous (Other)	8% Chrysotile
28228-ASB- 02 A-Mastic *552318509-0004A*	9" x 9" Vinyl Floor Tiles - Brown with Black Streaks - Storage Room (Loc. 1050B)	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 02 B-Floor Tile *552318509-0005*	9" x 9" Vinyl Floor Tiles - Brown with Black Streaks - Storage Room (Loc. 1050B)				Positive Stop (Not Analyzed)
28228-ASB- 02 B-Mastic *552318509-0005A*	9" x 9" Vinyl Floor Tiles - Brown with Black Streaks - Storage Room (Loc. 1050B)	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 02 C-Floor Tile *552318509-0006*	9" x 9" Vinyl Floor Tiles - Brown with Black Streaks - Storage Room (Loc. 1050B)				Positive Stop (Not Analyzed)
28228-ASB- 02 C-Mastic *552318509-0006A*	9" x 9" Vinyl Floor Tiles - Brown with Black Streaks - Storage Room (Loc. 1050B)	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 03 A *552318509-0007*	Parging cement on Air Handling Unit - Mechanicalo Room (Loc. 2090A)	White Fibrous Homogeneous		45% Non-fibrous (Other)	55% Chrysotile
28228-ASB- 03 B *552318509-0008*	Parging cement on Air Handling Unit - Mechanicalo Room (Loc. 2090A)				Positive Stop (Not Analyzed)

Initial report from: 11/30/2023 13:32:34

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2756 Slough Street Mississauga, ON L4T 1G3
Tel/Fax: (289) 997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order:	552318509
Customer ID:	55ECOH45
Customer PO:	28228
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
28228-ASB- 03 C *552318509-0009*	Parging cement on Air Handling Unit - Mechanicalo Room (Loc. 2090A)				Positive Stop (Not Analyzed)
28228-ASB- 04 A-Block Fill *552318509-0010*	Concrete Block mortar on walls - Mechanical Room (Loc. 1027)	Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 04 A-Mortar *552318509-0010A*	Concrete Block mortar on walls - Mechanical Room (Loc. 1027)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 04 B *552318509-0011*	Concrete Block mortar on walls - Mechanical Room (Loc. 2091)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 04 C *552318509-0012*	Concrete Block mortar on walls - Office (Loc. 1058A)	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 05 A *552318509-0013*	Dark red caulking on metal support - Roof 504	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 05 B *552318509-0014*	Dark red caulking on metal support - Roof 504	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 05 C *552318509-0015*	Dark red caulking on metal support - Roof 504	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 06 A *552318509-0016*	Offwhite caulking on metal support - Roof 503	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 06 B *552318509-0017*	Offwhite caulking on metal support - Roof 503	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 06 C *552318509-0018*	Offwhite caulking on metal support - Roof 503	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 07 A *552318509-0019*	Light grey caulking on vent - Roof 402	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 07 B *552318509-0020*	Light grey caulking on vent - Roof 402	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 07 C *552318509-0021*	Light grey caulking on vent - Roof 402	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 08 A *552318509-0022*	Light brown/silver caulking on metal support - Roof 503	Brown/Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 08 B *552318509-0023*	Light brown/silver caulking on metal support - Roof 503	Brown/Silver Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 08 C *552318509-0024*	Light brown/silver caulking on metal support - Roof 503	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 09 A *552318509-0025*	White caulking on vent - Roof 402	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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EMSL Canada Inc.
2756 Slough Street Mississauga, ON L4T 1G3
Tel/Fax: (289) 997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order:	552318509
Customer ID:	55ECOH45
Customer PO:	28228
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
28228-ASB- 09 B *552318509-0026*	White caulking on vent - Roof 402	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 09 C *552318509-0027*	White caulking on vent - Roof 402	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 10 A *552318509-0028*	Drywall joint compound on ceiling - Office (Loc. 1054A)	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 10 B *552318509-0029*	Drywall joint compound on ceiling - Office (Loc. 1054A)	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 10 C *552318509-0030*	Drywall joint compound on ceiling - Office (Loc. 1054A)	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 11 A-Wrap *552318509-0031*	Sweat wrap insulation on ducts - Storage Room (Loc. 1057)	Brown Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
28228-ASB- 11 A-Tar *552318509-0031A*	Sweat wrap insulation on ducts - Storage Room (Loc. 1057)	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 11 A-Insulation *552318509-0031B*	Sweat wrap insulation on ducts - Storage Room (Loc. 1057)	Yellow Fibrous Homogeneous	90% Min. Wool	10% Non-fibrous (Other)	None Detected
28228-ASB- 11 B-Wrap *552318509-0032*	Sweat wrap insulation on ducts - Storage Room (Loc. 1057)	Brown Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
28228-ASB- 11 B-Tar *552318509-0032A*	Sweat wrap insulation on ducts - Storage Room (Loc. 1057)	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 11 B-Insulation *552318509-0032B*	Sweat wrap insulation on ducts - Storage Room (Loc. 1057)	Yellow Fibrous Homogeneous	90% Min. Wool	10% Non-fibrous (Other)	None Detected
28228-ASB- 11 C-Wrap *552318509-0033*	Sweat wrap insulation on ducts - Storage Room (Loc. 1057)	Brown Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
28228-ASB- 11 C-Tar *552318509-0033A*	Sweat wrap insulation on ducts - Storage Room (Loc. 1057)	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 11 C-Insulation *552318509-0033B*	Sweat wrap insulation on ducts - Storage Room (Loc. 1057)	Brown Fibrous Homogeneous	90% Min. Wool	10% Non-fibrous (Other)	None Detected
28228-ASB- 12-Tar *552318509-0034*	Roofing material - Roof 402	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 12-Tar Felt *552318509-0034A*	Roofing material - Roof 402	Black Fibrous Homogeneous	25% Cellulose	75% Non-fibrous (Other)	None Detected
28228-ASB- 12-Fiberboard *552318509-0034B*	Roofing material - Roof 402	Brown Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected

Initial report from: 11/30/2023 13:32:34

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http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order: 552318509
Customer ID: 55ECOH45
Customer PO: 28228
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
28228-ASB- 12-Tar Paper *552318509-0034C*	Roofing material - Roof 402	Brown/Black Fibrous Homogeneous	65% Cellulose	35% Non-fibrous (Other)	None Detected
28228-ASB- 12-Foam *552318509-0034D*	Roofing material - Roof 402	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 13-Tar *552318509-0035*	Roofing material - Roof 501	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 13-Tar Felt *552318509-0035A*	Roofing material - Roof 501	Black Fibrous Homogeneous	25% Cellulose	75% Non-fibrous (Other)	None Detected
28228-ASB- 13-Fiberboard *552318509-0035B*	Roofing material - Roof 501	Brown Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
28228-ASB- 13-Tar Paper *552318509-0035C*	Roofing material - Roof 501	Brown/Black Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (Other)	None Detected
28228-ASB- 13-Tar Dot *552318509-0035D*	Roofing material - Roof 501	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 13-Foam *552318509-0035E*	Roofing material - Roof 501	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 14-Tar *552318509-0036*	Roofing Material - Roof 701	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 14-Tar Felt *552318509-0036A*	Roofing Material - Roof 701	Black Fibrous Homogeneous	25% Cellulose	75% Non-fibrous (Other)	None Detected
28228-ASB- 14-Fiberboard *552318509-0036B*	Roofing Material - Roof 701	Brown Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
28228-ASB- 14-Tar Paper *552318509-0036C*	Roofing Material - Roof 701	Brown/Black Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (Other)	None Detected
28228-ASB- 14-Foam *552318509-0036D*	Roofing Material - Roof 701	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 15-Shingle *552318509-0037*	Roofing Material - Roof 503	Gray/Black Fibrous Homogeneous	15% Cellulose	85% Non-fibrous (Other)	None Detected
28228-ASB- 15-Tar *552318509-0037A*	Roofing Material - Roof 503	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 15-Fiberboard *552318509-0037B*	Roofing Material - Roof 503	Brown Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
28228-ASB- 15-Tar Dot *552318509-0037C*	Roofing Material - Roof 503	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 11/30/2023 13:32:34

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EMSL Canada Order:	552318509
Customer ID:	55ECOH45
Customer PO:	28228
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
28228-ASB- 15-Foam *552318509-0037D*	Roofing Material - Roof 503	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 15-Tar Paper *552318509-0037E*	Roofing Material - Roof 503	Black Fibrous Homogeneous	25% Glass	75% Non-fibrous (Other)	None Detected
28228-ASB- 16-Shingle *552318509-0038*	Roofing Material - Roof 601	Gray/Black Fibrous Homogeneous	15% Cellulose	85% Non-fibrous (Other)	None Detected
28228-ASB- 16-Tar *552318509-0038A*	Roofing Material - Roof 601	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
28228-ASB- 16-Tar Felt *552318509-0038B*	Roofing Material - Roof 601	Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (Other)	None Detected
28228-ASB- 16-Fiberboard *552318509-0038C*	Roofing Material - Roof 601	Brown Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
28228-ASB- 16-Foam *552318509-0038D*	Roofing Material - Roof 601	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Analyst(s)

Kira Ramphal (54)
Hassan Moeez (12)

Matthew Davis or other approved signatory
or Other Approved Signatory

Initial report from: 11/30/2023 13:32:34

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
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EMSL Canada Or	552318508
CustomerID:	55ECOH45
CustomerPO:	28228
ProjectID:	

Attn: **Stuti Sathvara**
ECOH Management, Inc.
75 Courtneypark Drive West
Unit 1
Mississauga, ON L5W 0E3

Phone:	(905) 795-2800
Fax:	(905) 795-2870
Received:	11/27/2023 12:56 PM
Collected:	11/24/2023

Project: **28228 / Glendale SS - Boiler and AHU Replacement DSS**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client SampleDescription	Collected	Analyzed	Weight	RDL	Lead Concentration
28228-Pb- 01	11/24/2023	11/27/2023	0.2453 g	820 ppm	30000 ppm
552318508-0001	Site: Yellow paint on gas pipe - Roof 504				
28228-Pb- 04	11/24/2023	11/27/2023	0.0421 g	480 ppm	<480 ppm
552318508-0004	Site: Light blue paint on boiler - Mechanical Room (Loc. 1027)				
28228-Pb- 05	11/24/2023	11/27/2023	0.2502 g	80 ppm	1400 ppm
552318508-0005	Site: Blue paint on floor - Mechanical Room 9Loc. 1027)				
28228-Pb- 06	11/24/2023	11/27/2023	0.2481 g	400 ppm	6400 ppm
552318508-0006	Site: Grey paint on duct and AHU - Mechanical Room (Loc. 2091)				
28228-Pb- 07	11/24/2023	11/27/2023	0.2473 g	81 ppm	540 ppm
552318508-0007	Site: Light yellow paint on walls - Mechanical Room 9Loc. 2091)				
28228-Pb- 08	11/24/2023	11/27/2023	0.2444 g	82 ppm	480 ppm
552318508-0008	Site: Light pink paint on walls - Storage Room (Loc. 1056B)				
28228-Pb- 09	11/24/2023	11/27/2023	0.2588 g	80 ppm	<80 ppm
552318508-0009	Site: Black paint on concrete pad - mechanical Room (Loc. 1029)				

The reporting limit is based upon the sample weight received

Rowena Fanto, Lead Supervisor
or other approved signatory

Initial report from 11/30/2023 09:03:52

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: (289) 997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	552318508
CustomerID:	55ECOH45
CustomerPO:	28228
ProjectID:	

Attn: **Stuti Sathvara**
ECOH Management, Inc.
75 Courtneypark Drive West
Unit 1
Mississauga, ON L5W 0E3

Phone:	(905) 795-2800
Fax:	(905) 795-2870
Received:	11/27/2023 12:56 PM
Collected:	11/24/2023

Project: **28228 / Glendale SS - Boiler and AHU Replacement DSS**

Test Report: Lead by Flame AAS (SW 846 3050B/7000B)*

Client SampleDescription	*Collected*	*Analyzed*	*Weight (g)*	*RDL*	*Lead Concentration*
28228-Pb- 02	11/24/2023	11/27/2023	0.5007 g	40 mg/Kg	<40 mg/Kg
552318508-0002	Site: Concrete Block mortar - Mechanical Room (Loc. 1027)				
28228-Pb- 03	11/24/2023	11/27/2023	0.5004 g	40 mg/Kg	<40 mg/Kg
552318508-0003	Site: Brick Mortar - Vestibule (Loc. 1045)				

Rowena Fanto, Lead Supervisor
or other approved signatory

* Analysis following Lead in Soil/Solids by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 40 mg/kg based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. Definitions of modifications are available upon request.

Samples analyzed by EMSL Canada Inc. Mississauga, ON

Initial report from 11/30/2023 09:02:55

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: ECOH MANAGEMENT INC.
75 COURTNEYPARK DRIVE WEST UNIT 1
MISSISSAUGA , ON L5W 0E3
(905) 795-2800
ATTENTION TO: Stuti Sathvara
PROJECT: 28228 - HWDSB - Glendale SS
AGAT WORK ORDER: 23T097734
TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor
DATE REPORTED: Dec 01, 2023
PAGES (INCLUDING COVER): 5
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This Certificate shall not be reproduced except in full, without the written approval of the laboratory.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*
- *For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.*

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Certificate of Analysis

AGAT WORK ORDER: 23T097734

PROJECT: 28228 - HWDSB - Glendale SS

CLIENT NAME: ECOH MANAGEMENT INC.

ATTENTION TO: Stuti Sathvara

SAMPLING SITE:

SAMPLED BY:Stuti Sathvara

Total PCBs (caulking)

DATE RECEIVED: 2023-11-27

DATE REPORTED: 2023-12-01

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: Brown/Silver caulking on metal support - Roof	White caulking on vent - Roof 402	Dark red caulking on metal support - Roof 504	Off-white caulking on metal support and AHU	Light grey caulking on vent - Roof 402
				SAMPLE TYPE: Solid	Solid	Solid	Solid	Solid
				DATE SAMPLED: 2023-11-24	2023-11-24	2023-11-24	2023-11-24	2023-11-24
				5496956	5496964	5496965	5496966	5496967
Polychlorinated Biphenyls	µg/g		1	<1	<1	<1	<1	<1
Surrogate	Unit	Acceptable Limits						
Decachlorobiphenyl	%	60-130		72	72	80	116	120

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5496956-5496967 Results are based on the weight of the sample as received.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: ECOH MANAGEMENT INC.

AGAT WORK ORDER: 23T097734

PROJECT: 28228 - HWDSB - Glendale SS

ATTENTION TO: Stuti Sathvara

SAMPLING SITE:

SAMPLED BY:Stuti Sathvara

Trace Organics Analysis

RPT Date: Dec 01, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total PCBs (caulking) Polychlorinated Biphenyls	5496965		< 1	< 1	NA	< 1	105%	60%	140%	96%	60%	140%	NA	60%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

AGAT Laboratories
5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: ECOH MANAGEMENT INC.

AGAT WORK ORDER: 23T097734

PROJECT: 28228 - HWDSB - Glendale SS

ATTENTION TO: Stuti Sathvara

SAMPLING SITE:

SAMPLED BY:Stuti Sathvara

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Polychlorinated Biphenyls	ORG-91-5113	EPA SW-846 3541 & 8082A	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541 & 8082A	GC/ECD

AGAT Laboratories
5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only
Work Order #: 23T097734
Cooler Quantity: 1 bag
Arrival Temperatures: 21.3 | 20.9 | 22.1
Custody Seal Intact: ☐ Yes ☐ No ☒ N/A
Notes: No Ice

Report Information:
Company: ECOH Management Inc.
Contact: Stuti Sathvara
Address: 75 Courtneypark Drive West
Mississauga, ON
Phone: 647-293-9939 Fax:
Reports to be sent to:
1. Email: ssathvara@ecoh.ca
2. Email: edametto@ecoh.ca

Regulatory Requirements:
(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Excess Soils R406
Table (Indicate One)
☐ Regulation 558
☐ CCME

☐ Sewer Use ☐ Sanitary ☐ Storm
(Region)
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Turnaround Time (TAT) Required:
Regular TAT ☐ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☑ 3 Business Days ☐ 2 Business Days ☑ Next Business Day
OR Date Required (Rush Surcharges May Apply):
Please provide prior notification for rush TAT
*TAT is exclusive of weekends and statutory holidays
For 'Same Day' analysis, please contact your AGAT CPM

Project Information:
Project: 28228 - HWDSB - Glendale SS
Site Location: Glendale SS - 145 Rainbow Drive, Hamilon, ON
Sampled By: Stuti Sathvara
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:
Bill To Same: Yes ☐ No ☐
Company: ECOH Managment Inc.
Contact: Accounts Payable
Address: 75 Courtneypark Drive W, Mississauga ON
Email: accounting@ecoh.ca

Sample Matrix Legend
B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC Y/N	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs	O. Reg 153: Analyze F4G if required ☐ Yes ☐ No	O. Reg 153: PAHs	O. Reg 153: PCBs	O. Reg 153: VOC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 406: Excess Soils SPLP Rainwater Leach ☐ Metals ☐ VOCs ☐ SVOCs	O. Reg 406: Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	Potentially Hazardous or High Concentration (Y/N)
Brown/Silver caulking on metal support - Roof	2023/11/24	AM PM										☑						
White caulking on vent - Roof 402	2023/11/24	AM PM										☑						
Dark red caulking on metal support - Roof 504	2023/11/24	AM PM										☑						
Off-white caulking on metal support and AHU	2023/11/24	AM PM										☑						
Light grey caulking on vent - Roof 402	2023/11/24	AM PM																
		AM PM																
		AM PM																
		AM PM																
		AM PM																
		AM PM																
		AM PM																

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Stuti Sathvara	2023/11/27		Nov 27/23		3:38 PM

Page ____ of ____
No:

APPENDIX III

Site Photographs

ECOH
Environmental Consulting
Occupational Health

SITE PHOTOGRAPHS

Client Name:	Site Location:	Project No.
Hamilton Wentworth District School Board	Glendale Secondary School 145 Rainbow Drive, Hamilton, Ontario	28228

Photo No. 1.

Date: November 24, 2023

Location:
Various Locations

Description:

Plaster on beam enclosures and ceilings.

This material was previously confirmed to be asbestos-containing (0.5-5% Chrysotile).

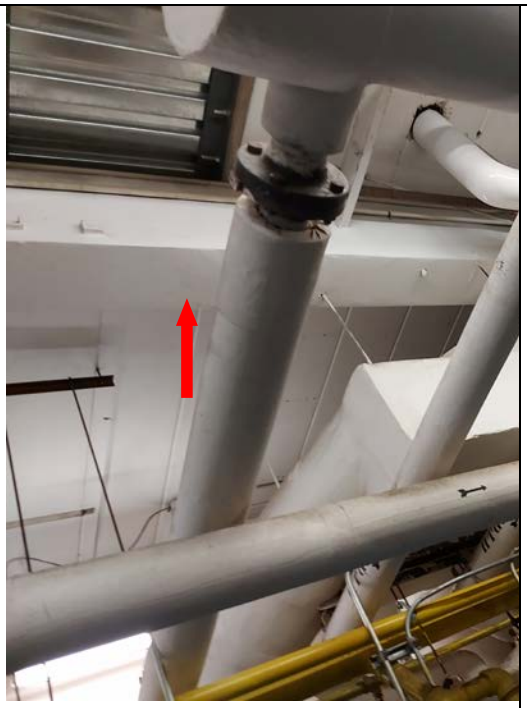

Photo No. 2.

Date: November 24, 2023

Location:
Storage room 1050B (Loc. 4047)

Description:

9” x 9” Vinyl floor tile (brown with black streaks)

This material was sampled and determined by laboratory analysis to be asbestos-containing (8% Chrysotile).

Client Name:	Site Location:	Project No.
Hamilton Wentworth District School Board	Glendale Secondary School 145 Rainbow Drive, Hamilton, Ontario	28228

Photo No. 3.

Date: November 24, 2023

Location:
Various Locations

Description:

Flexible duct connectors

This material is presumed to be asbestos-containing.

Photo No. 4.

Date: November 24, 2023

Location:
Various Locations

Description:

Parging cement on fittings

This material was confirmed to be asbestos-containing (55-70% Chrysotile)

Client Name:	Site Location:	Project No.
Hamilton Wentworth District School Board	Glendale Secondary School 145 Rainbow Drive, Hamilton, Ontario	28228

Photo No. 5. **Date: November 24, 2023** **Location:** Mechanical Room 2090A **Description:** Parging Cement on Air Handling Unit. ***This material was sampled and determined by laboratory analysis to be asbestos-containing (55% Chrysotile)***	

Photo No. 6. **Date: November 24, 2023** **Location:** Corridor 1048 (Loc. 4049) **Description:** Transite panels on ceiling. ***This material was confirmed to be asbestos-containing***	b

Client Name:	Site Location:	Project No.
Hamilton Wentworth District School Board	Glendale Secondary School 145 Rainbow Drive, Hamilton, Ontario	28228

Photo No. 7. **Date: November 24, 2023** **Location:** Various locations **Description:** Yellow Paint gas pipe ***This material was sampled and determined by laboratory analysis to be lead-based (30000 ppm).***	

Photo No. 8. **Date: November 24, 2023** **Location:** Mechanical Room 1027 (Loc. 4026) **Description:** Blue Paint on Floor. ***This material was sampled and determined by laboratory analysis to be lead-containing (1300 ppm).***	

Client Name:	**Site Location:**	**Project No.**
Hamilton Wentworth District School Board	Glendale Secondary School 145 Rainbow Drive, Hamilton, Ontario	28228

Photo No. 9.

Date: November 24, 2023

Location:
Various locations

Description:

Grey paint on ducts and AHU

This material was sampled and determined by laboratory analysis to be lead-based (6400 ppm).

CFMS-WEST CONSULTING INC.
Serving South Western Ontario

COMMISSIONING PLAN

GLENDALE SECONDARY SCHOOL
BOILER REPLACEMENT PROJECT

CFMS-West Consulting Inc.

2 Pelham Town Square,
Fonthill, Ontario L0S 1S0

905 304 3644
info@cfmswest.ca

PARTNERING TO PROVIDE **QUALITY CONTROL**

TABLE OF CONTENTS

1. INTRODUCTION & CONTENT

When implemented effectively, a thorough Commissioning Program contributes towards reducing facility life cycle costs, facilitates the establishment of measurable benchmark standards for all energy related systems, and validates that the project's mechanical, electrical and other building systems have been installed, operated, calibrated and are capable of performing as intended and stated in the Owners Project Requirements.

The Commissioning Plan document has been prepared for the Glendale Secondary School Boiler Replacement project by CFMS West Consulting Inc. hereby titled the Commissioning Authority (CxA), to provide the owner with a detailed description of the building systems commissioning process and the responsibilities of the commissioning team.

The CxA will update the document several times throughout the commissioning process and provide the team with information in a timely manner. As the plan evolves, information to be added will include definitions of commissioning terms, descriptions of project commissioning processes, a comprehensive team directory, detailed information on roles & responsibilities, project and system descriptions, lists of documents related to commissioning, details of commissioning documents, commissioning schedule milestones, detailed commissioning forms, and coordination, communications and resolution pathways.

The commissioning plan will be completed and delivered to the owner with the final commissioning report. This final report will contain a history of all test results and will provide a valuable reference to the owner.

2. COMMISSIONING OBJECTIVES & GOALS

The commissioning process is a quality control program which will be implemented on the project during the Preconstruction, Construction and Occupancy & Operation phases.

The commissioning process is conducted by the commissioning team which is made up of the design team, the construction team, CxA, and the Owner's project team. The process is managed by the CxA who will also conduct tasks within the commissioning process.

The commissioning process will begin at the Construction Phase and continues through the first year of operation. The objective is to verify the design intent performance during the heating and cooling seasons and under varying load conditions.

The overall benefits of the commissioning process include:

- Additional control over quality.
- Additional control over construction costs
- Additional control over the construction schedule
- Smooth turnover process.
- Building systems that work.
- Well trained operating staff
- Proper and useful O&M manuals
- Reduced number of problems and complaints

The commissioning plan that follows outlines the process to achieve these objectives and goals

3. PROJECT INFORMATION AND DESCRIPTION

Refer to the below fact sheet for the building information:

Project Name	Glendale Secondary School Boiler Replacement
Project Address	145 Rainbow Dr, Hamilton, ON L8K 4G1
Building Type	Institutional
Owner /Client	Hamilton Wentworth District School Board

4. DOCUMENTATION PROGRESS UPDATE

Refer to the below table for the status of documents pertaining to the project:

	DOCUMENT	STATUS
1	Commissioning Plan	March 21, 2025
2	Commissioning Kickoff Meeting	TBA
3	Shop Drawings Review Reports	TBA
4	Construction Checklists	TBA
5	Equipment Startup Reports	TBA
6	O & M Manuals Review Report	TBA
7	Training Matrix	TBA
8	Functional Performance Test Reports	TBA
9	Final Commissioning Report	TBA

5. COMMISSIONING TEAM & RESPONSIBILITIES

The commissioning team consists of representatives from the owner, the design team, the construction (contractors) team, and the CxA. The CxA will manage the commissioning team and the commissioning process and reporting directly to the owner.

Owner Representative

The owner has overall responsibility for this project and has engaged a Commissioning Authority (CxA) that does not include individuals directly responsible for project design or construction management. The CxA reports directly to the owner and takes direction from project team.

Commissioning Team

Key members of the integrated commissioning team are listed below. These individuals will be extended invitations to all commissioning meetings, as well as testing and training:

Role	Primary Contact	Company	Contact (Email, Cell)
Owner			
Project Manager	Jillian McCardle	HWDSB	jmccardl@hwdsb.on.ca
Design Team			
Mechanical Engineer			
Electrical Engineer			
Architect			
Cx Team			
Commissioning Agent	Kevin Pellerin	CFMS-West	kevinpellerin@cfmswest.ca
General Contractor and Subcontractors			
Project Manager			
Site Superintendent			
Mechanical Contractor			
BAS/Controls			
TAB			
Electrical Contractor			

Responsibilities

The Owner

The owner's responsibilities consist of:

- Engaging a Commissioning Authority that does not include individuals directly responsible for project design or construction management
- CxA reports directly and receive directions from the Owner /representatives(s) team.
- Attending commissioning meetings (as required)
- Receive commissioning reports and final commissioning report
- Supporting the commissioning process

The Design Team

The design team consists of ME Consultants. Their responsibilities in the commissioning process include:

- Prepare project specifications, including testing and commissioning
- Providing the design brief for mechanical, electrical and other building systems
- Reviewing shop drawings
- Reviewing test reports from the contractors and verifying results
- Receiving commissioning reports from the CxA
- Inspecting the installations for general conformance with the contract documents, codes and standards
- Review operating and maintenance manuals
- Witnessing selected contractor's acceptance/demonstration tests
- Review/approve as-built documentation
- Review performance testing results for general conformance with the contract documents

The Building Commissioning Authority (CxA)

- Develop and implement the commissioning plan
- Prepare and issue the team responsibility matrix
- Review equipment and systems submittals
- Chairs the commissioning meetings and records/ distributes meeting minutes
- Assisting with the commissioning schedule
- Conducting select installation reviews and issuing deficiency reports
- Review and monitor equipment start-up process
- Receiving and evaluating the contractors' test forms
- Preparing FPT forms for contractor (s) use
- Issuing commissioning progress reports
- Witness and verify contractor's performance verification tests (sampling technique)
- Co-ordinating with the TAB, BAS contractors and M&E Contractors
- Reviewing O&M manuals
- Review training schedule and agenda.
- Final commissioning reporting
- Verifying seasonal performance during the opposite season of original performance testing

The General Contractor Team

- Cooperate fully with CxA in execution of the Commissioning Plan.
- Incorporate all commissioning related activities and milestones in the construction/project schedule
- Directs all subcontractors to provide resolution to constructions issues
- Schedule all related commissioning activities in coordination with subcontractors and vendors
- Participating in commissioning meetings
- Distribution of contractor issued shop drawings
- Provide completed static and dynamic reports to the CxA
- Include the CxA in all correspondences that affect the commissioning process and activities (e.g. schedules, site instructions, change orders, meeting minutes, etc.)
- Ensure that sub-contractors and OEMs (Original Equipment Manufacturers) have completed all system start-ups and documentation as required by individual specification sections
- Ensures the subcontractors perform their commissioning responsibilities
- Collects, assembles and manages commissioning documentation from subcontractors
- Provides support and participate for functional testing as needed
- Corrects any installation deficiencies in a timely manner with cooperation with other related contractors
- Provide the CxA with a copy of the O&M manuals for review
- Provide necessary information for the system manual
- Coordinates owner training with subcontractors and CxA

ME Contractors

- Cooperate fully with CxA in execution of the Cx Plan and the associated commissioning activities
- Coordinates with the general contractor to confirm commissioning responsibilities at bid time
- Coordinate with the GC and other trades to issue equipment start-up schedule
- Review the commissioning plan and provided comments
- Coordinates with general contractor on scheduling of commissioning tasks
- Demonstrates proper system installation and operation
- Corrects system deficiencies in a timely fashion
- Preparing testing schedules
- Conducting all tests identified in the specifications
- Notifying all parties of scheduled test dates
- Completing and sign off all PFT (Pre-Functional Test) forms and make ready for CxA review
- Arranging for the CxA and the consultants to attend tests
- Support CxA with the necessary resources (individuals and equipment) for completing all commissioning testing activities
- Issuing test forms and progress reports to the CxA on a regular basis
- Coordinates with equipment vendors for proper documentations and procedures.
- ME contractor(s) and vendor(s) shall perform a complete 100% functional performance test for all equipment and systems and provide completed and signed off FPT sheets
- Cooperate with CxA to assist with implementing all seasonal and deferred commissioning activities
- Contractor(s) to submit valid calibration certificate for all test instruments
- Preparing operating and maintenance (O&M) manuals
- Preparing training schedules in coordination with the general contractor
- Conducting operator training
- Preparing as-built drawings
- Conducting acceptance/demonstration tests

Testing Adjusting & Balancing Contractor:

- Complete an initial project review prior to start any TAB activity to attempt to identify any construction issues preventing proper balancing of the systems
- The TAB contractor will test and balance the mechanical systems to the requirements of the project specification and in line with TAB standards
- TAB contractor will prepare a schedule for their work and coordinate with the GC to include these activities with in the construction schedule
- Provides all TAB documentation and associated reports
- Reports on operation and programming issues discovered in the field while balancing
- Issue report for the initial project review to the general contractor/mechanical contractor and copied CxA and mechanical engineer
- The TAB contractor will attend selected commissioning/construction meetings
- TAB contractor to submit valid calibration certificate for all instruments to be used
- Coordinate with CxA to witness selective percentage of water balancing process

Building Automation System Contractor:

- The BAS Contractor will install, commission, and demonstrate their system to the requirements of the specification.
- The BAS Contractor will coordinate closely with the mechanical contractor, electrical contractor, the TAB Contractor, and the CxA
- Completing and sign off all PFT (Pre-Functional Test) forms for CxA review and approval
- Provides detailed O&M manuals for all aspects related to Building Automation system
- Provide list of all schedules and set points
- Coordinates control system functional checks with the CxA and demonstrates the sequences of operation to the CxA as required in the functional check sheets
- The BAS contractor and in cooperation with other contractors and vendors shall perform a complete 100% functional performance test for all equipment and systems related to the BAS and provide completed and signed off FPT sheets
- The BAS contractor will attend selected commissioning meetings

Equipment Vendors

- Provides all documentation on furnished equipment, including complete submittals, equipment data, installation and O&M manuals, start-up procedures, and warranties
- Performs factory start-up when required
- Provides technical training services for equipment as supplied, based on outline training program prepared by CxA
- Conducting acceptance/demonstration tests
- Contractor will submit completed test forms and attend selected construction meetings when required

Responsibility Matrix

Product	Description	Responsibility of:							
		CxA	OR	A/E	GC	MC	EC	BAS	TAB
System design and schematics	Single line diagram, flow diagram and other design considerations, floor plans indicating location of equipment and configuration of system installation.	R		P					
Commissioning Plan	Document includes, commissioning process, team, responsibilities and deliverables.	P	R/A	R/I	R/I	R	R	R	R
Commissioning schedule	Commissioning schedule included in the project work schedule. Including all milestones, other M&E activities.	I/R	R	R	P	P	I	I	I
Commissioning meetings	Cx meetings will be scheduled as needed or on regular basis.	Pe	At	At	At	At	At	At	At
Shop Drawings /Submittals	Reviewing the shop drawings for all equipment under the commissioning scope. Review will be conducted after final approval of the EOR.	R		R		S	S	S	
Pre-Functional Test Forms	Static and dynamic test forms. Will not replace the OEM test sheets.	R		R		Pe	Pe	P/Pe	Pe
Functional test Forms	Performance verification test forms used by the Cx A to verify system operation with the BAS.	P/A				Pe		Pe	
Static testing	Includes, pipe pressure tests, air duct pressure test, flushing and cleaning	R				Pe	Pe		
Installation & above ceiling inspections	Reviewing equipment installation and above ceiling M/E services inspections	R		Pe					
Dust free environment (Clean building)	Achieving a dust free environment is a key step to start air moving devices (AMD)/Equipment.	A			Pe	Pe			
Equipment Start-up and start-up plans, check sheets	This is the OEM starting-up mechanical /electrical equipment and issue report.	R		R		P/Pe			Pe
BAS Programming, Point to point verification and Graphics	This is a process by the BAS vendor to verify all equipment are communicating to BAS	R/W						Pe	
System Air and Water balancing	Process to balance the air and water volume and set the correct designed pressure in the system. Verify the outlet and terminals air quantities.	R		R				Pe	Pe
Functional Performance testing	Complete verification and testing of the system and individual components and as integrated systems.	Pe/W/A		W		Pe		Pe	
Final Commissioning report	Report will outline the commissioning activities and the outcome of this process, listing of all concerns and pending issues.	P/A	R/A						
O & M manuals	This is the equipment and systems operating and maintenance manuals as per technical specifications.	R				P/S	P/S	P/S	I
Training Program	Topics to be covered during the training session	R	At	Pe /W	Pe	Pe	Pe	Pe	
Seasonal Testing	Opposite season test	Pe	At	W	At	At	At	Pe	

Legend:

A	Responsible to Approve	Pe	Responsible to Perform	I	Responsible to give Input	S	Responsible to Submit
At	Responsible to Attend	R:	Responsible for Review	P	Responsible to Prepare	W:	Responsible to Witness

6. BUILDING COMMISSIONING PROCESS

Building Commissioning is the process of bringing the project from a static state to a dynamic operating condition to meet the intended use. More specifically, commissioning includes bringing the project to a working and fully operational condition in compliance with the design intent and project documents. Therefore, commissioning involves those actions and activities that convert the buildings mechanical & electrical components into a fully functioning facility.

The Construction Phase

Development of the Commissioning Plan:

The Commissioning Plan will be developed for the Cx Team to review. The Commissioning Plan provides an overview of the commissioning process and responsibilities. The Commissioning Plan includes preliminary project specific information on the team, systems to be commissioned, and project schedule milestones. The team shall review the plan and provide comments to the CxA. This plan will continue to be developed and refined through the commissioning process.

Commissioning Kick-off Meeting:

The CxA will schedule a kick-off meeting with the entire Commissioning Team to introduce the players, review commissioning scope, review the commissioning process, discuss team responsibilities, and develop a team specific approach to commissioning.

Submittal Review:

A review encompassing aspects from a commissioning perspective shall be conducted to the submittals of all systems to be commissioned. CxA review of submittals does not relieve the design team of their submittal review responsibilities. Systems to be reviewed include:

Mechanical Systems
Building Automation System
Boilers
Pumps

Review of Contractor and Vendor Startup Forms:

The contractor shall provide any standard forms wished to be used during the commissioning process of the project such as contractor standard pressure test documentation, equipment starts- up forms, etc. The CxA will review/approve the forms and incorporate them into the Commissioning Plan. Startup forms can be provided by the contractor or equipment manufacturer. In cases where forms do not exist but are required, the CxA shall provide start-up forms.

Static Test Forms include:

- Pipe pressure testing
- Flushing and cleaning reports
- Chemical treatment sign off

Dynamic Test Forms are required for all systems identified under submittal review.

Managing the Construction Schedule:

The general contractor develops the project schedule for the project and the CxA shall provide list for commissioning milestones and testing. The CxA also reviews the schedule to look for potential conflicts and to ensure there is sufficient time for testing towards the end of the project.

The CxA will work with the project team to help in preparing contractors commissioning schedules. The schedules will identify equipment and systems by area and the various commissioning tasks. The schedules will include key starting dates such as 'power availability' and 'clean building'. Each Contractor's schedule will be reviewed, and updated as required, at the construction meetings or the commissioning meetings.

Commissioning Schedule milestones for the project:

- Commissioning Plan
- Commissioning Kick off Meeting
- Submittal Review
- Commissioning Schedule
- Static Testing Activities
- Power On
- Dynamic Testing Activities
- Functional Performance Testing Activities
- O&M Manual Submission
- Training
- Substantial Completion
- Seasonal Testing
- Final Commissioning Report

Functional Test Sheets:

The functional performance test (FPT) sheets will be developed by the CxA – CFMS West Consulting and to be used with the contractors to fully test the sequences of operation of all commissioned systems. The test forms will include the test procedure and expected results of each test point. The contractors shall review the forms and confirm functional tests can be performed in a manner that does not compromise the safety of the equipment or personnel performing the test. FPT sheets shall be prepared for all systems identified under submittal review.

Commissioning Meetings:

During the early stages of the construction process, the CxA will integrate the first commissioning discussions at the regular site meetings; attendance as required. The initial meetings will deal with the commissioning process, responsibilities, and the reporting methodology.

During the construction process, commissioning issues, scheduling, pre-functional test forms, functional test forms and results will be discussed as required at the construction meetings; attendance as required. During the dynamic testing process and the time leading up to substantial performance, separate commissioning meetings shall be held if required.

On-going Construction Observations & Installation Checks:

The CxA will conduct periodic jobsite visits. During these visits the CxA will perform site inspections, commenting on installation quality and attend site meetings to remain informed on construction progress and to update parties involved in commissioning process. A written jobsite inspection report shall be provided and distributed to the contractors, owner and other team members as determined during the kick- off meeting.

The following list of activities will be performed by the CxA during a visit to the jobsite:

- Attending jobsite meeting
- Complete equipment installation check and above ceiling inspections
- Witness static and dynamic activities
- Verify site cleanness and dust free environment
- Complete required checklists;(PFT)
- Conduct Functional performance test (FPT)

Static & Dynamic Testing

The CxA will review the static and dynamic testing reports and report on any items of concern from a commissioning or operations point of view.

Water Balancing

The CxA will co-ordinate with the Balancing Contractor to ensure that a balancing plan and schedule are prepared and reports are submitted. The TAB contractor shall visit the site and issue a report for the visit listing any comments, concerns or requirements for the balancing process. CxA will review the final balancing report and comment.

Functional Performance Test

The FPT is to verify that equipment, systems, and sub-systems functions and perform to meet the OPR and project documents. They are means to determine that different systems interact as required to achieve an overall operating and functioning facility.

The FPT typically involve forcing the system into a series of operating modes, and observing the system's response. The CxA will accurately record all their activities and observations on the FPT sheets and then ensure all systems returned to a "normal' state. The CxA will use the Issue list to log any performance issues might arise during the test and their resolutions.

If desired, it is possible to have the current or future building operators attend the Functional Performance Testing.*"Having the building operators participate in testing enhances the process and is a unique opportunity to deepen their understanding of the systems and controls".*

Prior to conducting FPT, the following must be satisfied:

- All static and dynamic start-up reports completed successfully;
- Controls system with all its graphics, verifications, calibrations, schedules, alarms and programs are completed and relevant reports and check sheets completed
- Air and water balancing process completed and reports submitted
- All corrections and re starting of start-ups completed successfully
- Maintaining a dust free environment in the building
- Availability of an experienced BAS contractor personnel during the test time
- Test requirements and BAS sequence of operation is provided for FPT form generation
- Occupancy and other schedules are provided
- Set points provided
- Ensuring the FPT can be performed in a manner that does not compromise the safety of the equipment or personnel performing the test or witnessing it

Development of the Commissioning Issues List:

The Cx A will manage, distribute and review a Commissioning Issues of Concern List (IOC) with the team. The Commissioning Issues Log will document all issues impacting the successful completion of the commissioning process. The CxA will assist the commissioning team to bring resolution to commissioning issues in a timely manner.

Operator Training Program:

Operations and maintenance documentation and training are vital to the long-term operational health of the facility. The Commissioning Authority (CxA) reviews agenda with the owner's representative(s) -operators- to ensure that training agendas meet the specifications in the contract documents and the OPR.

The following steps will help the development and implementation of the training program

- The GC shall develop and submit a Training Plan to the project team for review and approve.
- The training plan shall identify systems requiring training, required instructor (s), time period for training, and location of training;
- Technical content for the training exercises shall be provided by a combination of the equipment manufacturers, Sub-trade contractors, and design team personnel;
- The GC shall coordinate with the relevant personnel – including at minimum the OR, A/E, CxA to schedule required training exercises and confirm appropriate personnel to receive training;
- Detailed training agendas will be issued to the commissioning team prior to the scheduled sessions;
- Training Agenda will include at the minimum the following:

    - Review of drawings to demonstrate the relationship between the installed devices and the drawings
    - Provide walk through outlining the major components associated with the training session
    - Overview of the operation of system/component, and its interface with the Building Automation System
    - Preventative maintenance procedures & routines. (Dealing with alarms and trends)
    - Review the SOO and describe the adjustments that can be made by an operator
    - Review system adjustment and calibration
    - Troubleshooting procedure and system diagnostic
    - Review of BAS graphics, programs and trends
    - Attendees Q & A

O&M Manuals Review:

The CxA will review the submitted O&M manuals for commissioned systems to verify compliance with the OPR and contract document. CxA - CFMS West Consulting – will review the O&M manuals for warranty certificates, availability of all reports, maintenance requirements, single line diagrams, valve charts, TAB reports, BAS point list and check sheets, sequence of operation, required contact information and warranties.

The O & M manuals shall include at the minimum the following sections:

- Basis of design document as issued by the EOR
- Warranties and applicable to the project
- Contractors contact list
- Equipment start up reports
- Test reports (Authority test Reports)
- Shop drawings, troubleshooting and PM literatures for all equipment and systems
- Air and water balancing reports and single line diagrams
- Building Automation System shop drawings and sequence of operation

Commissioning Report:

The CxA- CFMS West consulting will provide a Final Commissioning Report upon completion of all commissioning activities. The final commissioning report will contain the executive summary, summary of the design review process, summary of the submittal review process, the current copy of the Commissioning Plan, OPR, BOD, commissioning specifications, completed commissioning issues list, meeting minutes, completed check forms, and O&M documentation and training process.

Occupancy and Operation Phase

The following activities will be performed during the Occupancy and Operation Phase of the project:

Completion of Seasonal and Deferred Systems tests:

The CxA may determine that certain sequences may not be thoroughly tested unless the ambient conditions are correct. These functional tests may be deferred until the appropriate conditions are available. The BAS and mechanical contractors will be conducting this test along with the CxA.

7. SYSTEM INCLUDED IN THE COMMISSIONING

Refer to below list for a full list of the equipment included in the project:

Mechanical Systems
Building Automation System
Boilers
Pumps

8. COMMUNICATIONS PROTOCOL

CFMS West consulting as the Commissioning Authority, our primary focus is to act as an advocate for the owner ensuring that modern methods of construction and leading-edge commissioning are successfully delivered. Essential to this process is the establishment of a communications protocol – prepared for and reviewed during the commissioning kick-off session. Below is the communications protocol:

Issue	Communication Protocol
Requests for information (RFI) or formal documentation requests	The CxA goes first: through OR and copied GC, A/E
Minor or verbal information and clarifications:	The CxA goes direct to the GC, with correspondence copied to the OR/ A/E
Notifying contractors of noted Cx issues	The CxA documents issues through the OR & GC, but may not discuss issues with contractors prior to notifying the GC and A/E. Issues Logs are issued regularly to the Commissioning Team.
Scheduling functional tests	The CxA may provide input for and coordination of testing through the OR & GC, but does not directly schedule contractors or subs.
Scheduling commissioning meetings	The CxA with GC selects the date and schedules the meetings with the Owner and Design Team
Making requests for significant changes:	The CxA **has no authority** to issue change orders or direct the contactors or their subs as it pertains to design related modifications. Design Team issues instructions.
Making small changes in specified sequences of operations	The CxA **may not** make small sequences of operations changes to improve efficiency or control or to correct issues, through the responsible contractor. The CxA shall document the change and provide all information of specified sequences to the OR, GC and A/E. The CxA **may not** make changes to specified sequences without approval from the A/E.
Contractors or Subs disagreeing with requests, findings or interpretations by the CxA:	Contractors or Subs will not try and resolve with the CxA first. Contractors or Subs will work through the GC who will work with the CxA directly. The OR will be included in the correspondence /discussion as needed.
Witnessing systems and equipment training	The CxA may provide input for and assistance in the coordination of training and testing through the GC, but **does not** directly schedule contractors or subs.
Weekly site reports and updates	The CxA issues site reports and update documents through the OR, with copy to the, GC and A/E.
Suspected design issues found during the Cx process	The CxA documents issues first through the GC and A/E, but may not discuss design issues with contractors or subs prior to notifying the OR and GC.

9. NEXT STEP

The Commissioning plan is a live document that will be updated throughout the project**.** The OR, A/E, contractors and other project team shall be responsible for providing updates for the information in this document. CFMS West consulting will review the updates and issue revisions accordingly.

Revision No.	Date Issued	Issued By
R00	March 21, 2025	CFMS-West Consulting

Quotation

ENVIROAIR INDUSTRIES INC.

8639, chemin Dalton
Montreal, QC H4T 1V5
CANADA
514-738-9865

Opportunity	Quotation #
26014	**1088421**
HWDSB - Glendale Secondary School	
Date	Page
03/03/2025	1 of 3

Quote Expires On: 04/04/2025

BY : JCHAVEZ

Quantity	*ITEM*	*Total Price*

3 **PK SOLIS**

SOLIS Condensing boiler/Patterson Kelley

Mod: SL2000
Tag: B-1
Cap: 2,000,000 BTU/Hr
Elec: 208V - 240V / 1Ph / 60Hz
Eff: 96%
Fuel Type: Natural Gas

INCLUDED:

- CSA, ASME IV, CSD-1 and ANSI Z21.13
- Turndown 10:1
- SS 316 tube and tube sheet/ SS304 Heat exchanger shell
- Approved as Category II and IV appliance, unless otherwise specified
- NURO touch-screen control system: Intuitive interface, cascade, relay for pumps/valves, heating and domestic loop control
- One (1) year warranty (parts only) from start-up or eighteen (18) months from date of delivery, whichever occurs first
- Ten (10) years warranty (parts only) on the heat exchanger and for thermal shock and five (5) years on the fuel burner

NOTE:
Options marked with an asterisk (*) are shipped loose. Installation is NOT INCLUDED.
Pressure for the relief valve needs to be confirmed by the client.

- Condensate neutralization kit*
- Low water cutoff probe*
- Remote header sensor*
- Outdoor air sensor*
- Relief valve kit*
- K&W Fixed blade dampers*

Quotation

ENVIROAIR INDUSTRIES INC.

8639, chemin Dalton
Montreal, QC H4T 1V5
CANADA
514-738-9865

Opportunity	Quotation #
26014	**1088421**
HWDSB - Glendale Secondary School	
Date	Page
03/03/2025	2 of 3

Quote Expires On: 04/04/2025

BY : JCHAVEZ

Quantity	*ITEM*	*Total Price*

1 **SECURITY CHIMNEY VENTING**

Venting system / Security Chimneys

For 3 x PK Solis SL-2000

Model: SSD/SSID
UL Listing: 1738
ID: 8", 20"
Inner Wall Material: 316
Insulation Type: Air/Fiber
Insulation Thickness: 1"/2"
Outer Wall Material: 441
Barometric Dampers Qty: 0

INCLUDED:

Complete pre-fab breeching and chimney with (if required for the system):

- Starting adapters, variable dimension pieces, brackets/bands, fire stops, storm collars, flashing and terminations.

NOT INCLUDED:

- site condition/measurement confirmation (contractor's responsibility)
- storage of product after release (contractor's responsibility)
- installation
- guy wires and/or guy wire supports/anchors
- combustion air duct
- support rods
- angle iron for support
- condensate neutralizers
- roof curbs
- seismic

NOTE: The venting dimensions on this quote are based solely off the provided documents. Actual site condition/measurement confirmation are the responsibility of the installing contractor. No draft calculations have been performed to confirm system can naturally drafted. All site measurements relating to venting must be signed off by installing contractor prior to release of venting equipment. Pricing can change based on differences found between provided documents and on site conditions.

1 **STARTUP**

Startup

Included for 1 job site visit, performed by PK factory trained technician
Extra visits will require a PO

1 **FREIGHT NES**

Freight charges

Quotation

ENVIROAIR INDUSTRIES INC.

8639, chemin Dalton
Montreal, QC H4T 1V5
CANADA
514-738-9865

Opportunity	Quotation #
26014	**1088421**
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Quote Expires On: 04/04/2025

BY : JCHAVEZ

Quantity	*ITEM*	*Total Price*

Included to job site curb

All of our equipment is delivered in a standard enclosed van or on a flat-bed (if the weight, volume, and/or dimensions requires it).
If you request a truck outside of our standards, extra costs will apply. Contact your representative for more details.

TOTAL PRICE : **$ 205,500.00**

CND Dollars

NOT-INCLUDED :

Labour for warranty (except if mentioned)
Start-up or Start-up assistance (except if mentioned)
Handling / installation
Other accessories and/or sections not mentioned
Electrical, plumbing, controls and refrigeration

TERMS :

Price is valid for 30 days
Payment terms: To be discussed
F.O.B. Factory
All taxes extra
Order will be subject to credit approval

1266 South Service Road, Suite C1-1
Stoney Creek ON L8E 5R9 | CANADA
t: +1.905.525.6069 | exp.com

Shop Drawing Review

Date: May 8, 2024	**Remarks applicable to the following system:**
Project No.: ALL-23010629-A0	① **Make Corrections Noted Resubmission Not Required**
Project: HWDSB Glendale Sec Sch Boiler AHU Replacement	**See Remarks.**
Spec Section No.: M0.6	
Submission No.: 1	
By: Jonah Leibtag	**Review is for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the contract documents. Contractor is responsible for the dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his or her work with that of all other trades; and the satisfactory performance of his or her work.**
No. of Pages in Set: 35	
No Exception Taken ⓪ **Revise & Resubmit** ②	
Make Corrections Noted Resubmission Not Required ① **Rejected, Submit Compliant Product/System** ③	

Remarks

.1 All controls to be field wired direct connection back to BAS by control contractor. Integral controls on boiler to monitor safety features only. Mechanical contractor to coordinate with controls contractor to ensure all control connections are completed as per HWDSB Standards.

.2 Stamped venting shop drawings to be provided with separate submittal.

No further comments

Submittals include the following:

A) 3 x P-K Boilers

A) Boilers by Patterson-Kelley

(Qty. 3) P-K SONIC CONDENSING BOILERS

Model	SL2000
Tag	B-1,2,3
Capacity	2,000,000 BTU/Hr
Power	208V - 240V / 1Ph / 60Hz
Efficiency	96%
Fuel Type	Natural Gas

TO INCLUDE:

- CSA, ASME CSD-1 and ANSI Z21.13
- Turndown 10:1
- Stainless steel 316L heat exchanger
- Approved as Category II and IV appliance, unless otherwise specified
- NURO touch-screen control system: Intuitive interface, cascade, relay for pumps/valves, heating and domestic loop control, external signal 4-20mA, Modbus
- One (1) year warranty (parts only) from start-up or eighteen (18) months from date of delivery, whichever occurs first
- Ten (10) years warranty (parts only) on the heat exchanger and five (5) years on the fuel burner

NOTE:
Options marked with an asterisk (*) are shipped loose. Installation is NOT INCLUDED.
Pressure for the relief valve needs to be confirmed by the client.

- Condensate neutralization kit*
- Low water cutoff probe*
- Remote header sensor*
- Outdoor air sensor*
- Relief valve kit*

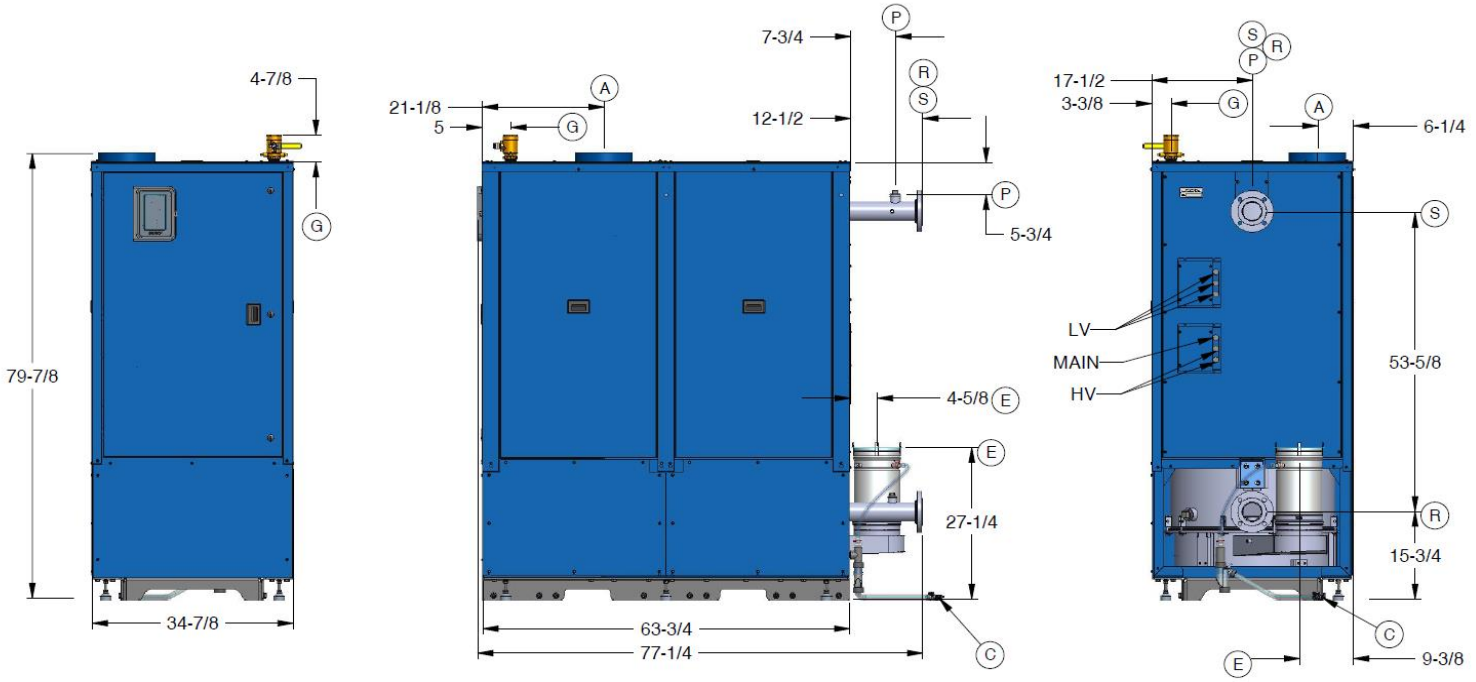
P-K SOLIS™

Boiler Models SL-1500, SL-2000, SL-2500, & SL-3000
Natural Gas with NURO® Control

PATTERSON-KELLEY

Rep Name: Smith Energy | **Email: slamas@smithenergy.com**

Phone Number: 519-242-4724 | **Date: / / /**



Primary dimensions are in inches. The secodary dimensions, [in brackets], are in millimeters.

This boiler requires Category IV venting (condensing-positive pressure) or Category II venting† (condensing -negative pressure as defined in ANSI Z223.1/NFPA 54/CSA-B.149 latest edition.

†Category II venting must include the optional combustion air damper

BOILER CONECTIONS		
A	Combustion Air Inlet	10" dia. stub
C	Condensate Drain	3/4" hose
E	Exhaust Vent	8" (1500 & 2000) 10" (2500 & 3000)
G	Natural Gas	1-1/2" NPT-F (1500 & 2000) 2" NPT-F (2500 & 3000)
J	Wiring Junction Boxes	inside cabinet
P	Pressure Relief Valve	see list for options
R†	Boiler Return	3" pipe, flanged
S†	Boiler Supply	3" pipe, flanged

P-K SOLIS™

Boiler Models SL-1500, SL-2000, SL-2500, & SL-3000
Natural Gas with NURO® Control

PATTERSON-KELLEY

BOILER CONTROLS
ASME CSD-1 is standard Complies with: GE GAP (IRI) guidelines GAP.4.1.0 and GAP.4.1.3 FM Global 6-4 Section 1.0
Main Gas Train with Dual Shut-off
Integrated Boiler Control, NURO Series
Operating Thermostat, 42^0-195^0F (5.6^0-91^0C)
High Limit Thermostat, Manual Reset, 100^0-197^0F (38^0-92^0C)
High Exhaust Back Pressure Switch
LWCO/Flow Switch, Paddle Type & LWCO, Probe Type
Combustion Air Proving Switch, Differential Pressure Type
Combustion Blower, Variable Speed, 1625 Watt

A.S.M.E. SECTION IV DESIGN DATA	SL-1500	SL-2000	SL-2500	SL-3000
Max Pressure	160 PSIG			
Max Allowable Temperature	210°F			
Max Setpoint	185°F			
Flow Rate @ 20°FΔT	144 GPM	192 GPM	240 GPM	288 GPM
Min Flow Rate @ All Firing Rates	20 GPM	20 GPM	25 GPM	25 GPM

NOTE: Need to confirm Pressure Relief Valve Size

MODEL SELECTION				
Boilers	□ **SL-1500**	□ **SL-2000**	□ **SL-2500**	□ **SL-3000**
Fuel Options	□ NG			
Min Inlet Gas Pressure	3.5"w.c.			
Max Inlet Gas Pressure	14" w.c.			
Max Input (BTU/hr)	1,500,000	2,000,000	2,500,000	3,000,000
Max Output (BTU/hr)	1,440,000	1,920,000	2,400,000	2,880,000
Boiler HP	44.8	59.7	74.7	89.6
Min Input (BTU/hr)	150,000	200,000	250,000	300,000
Min Output (BTU/hr)	144,000	192,000	240,000	288,000
Turndown Ratio	10:1			
Operating Weight	3000 lbs.	3000 lbs.	3470 lbs.	3470 lbs.
Shipping Weight	2445 lbs.	2445 lbs.	2650 lbs.	2650 lbs.
Boiler Water Content	117 gal	117gal	149 gal	149 gal
Shipping Dimensions	77.3"x35"x80" (LxWxH)		80"x35"x80" (LxWxH)	
Power Supply	208/240V, 1ph, 60Hz		220/480V, 3ph, 60Hz	
Operating Current	15 Amps	10 Amps	20 Amps	20 Amps
Recommended Minimum Circuit Capacity	20 Amps	15 Amps	25 Amps	25 Amps

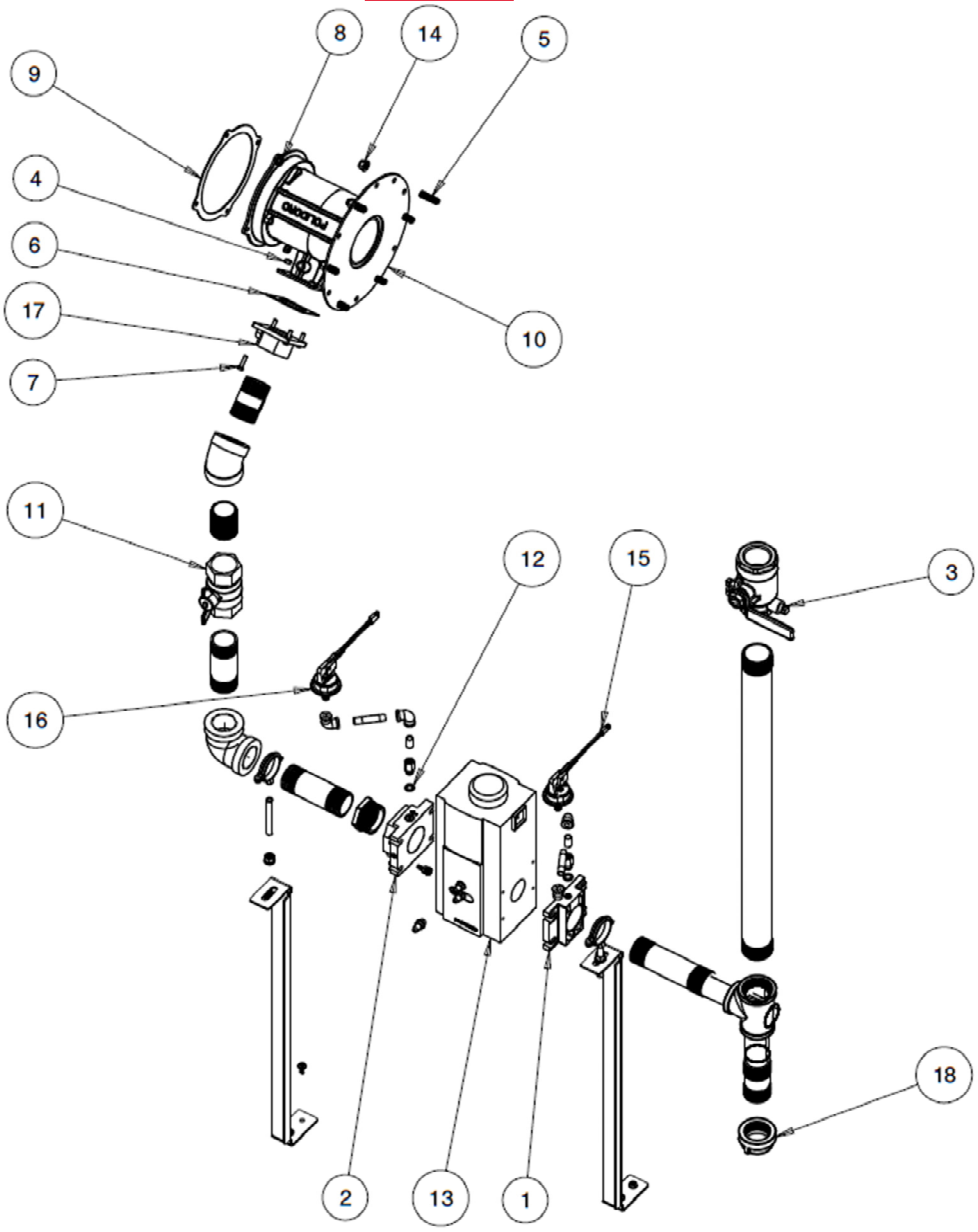
PRESSURE RELIEF VALVE/PRESSURE-TEMPERATURE GAUGE Shipped Loose for Field Installation		
□	30 PSIG 1-1/2"x 2"	15-160 psi/0-250°F
□	60 PSIG 1-1/4"x 1-1/4"	15-160 psi/0-250°F
□	75 PSIG 1-1/4"x 1-1/4"	15-160 psi/0-250°F
□	80 PSIG 1-1/4"x 1-1/4"	15-160 psi/0-250°F
□	100 PSIG 1"x 1-1/4"	15-160 psi/0-250°F
□	125 PSIG 1"x 1"	15-160 psi/0-250°F
□	150 PSIG 1"x 1"	15-160 psi/0-250°F

RECOMMENDED CLEARANCE FOR SERVICE ACCESS				
Front - 30"	Rear - 18"	Top - 24"	Left Side - 12"	Right Side - 0"

Notes:

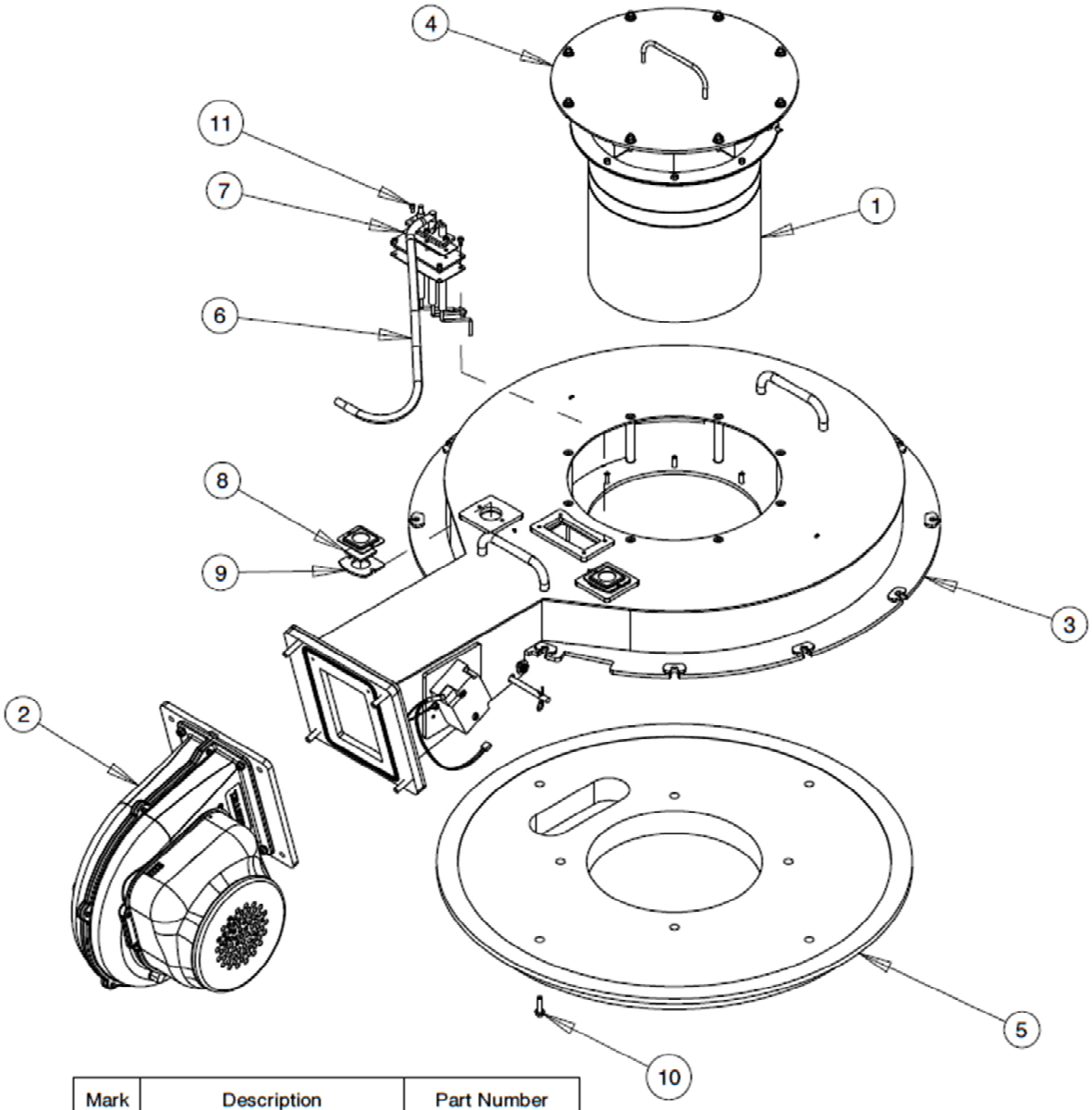
-Patterson-Kelley reserves the right to make changes at any time without notification

6.3.4 Natural Gas Train (SL-1500 & SL-2000)



MARK	PART NO.	DESCRIPTION	MARK	PART NO.	DESCRIPTION
1	2300000009	1-1/4" Gas Flange	10	2631000052	Air/Gas Mixer
2	2300000423	1-1/2" Gas Flange	11	2640000304	1-1/4" Valve
3	2311000023	1-1/2" Valve	12	2640000424	Gasket,14mm OD x 10mm ID
4	2600000103	Hex Nut, M5 Nylock	13	2640000426	Gas Valve
5	2600000170	Hex Socket Set Screw, M8 x 35mm	14	2660000118	M8 Nylock Flange Nut
6	2620000171	Gas Flange Gasket	15	2660000346	Low Gas Pressure Switch, Grey
7	2620000186	Hex Head Screw, M5 x 20 mm Length	16	2660000347	High Gas Pressure Switch, Yellow
8	2630000125	1/4"-20 Hex Nut	17	2691000043	1-1/4" Flange
9	2631000048	Blower Gasket	18	850P001547	1-1/4" Cap

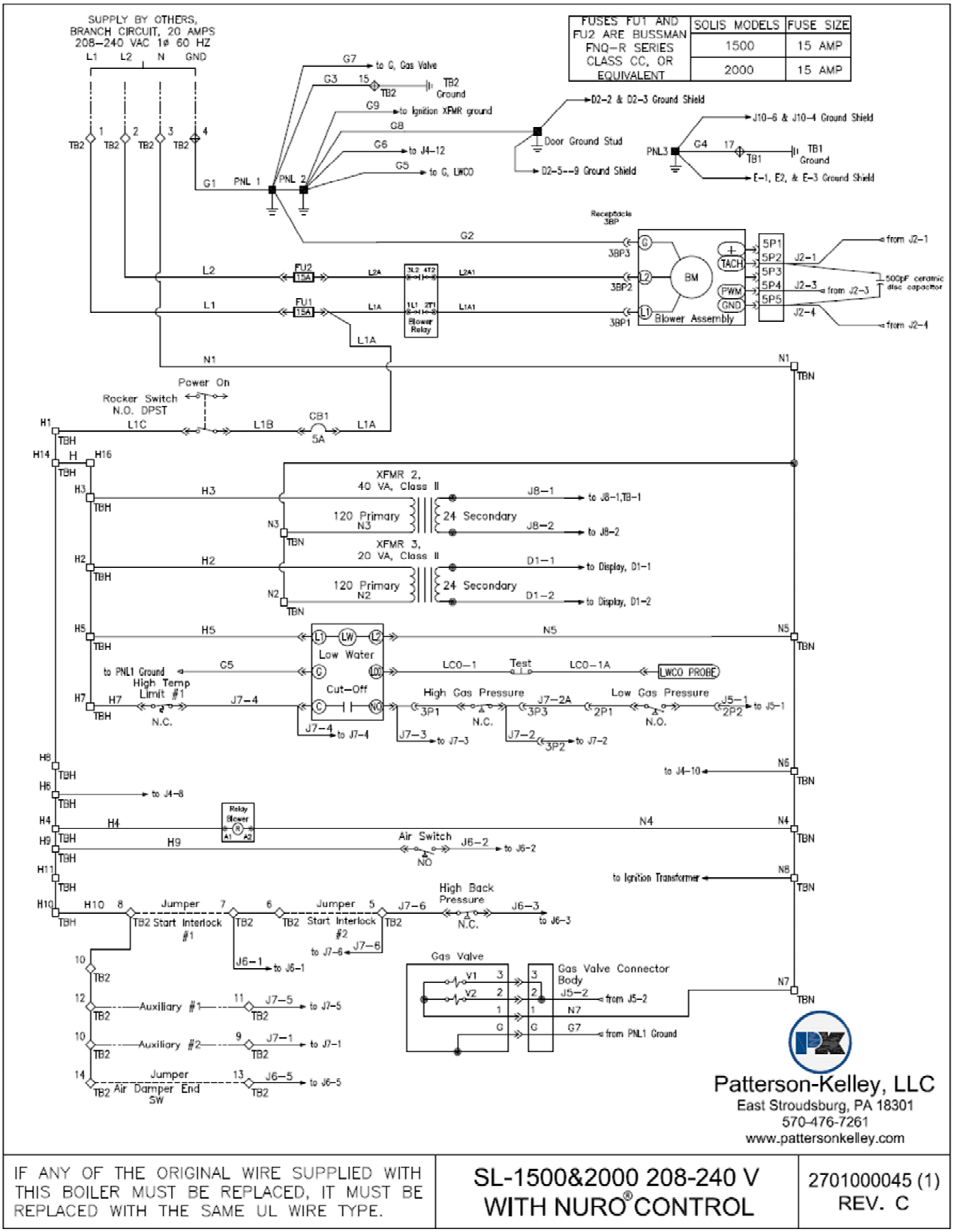
6.3.5 Burner & Blower Assembly (SL-1500 & SL-2000)

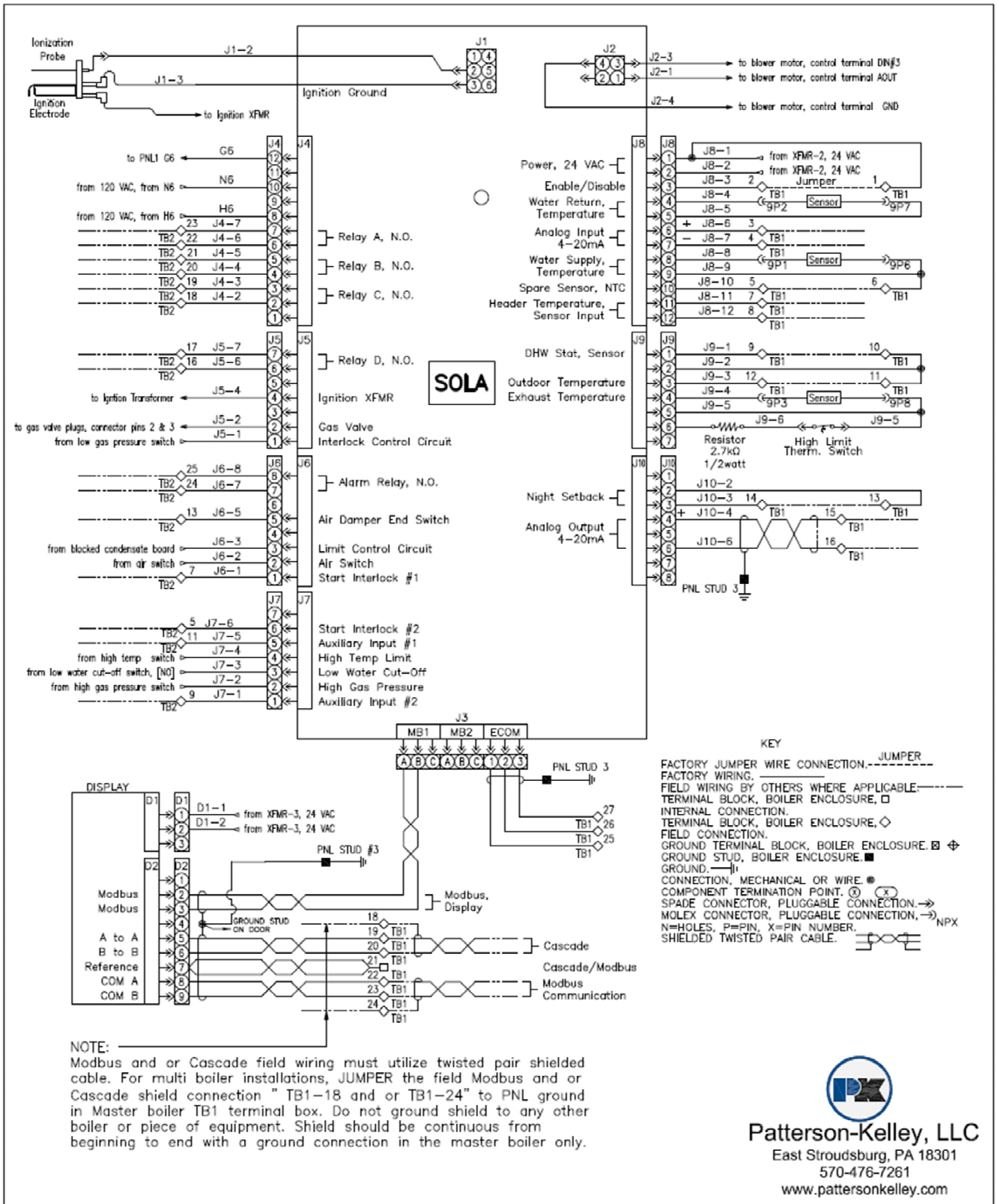


Mark	Description	Part Number
1	Mesh Burner 289mm	512200122
2	Combustion Blower / Fan	N/A
3	Heat Exchanger Cover	N/A
4	Burner Cover	N/A
5	Burner Insulation	591222200
6	Ignition Electrode	511330470
7	Ignition Electrode Gasket	590300073
8	Inspection Glass	591419201
9	Inspection Glass Gasket	590318010
10	M6-1.0x25 Hex Flange Bolt	N/A
11	M4x8 Screw	N/A

6.2 Wiring Diagrams

6.2.1 SL-1500 & SL-2000 Natural Gas





NOTE:
Modbus and or Cascade field wiring must utilize twisted pair shielded cable. For multi boiler installations, JUMPER the field Modbus and or Cascade shield connection " TB1-18 and or TB1-24" to PNL ground in Master boiler TB1 terminal box. Do not ground shield to any other boiler or piece of equipment. Shield should be continuous from beginning to end with a ground connection in the master boiler only.

Patterson-Kelley, LLC
East Stroudsburg, PA 18301
570-476-7261
www.pattersonkelley.com

IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THIS BOILER MUST BE REPLACED, IT MUST BE REPLACED WITH THE SAME UL WIRE TYPE.	SL-1500&2000 208-240 V WITH NURO® CONTROL	2701000045 (2) REV. C

DATA SHEET

MODEL: NB-5LP Tank (LOW PROFILE)

JJM BOILER WORKS, INC.

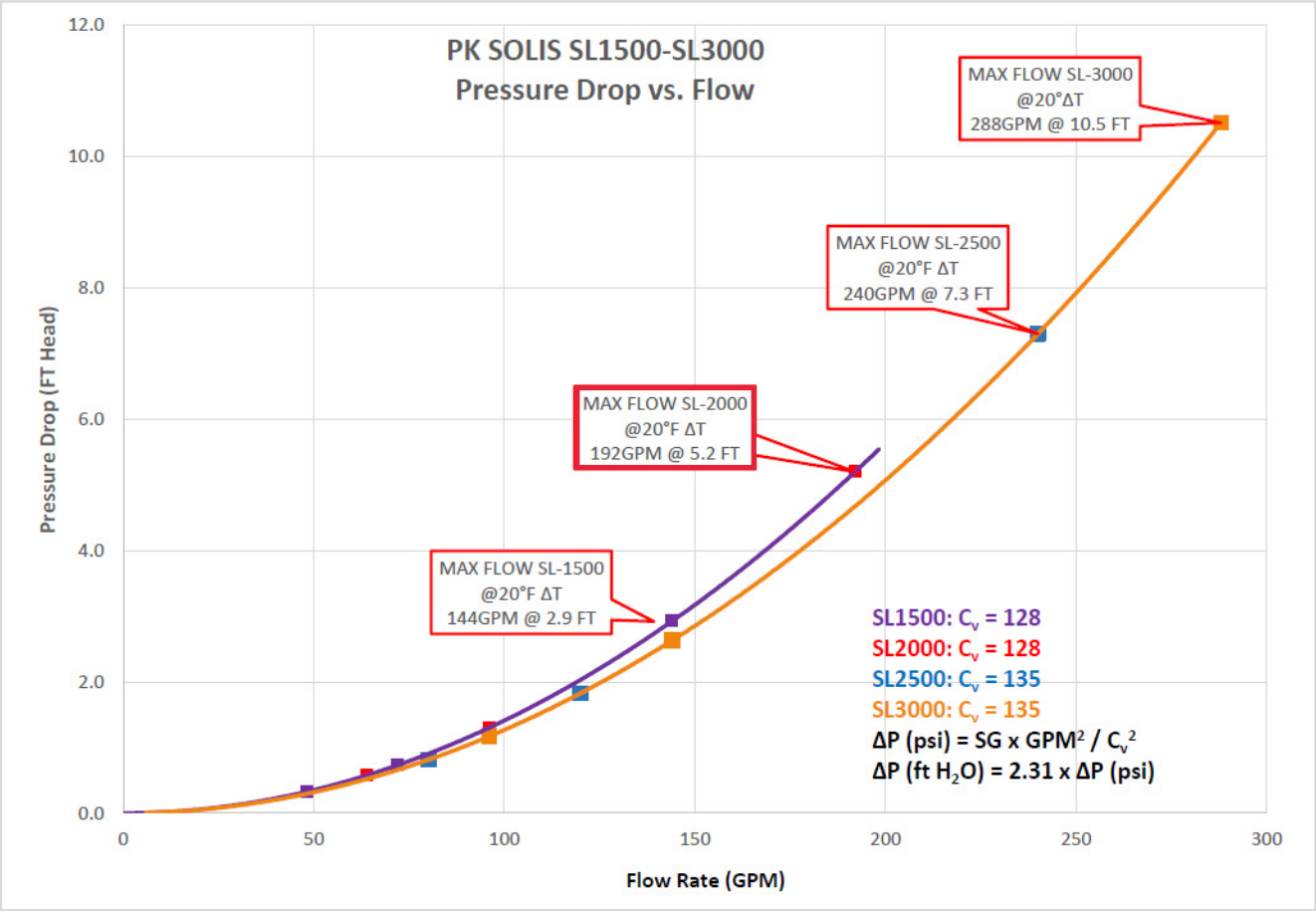
Model	Part#	Rating	GPH	Material	Active Ingredient	Temp. Rating
NB-5LP	2002	5,000 MBH	40.0 MAx	8 Gallon Poly Tank	MgO Pellets	140F Const.

Inlet port	Outlet port	Mounting	Vent	Fill Lid
(2) 1” FNPT	(2) 1” FNPT	Horizontal Floor	.75” FNPT	Poly Cover 6 Baffles

Single or multiple piped Condensate drains.

Hydronics/Water Flow

The chart below represents the pressure drop (Ft of Head) versus the water flow rate (GPM) for the P-K SOLIS™ SL-1500 through SL-3000 boilers. This information is useful to help size an appropriate circulation pump. Keep in mind this pressure drop represents the boiler only, additional consideration is needed for any connecting piping, valves, strainers, couplings, flanges, etc.



P-K SOLIS SL-1500 through SL-3000 Boilers: Minimum & Maximum Flow Rates

Flow Condition	Boiler Operation	Flow Rate				Approximate ΔT
		SL-1500	SL-2000	SL-2500	SL-3000	
Maximum Flow	High Fire	144 GPM	192 GPM	240 GPM	288 GPM	20 °F
Minimum Flow	High Fire	48 GPM	64 GPM	80 GPM	96 GPM	60 °F
Minimum Flow	Ignition	58 GPM	77 GPM	96 GPM	115 GPM	20 °F
Minimum Flow	Low Fire	20 GPM	20 GPM	25 GPM	25 GPM	15 °F

Propylene Glycol Flow

The table below summarizes the flow for the P-K SOLIS appliances with different Propylene Glycol mixtures:

Model →	SL-1500		SL-2000		SL-2500		SL-3000	
Mixture ↓	**Flow**	**Pressure**	**Flow**	**Pressure**	**Flow**	**Pressure**	**Flow**	**Pressure**
0%	144 GPM	2.9 ft	192 GPM	5.2 ft	240 GPM	7.3 ft	288 GPM	10.5 ft
10%	146 GPM	3.0 ft	194 GPM	5.3 ft	243 GPM	7.5 ft	292 GPM	10.8 ft
20%	148 GPM	3.1 ft	197 GPM	5.5 ft	246 GPM	7.7 ft	295 GPM	11.0 ft
30%	150 GPM	3.2 ft	200 GPM	5.7 ft	250 GPM	7.9 ft	300 GPM	11.4 ft
40%	156 GPM	3.4 ft	208 GPM	6.1 ft	259 GPM	8.5 ft	311 GPM	12.3 ft
50%	163 GPM	3.7 ft	217 GPM	6.6 ft	271 GPM	9.3 ft	326 GPM	13.4 ft
60%	171 GPM	4.1 ft	228 GPM	7.3 ft	285 GPM	10.3 ft	342 GPM	14.8 ft

Model RVW60

ASME HOT WATER SAFETY RELIEF VALVE

(10600 Series)

Job Name:	Contractor:
Job Location:	P.O. Number:
Engineer:	Representative:
Tag:	Wholesale Distributor:

DESCRIPTION

ASME Section IV capacity certified bronze safety relief valve for protection of hot water heating boilers, systems and similar equipment. It can be pre-set to any pressure ranging from 15 to 160 psig (1 to 11 bar) at 250°F (121°C) max.

FEATURES

- Sizes: ¾" – 2" (20 – 50mm)
- ASME Section IV Certified Capacity
- Corrosion Resistant Construction
- Diaphragm Isolated Spring Chamber
- Extremely High Capacity
- Directive 97/23/EC (PED) Compliant Option
- MADE IN THE USA

MATERIALS

Body/Cap: ASTM B584 Bronze
Spring: Alloy Steel, plated
Seat: Silicone

Capacity @ 150# = 3,116,000 Btu/hr

CAPACITIES, BTU/HR

ASME HV Rating – 90% of actual capacity at 10% overpressure

RVW60 Standard Discharge Port					
PSIG	¾" 10604	1" 10605	1-1/4" 10606	1-1/2" 10607	2" 10608
15	541,000	876,000	1,515,000	2,061,000	3,397,000
30	827,000	1,339,000	2,316,000	3,151,000	5,193,000
50	1,209,000	1,956,000	3,384,000	4,604,000	7,589,000
100	2,162,000	3,500,000	6,055,000	8,238,000	13,577,000
125	2,639,000	4,272,000	7,390,000	10,054,000	16,571,000
150	3,116,000	5,044,000	8,725,000	11,871,000	19,565,000

RVW61 High Capacity Discharge Port					
PSIG	¾" 10614	1" 10615	1-1/4" 10616	1-1/2" 10617	2" 10618
15	635,000	1,027,000	1,777,000	2,417,000	3,984,000
30	970,000	1,570,000	2,716,000	3,696,000	6,091,000
50	1,418,000	2,295,000	3,969,000	5,400,000	8,900,000
100	2,536,000	4,105,000	7,101,000	9,661,000	15,924,000
125	3,096,000	5,011,000	8,668,000	11,792,000	19,435,000
150	3,655,000	5,916,000	10,234,000	13,923,000	22,947,000

Model
☒ Standard Outlet (RVW60) ☐ Oversize Outlet (RVW61)

Size (Inlet)
☒ ¾" ☐ 1" ☐ 1-1/4" ☐ 1-1/2" ☐ 2"

Set Pressure
150# psig (15-160)

DIMENSIONS

	Size	Height		Width		Weight	
Series	FNPT x FNPT	In.	mm	In.	mm	lbs.	kgs
10604 10614	3/4 x 3/4 3/4 x 1	5.3	133	3.2	81	2.3	1.1
10605 10615	1 x 1 1 x 1-1/4	6.7	170	4.0	102	4.0	1.8
10606 10616	1-1/4 x 1-1/4 1-1/4 x 1-1/2	8.4	213	5.1	129	7.7	3.5
10607 10617	1-1/2 x 1-1/2 1-1/2 x 2	10.8	274	5.9	150	11.25	5.1
10608 10618	2 x 2 2 x 2-1/2	14.0	356	7.2	183	23.5	10.6

APPROVALS

ASME Section IV Heating Boilers
Pressure Equipment Directive 97/23/EC (PED)
Canadian Registration Number 0G8547.5C

TASSERON
SENSORS & CONTROLS

DATASHEET

OUTSIDE / ROOM TEMPERATURE SENSOR

FEATURES
- Wall mounted
- Small design housing
- Easy connecting
- Bottom or back cable entry
- Complete mounting set
- Splash proof
- UV resistant

APPLICATIONS
- HVAC
- Room sensing
- Outside sensing
- Building controls

GENERAL INFORMATION
The Tasseron outside / room sensor measures air temperature indoor or outdoor. The sensor has a solid construction with a white UV resistant plastic cover to minimize solar influence.

Installation costs are saved using this sensor as it is designed for quick connection and it comes in a complete set for mounting on the wall. The set comes in a little box which includes: the sensor with grommet for cable sealing, screws, wallplug and a mounting instruction.

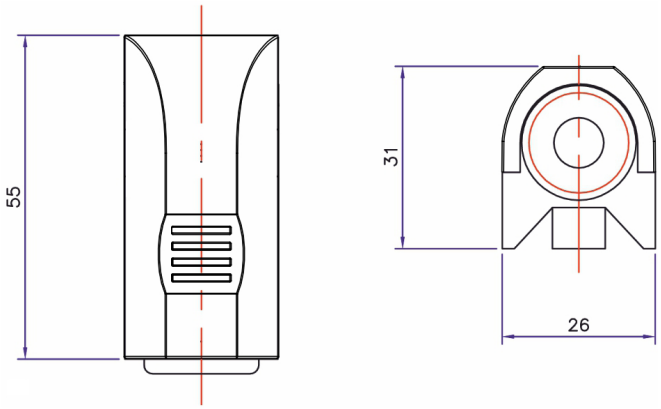
GENERAL TECHNICAL INFORMATION

Characteristic	Parameter	Value	Unit
Operating temperature	T_{op}	-40...60	ºC
Resistance tolerance NTC (@60ºC)	ΔR_R	±3	%
Insulation resistance	R_{ins}	>200	MΩ
Test Voltage (t = 1s)	V_{test}	2000	V_{AC}

TASSERON
SENSORS & CONTROLS

MEASUREMENTS & MATERIALS

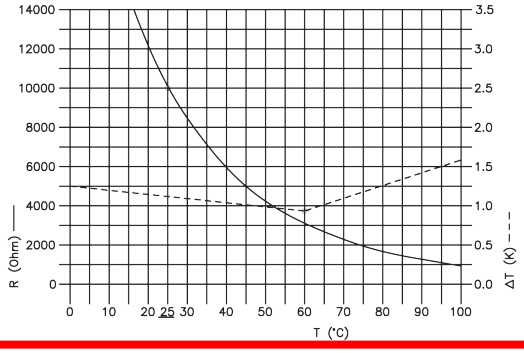
Housing size (l x w x h) : 55 x 26 x 31 mm
Housing material : PC White / Black
Electrical connection : 2 way 0,3 - 1,5 mm²
cable spring connector



AVAILABLE SENSOR VALUES

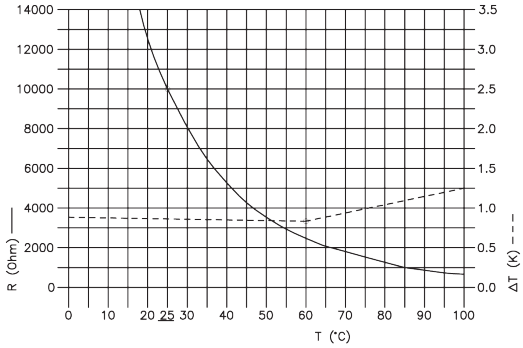
NTC 10K 3%@60ºC B3435

T(°C)	Rn(Ohm)
0	27700
5	22290
10	18070
15	14740
20	12110
25	10000
30	8300
35	6924
40	5810
45	4896
50	4147
55	3525
60	3011
65	2582
70	2224
75	1922
80	1668
85	1451
90	1267
95	1110
100	975



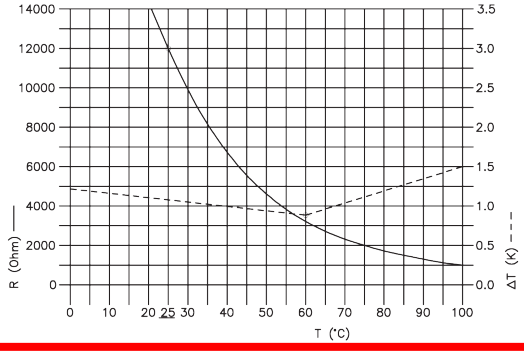
NTC 10K 3%@60ºC B3977

T(°C)	Rn(Ohm)
0	32624
5	25381
10	19897
15	15711
20	12493
25	10000
30	8056
35	6530
40	5324
45	4365
50	3599
55	2982
60	2483
65	2079
70	1748
75	1476
80	1252
85	1066
90	912
95	782
100	674



NTC 12K 3%@60ºC B3740

T(°C)	R(Ohm)
0	36033
5	28562
10	22799
15	18308
20	14796
25	12000
30	9801
35	8060
40	6663
45	5531
50	4615
55	3862
60	3248
65	2749
70	2336
75	1993
80	1707
85	1466
90	1264
95	1095
100	951



ORDERING INFORMATION

Measuring element	Ordering Code
NTC 10K B3435	TSA00AA
NTC 10K B3977	TSA00A1
NTC 12K B3740	TSA00B4

Other measuring elements on request

Packing quantity and MOQ: 144 pieces

Tasseron Sensors B.V.
Ambachtshof 50
NL-2632 BB Nootdorp
The Netherlands
Tel: +31 (0)15 310 40 00
Fax : +31 (0)15 310 40 40
Email: sensors@tasseron.nl

Tasseron Sensors Inc.
2401 Reach Road
Williamsport, PA 17701
United States
Tel: +1 (570)601-1971
Fax : +1 (570)601-1972
Email: sales@tasseronusa.com

Patterson-Kelley, LLC
155 Burson Street
East Stroudsburg, PA 18301 USA

Phone: 570.421.7500
Fax: 570.421.8735
www.pattersonkelley.com

Patterson-Kelley

P-K PART # 2691000070

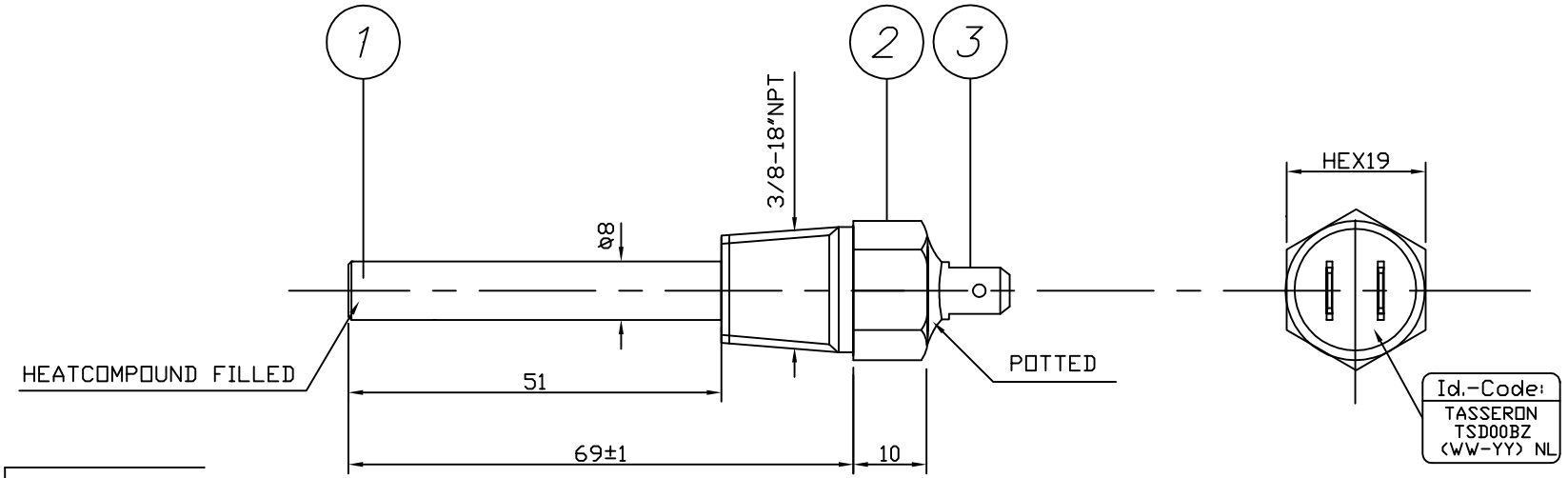
REV. B

VENDOR DRAWING

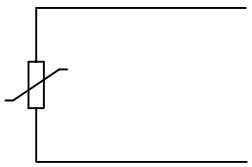
SNSR,NTC,D8X51MM,3/8"NPT,12K3%,TSD00BZ-R

REV.	DATE	DESCRIPTION
A	6-3-19	INITIAL RELEASE; PATTERS5 - REV 0 QUOTED PART - M.O.Q 1000
B	7-19-19	FASTON CONNECTION WAS 4.8 X 0.8 MM VENDOR PART WAS PATTERS5, NOW TSD00AX-R; RELEASED AT REV 1
B	3-30-20	VENDOR PART WAS TSD00AX-R, NOW TSD00BZ-R; RELEASED AT REV 1

P-K P/N: 2691000071



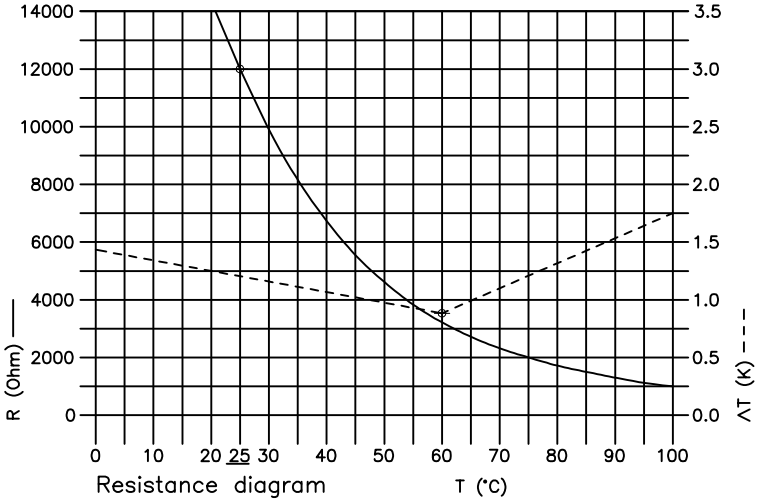
NTC thermistor
type 12KOhm 3%
single 2-wire
12KOhm at 25°C
Bvalue 3740K @25/85°C
range 0..+105°C
tolerance 3% at 60°C



Electrical circuit

T(°C)	R(Ohm)
0	36100
5	28590
10	22790
15	18290
20	14770
25	12000
30	9805
35	8055
40	6653
45	5524
50	4609
55	3863
60	3253
65	2752
70	2337
75	1994
80	1707
85	1467
90	1266
95	1096
100	952

Resistance table



Resistance diagram

POS.	QTY.	MATERIAL	DESCRIPTION
1	1	–	NTC
2	1	AISI 316L/1.4404	HOUSING HEX19
3	1	–	FASTON 6.3x0.8 MM CONNECTOR

REV.	DESCRIPTION	DWN	APP RD	APP PRD	DATE
—	–	—	—	—	–
—	–	—	—	—	–
—	–	—	—	—	–
—	–	—	—	—	–
—	–	—	—	—	–
1	Chg. Tabs	JB	CB	—	16-07-19
0	preliminary	JB	CB	—	06-03-19

TASSERON SENSORS & CONTROLS

NTC sensor 12K3%, HEX19, 3/8" NPT, Ø8X69mm

–

DRAWING NO. TSD00BZ-R

A4

⚠ CHANGE CAD-DRAWING ONLY WITH CAD-SYSTEM ⚠

SCALE: 1:1
DIMENSIONS: all units in mm
TOLERANCES: ±0.2mm unless otherwise noted

The *FLEXIBILITY* You Want. The *FEATURES* You Need.

Low Water Cut-Offs for Commercial Water Boilers

Safgard™ 500/550

Safgard™ 1100M

- Flexible Designs
- Easy Installation
- Manual Reset with Nuisance Lock-Out Protection
- Test Button
- LED Indicating Lights
- Meets ASME CSD-1 Requirements for Commercial Water Boilers

HYDROLEVEL COMPANY

INNOVATORS IN BOILER PROTECTION SINCE 1965

Safgard™

Low Water Cut-Offs For Commercial Water Boilers

Safgard commercial low water cut-offs combine Hydrolevel's over 45 years of electronic boiler control experience, advanced technology and design input from heating professionals. The result is two easy-to-install low water cut-off options to fit nearly any commercial application.

Flexible Designs

- Safgard 500/550: Heavy-duty construction and 16 AMP relay suitable for virtually any commercial water boiler needs
- Safgard 1100M: Compact size provides the flexibility for wall-hung boiler or and other space-constrained installations.

Easy Installation

- Hydrolevel provides step-by-step, diagramed instructions for fast, easy installation and wiring. The 1100M includes a plug-in wire harness with labeled quick connects for 24 volt wiring. No guessing!

Manual Reset

- Burner circuit locks-out if water remains below probe for 30 seconds. Manual reset will not trip due to power failures.

Burner Circuit Test Button

- Allows for testing the control without lowering the water level.

LED Indicating Lights

- Safgard models 500, 550 and 1100M feature indicator lights for easy troubleshooting

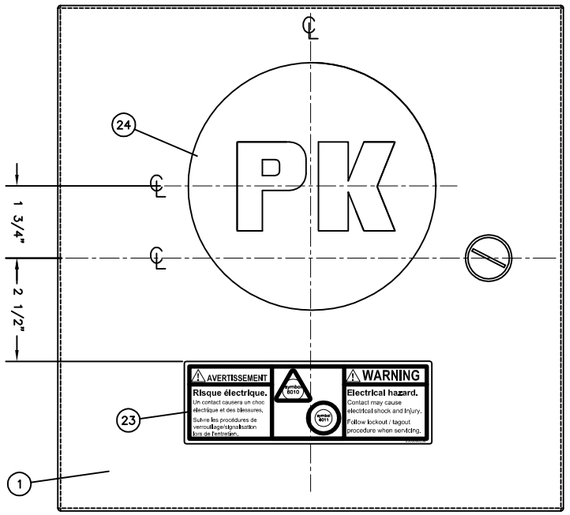
Specifications	Safgard 500	Safgard 550	Safgard 1100M
Boiler Application	Gas	Gas or Oil	Gas
Voltage	24 VAC	120 VAC	24 VAC
Power Consumption	2 VA	4 VA	1 VA
Switching Capacity	5.8 FLA, 34.8 LRA	5.8 FLA, 34.8 LRA	50VA
Maximum Load	16 Amp	16 Amp	2 Amp
Switch Contacts	SPDT	SPDT	SPST
Maximum Pressure	250 PSI	250 PSI	160 PSI
Maximum Water Temperature	250°F (121°C)	250°F (121°C)	250°F (121°C)

HYDROLEVEL COMPANY

126 BAILEY ROAD • NORTH HAVEN, CT 06473 • (203) 776-0473 • FAX (203) 764-1711 • TOLL FREE 800-654-0768

www.hydrolevel.com

MCLWCOSS Rev. 061515



FRONT VIEW
DOOR

WIRE #	FROM	END 1	TO	END 2	GAUGE	COLOR
L1	TERMINAL STRIP 120VAC H	FERRULE	FUSEHOLDER .5A (BOTTOM)	FERRULE	18	BLACK
L1A	FUSEHOLDER .5A (TOP)	FERRULE	TRANSFORMER H1	FERRULE	18	BLACK
N	TERMINAL STRIP 120VAC N	FERRULE	TRANSFORMER H4	FERRULE	18	WHITE
GND	TERMINAL STRIP 120VAC G	FERRULE	ENCLOSURE GROUND STUD	EYE	18	GREEN
G	ENCLOSURE GROUND STUD	EYE	DOOR GROUND STUD	EYE	18	GREEN
2-1	TERMINAL STRIP TB1 COM 1A	FERRULE	PIN 1 / Tx/+	FERRULE	22*	ORANGE
2-2	TERMINAL STRIP TB1 COM 1B	FERRULE	PIN 2 / Rx/-	FERRULE	22*	WHITE
2-3	COMMON	FERRULE	PIN 3 / GND	FERRULE	22	GRAY
	TERMINAL STRIP SHIELD G					
24V A	TRANSFORMER TERMINAL X2	FERRULE	FUSEHOLDER 1A (TOP)	FERRULE	18	RED
24V	FUSEHOLDER .5A (BOTTOM)	FERRULE	PIN 4 / + PWR	FERRULE	18	RED
COM	TRANSFORMER TERMINAL X1	FERRULE	PIN 5 / - PWR	FERRULE	18	YELLOW
FG	ENCLOSURE GROUND STUD	EYE	PIN 6 / FRAME GND	FERRULE	18	GREEN
1A-1	TERMINAL STRIP NET +	FERRULE	PIN 1 / RS 485+	FERRULE	22*	BLACK
1A-2	TERMINAL STRIP NET -	FERRULE	PIN 2 / RS 485-	FERRULE	22*	RED
1A-3	TERMINAL STRIP RS485 COM	FERRULE	PIN 3 / RS 485 GND	FERRULE	22	GRAY
	TERMINAL STRIP SHIELD G					

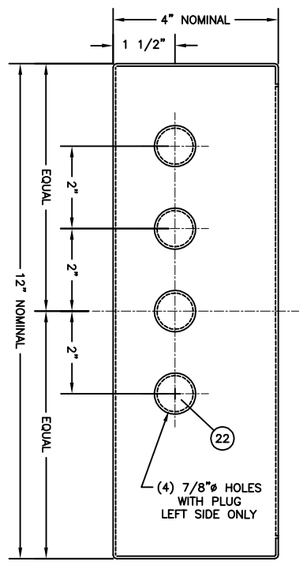
* TWISTED PAIR

NOTE;
KEEP BOTH SETS OF TWISTED PAIR WIRES SEPARATE.
DO NOT BUNDLE WITH 120V OR 24V WIRES.

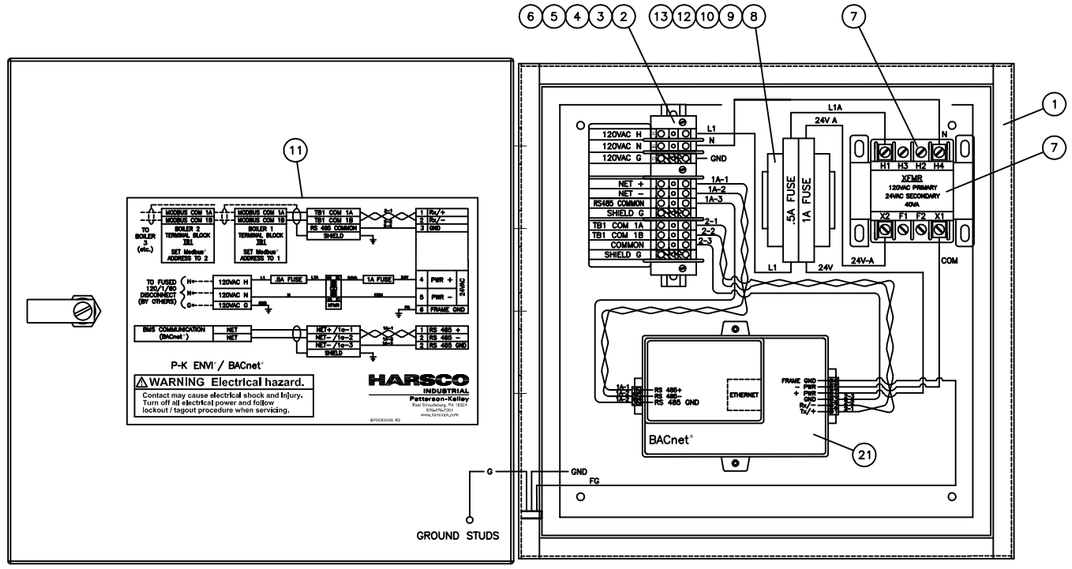
ITEM NO	QUANTITY / UM	PART NUMBER	DESCRIPTION
1	1.00 EA		JUNCTION_BOX,12"X12"X4",NEMA1
2	100.00 MM	2630000195	RAIL,DIN,15MMX5.5MM
3	8.00 EA	2630000191	TERM_BLK,DIN,ALTECH,CMT4
4	3.00 EA	2630000192	TERM_BLK,DIN,ALTECH,CGMT4,GND
5	3.00 EA	2630000193	TERM_BLK,DIN,ALTECH,CA602,END
6	5.00 EA	2630000190	PARTITION,ISOLATION,ALTECH,PPCMT4
7	1.00 EA		XFMR,ACME,CE01-0050,50VA
8	2.00 EA		FUSE_BLK,ALTECH,CAFL4U
9	1.00 EA		FUSE,1/4"X1-1/4",0.50AMP
10	1.00 EA		FUSE,1/4"X1-1/4",1.00AMP
11	1.00 EA		WIRING_DIAGRAM,BP00000468
12	2.00 EA		END_STOP,PHOENIX,CLIPFIX_35
13	2.00 IN		RAIL,DIN,35MM

THE BELOW ARE OBTAINED FROM HARSCO INDUSTRIAL, PATTERSON-KELLEY

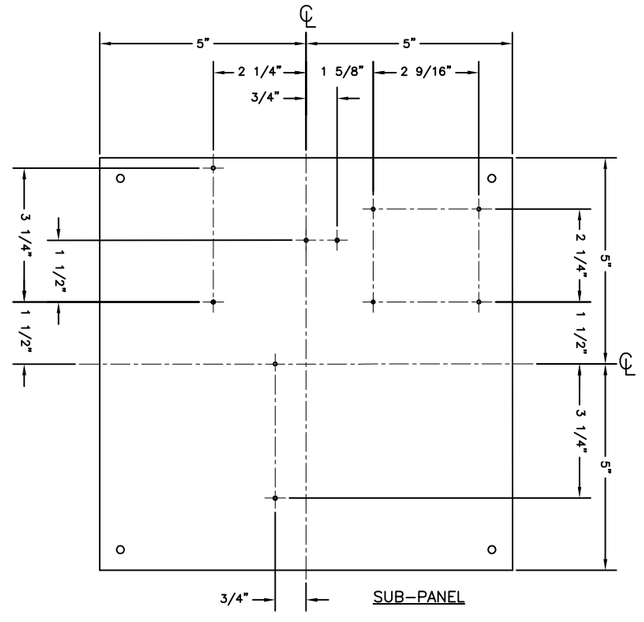
ITEM NO	QUANTITY/UM	PART NO	DESCRIPTION
21	1.00 EA	2600000643	CONV,PROTOCESSOR,BACNET,
22	4.00 EA	2600000150	PLUG,FINISH,FITS_7/8"ID,LOCKING,NON-VENT
23	1.00 EA	2300000236	LBL,SFTY,ELECTRICAL_HAZARD,ANSI-ISO
24	1.00 EA	2631000033	LBL,P-K,DOMED_INSERT,5.65"DIA
25	1.00 EA	1004905965	MAN,PROTOCESSOR_STARTUP_GUIDE



LEFT SIDE VIEW
DOOR OPEN



FRONT VIEW
DOOR OPEN



REV	DESCRIPTION	BY	CHECK	DATE
A	MIGRATED REV. 2 TO WINDCHILL	VN	DCT	04/13/17
2	ECN #2425 - DELETE P/N-2630000109, REPLACE WITH P/N-2631000033.	VN	LSW	03/17/16
1	ADDED ITEM 25, STARTUP MANUAL, PER ECN 2069	JS	JS	07-26-12

	BY	DATE
DRAWN	JS	07-05-12
CHECKED	CE	07-06-12
APPROVED	CE	07-06-12

FILE SIZE: D

TITLE: PNL,PROTOCOL_CONVERTER,BACNET

HARSCO INDUSTRIAL Patterson-Kelley
East Stroudsburg, PA 18301
877-726-5301
www.harscopk.com

REFERENCE NUMBER:

DRAWING NUMBER: BP00000468

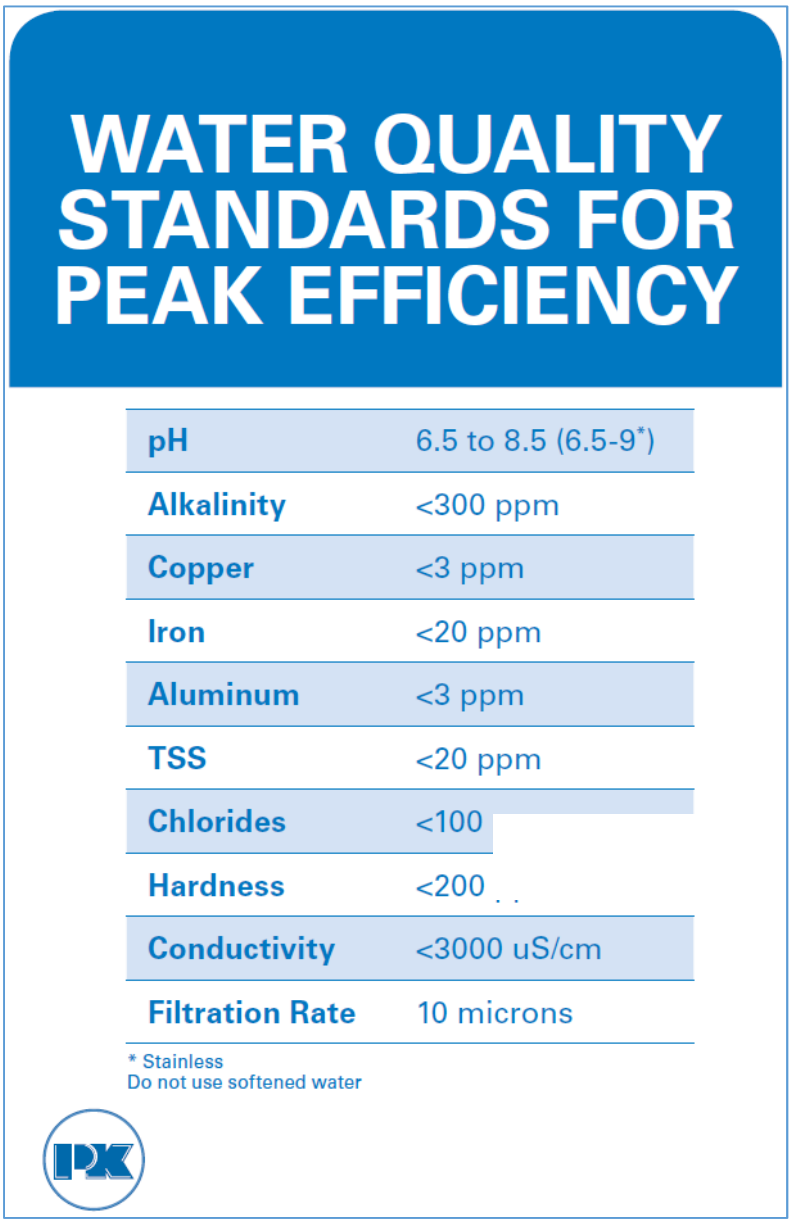
REV: A

Appendix C – Water Quality Standards Quality Standards for Hydronic Boilers in Multi-Metal Systems

Patterson-Kelley boilers are designed to be incorporated into any multi-metal hydronic heating system. All multi-metal hydronic systems require that attention be paid to water treatment. The chemical additives for any multi-metal system must be specifically formulated for use with all the various metals used in that system.

Any closed, hydronic heating systems should include a meter, to monitor water addition to the recirculating loop, and a filter, pursuant to ASHRAE Standard 189.1 and the AWT Handbook. Water added to a closed hydronic system should not exceed more than 10% of the system volume per year and meter readings should be recorded, at least monthly, to ensure system losses are minimized and corrective actions shall be taken when needed.

Treatment programs for multi-metal systems should meet or exceed the following generally accepted best practices water quality guidelines: Prior to initiating any treatment program, a water sample of the proposed fill water should be sampled for analysis. Once filled and bled of air, a pH neutral, industrial cleaner for use in multi-metal systems should be used to clean the entire hydronic system. Samples of the system water with cleaner should be taken and analyzed to ensure proper cleaner strength. Once cleaned, the system should be flushed with fresh (fill) water until the system water is within 100 micro Siemens in conductivity of the fresh water. When flushing is complete, a treatment program that is designed for use in that multi-metal system, after consideration of the metals it contains, must be used. Treatment programs should also comply with the standard water quality guidelines listed above.



7 P-K SOLIS™ SPECIFIC LIMITED WARRANTY

Last Updated 12/12/2016

Subject to the terms and conditions herein and the Terms and Conditions of Sale (as defined herein), Patterson-Kelley ("Seller") warrants to the purchaser of the product ("Buyer") that the heat exchanger and burner are free of defects in material and workmanship, when operated in accordance with the conditions stated herein, for a period of ten (10) years for the heat exchanger, five (5) years for the burner and a ten (10) year warranty against failure due to thermal shock commencing on the date of shipment or, if a start-up report is furnished to Seller, on the start-up date shown on the report furnished to Seller (the "Warranty Period"), provided that startup is completed within six (6) months of shipment and the start-up report is furnished to Seller within thirty (30) days of startup (this "Specific Limited Warranty"). The Exclusions and limitations of liability set forth in the Terms and Conditions of Sale (as defined herein) apply to this Specific Limited Warranty. Capitalized terms used but not defined herein have the meanings ascribed to them under Seller's terms and conditions of sale for the product, which can be found at **http://pattersonkelley.com/warranty.php** (the "Terms and Conditions of Sale"). This Specific Limited Warranty is transferrable to the owner that utilizes the product(s) purchased hereunder for its intended use at the original installation site (the "Original Owner"). This Specific Limited Warranty is non-transferable to anyone who subsequently receives or purchases products from the Original Owner. If the Original Owner did not purchase the product directly from Seller, the Original Owner should contact the reseller from whom it purchased the product for a copy of the Terms and Conditions of Sale attached to the Order Acknowledgement received by the original purchaser of the product from Seller.

I. REMEDY

Seller's obligations under this Specific Limited Warranty is limited to repairing or, if in Seller's judgment it seems more appropriate, to furnishing without charge (installation not included), FCA Seller's factory (Incoterms 2010), a similar part to replace any part which after examination shall, to Seller's own satisfaction be determined to have been defective at the time it was shipped. In the event that a replacement is provided by Seller, the defective item will become the property of Seller. Transportation to Seller's facility or other designated facility for repairs of any products or party alleged defective shall, in all events, be at Buyer's sole risk and cost. This warranty applies only if the original installer and Seller (Attention: Patterson-Kelley, 155 Burson Street, East Stroudsburg, PA 18301) receive, within the Warranty Period, an immediate written notice, providing a detailed description of all claimed defects, upon discovery of such defects together with proof of purchase (invoice or Order Acknowledgment) and a copy of the start-up report for the affected product. Seller may seek reimbursement of any costs incurred by Seller where the product is found to be in good working order, or when it has been determined that this Specific Limited Warranty does not apply as per the exclusions set forth below. The remedies available to Buyer set forth herein are exclusive remedies, and all other remedies, statutory or otherwise, including but not limited to the right of redhibition, are waived by Buyer. Buyer acknowledges that the exclusion of remedies is neither unreasonable nor unconscionable. Buyer shall indemnify and hold Seller harmless against, any claim due to any injury or death to any person or damage to any property resulting in whole or in part from any modification or alteration Buyer makes to any product sold hereunder.

II. EXCLUSIONS

To the full extent permitted by law, Seller shall have no liability for and the Warranties do not cover:
(A) any product which has been altered or repaired by other than Seller's personnel;
(B) deterioration or failure of any product due to
- (i) abrasion, corrosion, erosion or fouling,
- (ii) misuse,
- (iii) modification not authorized by Seller in writing or
- (iv) improper installation, lack of or improper maintenance or operation;

(C) equipment not furnished by Seller by the owner, either mounted or unmounted, or when contracted for by a party or parties other than Seller to be installed or handled;
(D) the suitability of any product for any particular application;
(E) the design or operation of owner's plant or equipment or of any facility or system of which any product may be made a part;
(F) any damage to the product due to abrasion, erosion, corrosion, deterioration, abnormal temperatures or the influence of foreign matter or energy;
(G) the performance of any product under conditions varying materially from those under which such product is usually tested under industry standards at the time of shipment;
(H) leakage or other malfunction caused by:
- (i) defective installations in general and specifically, any installation which is made
  - (a) in violation of applicable state or local plumbing, housing or building codes or
  - (b) contrary to the written instructions furnished with the product,
- (ii) adverse local conditions in general and, specifically, sediment or lime precipitation in the tubes, headers and/or shells or corrosive elements in the water, heating medium or atmosphere, or

(iii) misuse in general and, specifically, operation and maintenance contrary to the written instructions furnished with the unit, disconnection, alteration or addition of components or apparatus, not approved by Seller, operation with heating media, fuels or settings other than those set forth on the rating plate or accidental or exterior damage;

(I) production of noise, odors, discoloration or rusty water;

(J) damage to surrounding area or property caused by leakage or malfunction;

(K) costs associated with the replacement and/or repair of the unit including: any freight, shipping or delivery charges, any removal, installation or reinstallation charges, any material and/or permits required for installation, reinstallation or repair, charges to return the boiler and/or components;

(L) INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES, SUCH AS LOSS OF THE USE OF PRODUCTS, FACILITIES OR PRODUCTION, INCONVENIENCE, LOSS OF TIME OR LABOR EXPENSE INVOLVED IN REPAIRING OR REPLACING THE ALLEGED DEFECTIVE PRODUCT;

(M) any claim due to any injury or death to any person or damage to any property resulting in whole or in part from any modification or alteration Buyer makes to any product sold hereunder; and

(N) Design defects where Seller has complied with Buyer's design specifications.

III. PROOF OF PURCHASE

Proof of purchase (invoice or Order Acknowledgement) and a copy of the start-up report for the affected product must be provided to Seller when requesting service under this Specific Limited Warranty.

IV. ORDER OF PRECEDENCE

The Standard Limited Warranty set forth in the Terms and Conditions of Sale, (b) this Specific Limited Warranty and (c) any applicable Extended Limited Warranty exclusively govern and control Seller's and Buyer's respective rights and obligations regarding the warranty of the product. In case of any inconsistency, conflict, or ambiguity between the Standard Limited Warranty, this Specific Limited Warranty and any applicable Extended Limited Warranty (collectively, the "Warranty Documents"), the documents shall govern in the following order: (w) any applicable Extended Limited Warranty; (x) this Specific Limited Warranty; (y) the Standard Limited Warranty and (z) other provisions in the Terms and Conditions of Sale. Information identified in one Warranty Document and not identified in another shall not be considered a conflict or inconsistency. No sales representative, agent, or employee of Seller or any reseller in the chain of sale of the product is authorized to make any modification, extension, or addition to this Specific Limited Warranty, unless agreed to in writing by Seller.

Revised - June, 2017

NBSeries Installation Operation & Maintenance

Models: NBT-610, NBT-230

Acidic Waste WaterCondensate pH Treatment Tank

69 Ferry Street - Units 17 - 20
Easthampton, MA 01027 I 413-527-1893

2400 Feather Sound Drive, Clearwater, FL 33762
413-427-3373

jjmboilerworks.com

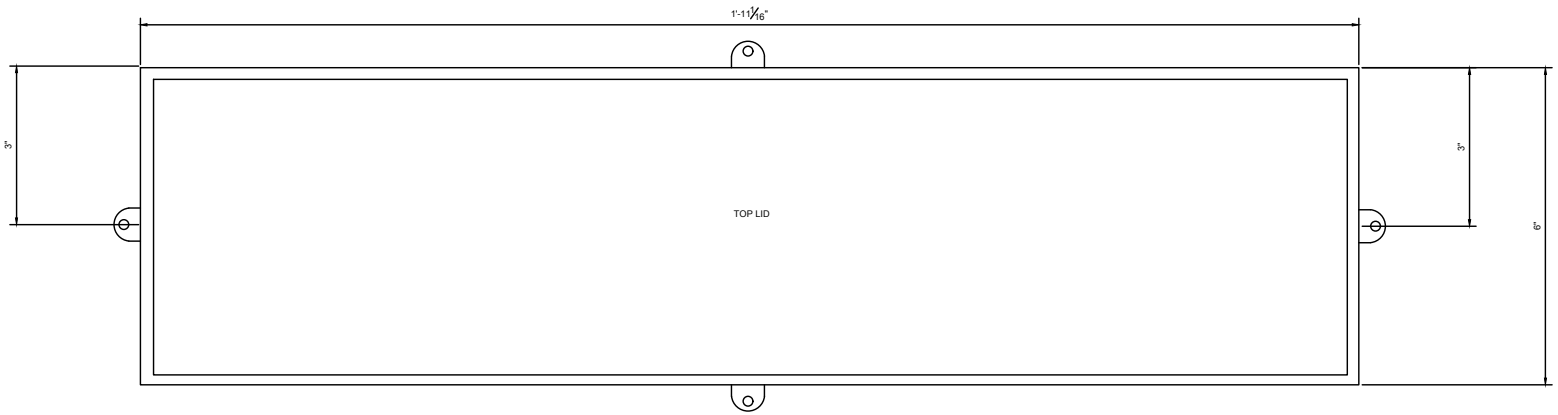
DATA SHEET

MODEL: NBT-230

Model	Part#	Rating MBH	GPH	Material	Active Ingredient	Temp. Rating
NBT-230	2011	3500 Max	26.0	Polypropylene	Mg(OH)2 Pellets	140F Const.

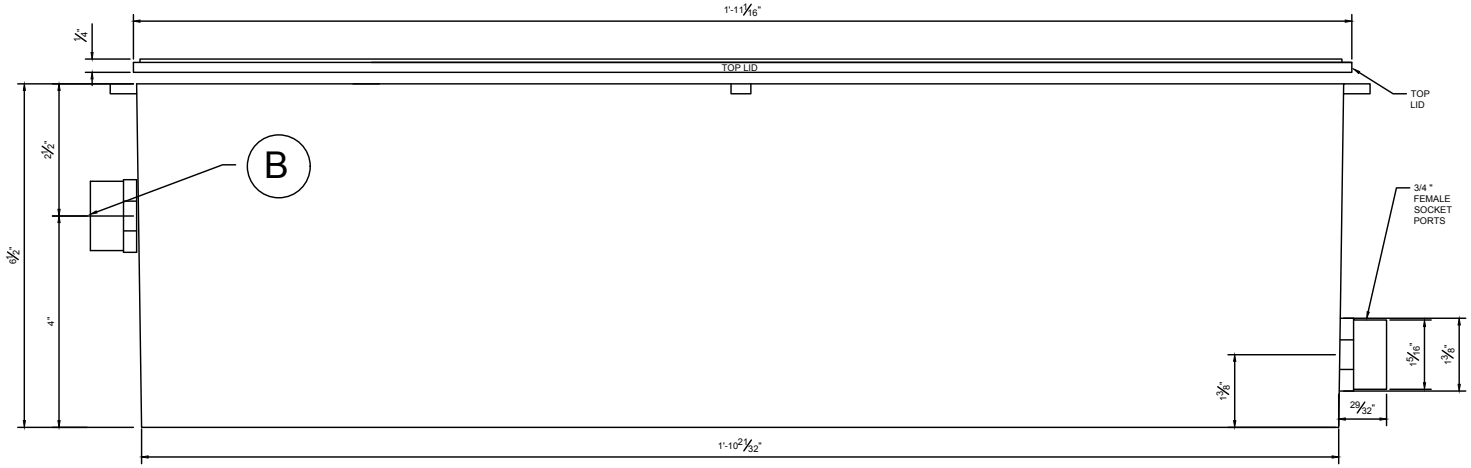
Inlet port	Outlet port	Mounting	Clear Cover	Field Rechargeable
.75” PVC Socket	7.5” PVC Socket	Horizontal Floor	Clear Cover	YES

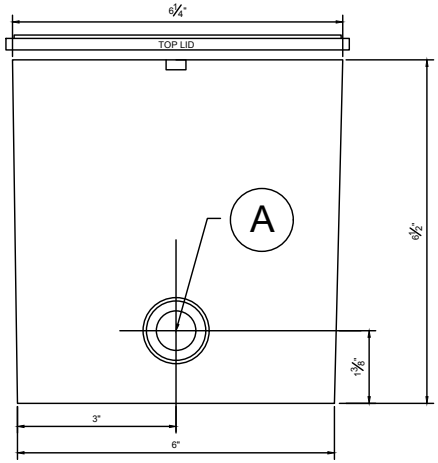
Fittings	Fittings	Wall Brackets	Porous Refill Bag	Refill part #
.5” NPT x ¾” Barb (2)	.5” NPT PVC x ¾” Soc.	NO	Yes	1114



A INLET PORT

B OUTLET PORT





REV:	DESCRIPTION:	BY:	DATE:
AMENDMENTS:			

SITE: JJM BOILER WORKS INC.	NBT 230 dimensions DRAWING NO.		---- PROJECT NO.	08/02/16 DATE.
TITLE: NBT-230 Dimensions	NA SCALE AT A4.	SG DRAWN.	CHECKED.	REVISION.

Overview

Read before proceeding

⚠WARNING

Always use eye protection and plastic or rubber gloves when installing, recharging, adding water, or cleaning the NBT-610 & 230 tanks.

Failure to comply with these guidelines could result in severe personal injury, death or substantial property damage.

Keep pH Power Pellets® and power pellet bags out of the reach of children and animals. pH Power Pellets® (magnesium Hydroxide) are NOT food grade and should not be consumed by humans or animals.

Always return the clear cover lockdown bolts and nuts in place and tighten for child safety.

DO NOT exhaust flue gases through tanks, they are not rated for boiler or furnace flue gases. Operating NBT tanks as exhaust vents can cause injury or death from carbon monoxide.

Gas traps must be installed between the boiler, vent drains, and furnace condensate outlet and the inlet of all NBT tanks.

Neutralizer and lines must be wet

- **Before operating the boiler, hot water heater or furnace, fill the NBT tanks and traps with tap water. NEVER operate with tubes or P-traps dry.**

Application restrictions

- Condensing boilers, hot water heaters or furnaces, and flue pipe condensate drains.
- NBT-610 & NBT-230 tanks must be installed below system P-traps, boiler, furnace, and breeching condensate drains.
- The use of Ferris and Copper piping on the neutralizer inlet or out is not permitted. The use of CPVC, PVC, PP Tubing, and Stainless Steel piping is the only material that shall be used.

Combined piping options

Flue pipe condensate drains / NBT tanks

- Condensate drain piping options / Flue Drain, Boiler Drain, Furnace Drain, Hot Water Heater Drains: See Figures 1,2,3,4,5,6, and 7.
- If using a separate NBT-610 & 230 tank for a common flue pipe drain the tank should be rated at 33.3% of the total gross BTU of all units attached to the common vent.

Replacement of the NBT-610 & NBT-230 pH Power Pellet® Media Bags

- The media bags should be replaced when pH level at the NBT-610 & NBT-230 outlet level falls below 5.0.
- At a minimum the media bags must be changed once a year.
- Use only JJM pH Power Pellet® media bags. DO NOTE USE LIMESTONE OR MARBLE CHIPS.

What is pH?

The pH measurement of a fluid is an indicator of the acidity or alkalinity. Neutral fluids have pH of 7.0. Acid fluids have pH below 7. And alkaline fluids have pH above 7 (up to 14). The pH can be easily measured using a digital pocket pH probe.

Condensate pH from condensing boilers and furnaces is typically around 3.2 - 4.0. The condensate pH needs to be increased (made more neutral) to prevent possible damage to cast iron soil pipe, ABS pipe, septic tanks, plants, wastewater treatment plants and other materials handling wastewater.

NBT-610 & NBT-230 condensate pH treatment tanks increase pH (reduce acidity).

NBT residential/commercial flue-side condensate neutralizing tanks are designed to raise the pH level of the condensate discharged by high-efficiency boilers and warm air furnaces and hot water heaters.

Applying NBT-610 & NBT-230 neutralizing tanks

Condensate can be collected from flueways and boiler/furnace condensate trap outlets. See WARNING section at left for guidelines on application.

Match neutralizing tank to boiler, hot water heater and furnace gross BTU input ratings.

Do not install a condensate pump unit before the NBT tanks inlet; a condensate pump can only be installed at the outlet of a NBT tank.

Locate the neutralizing tank outlet port below the condensate connection and slightly above the floor drain or inlet to a condensate pump reservoir (if used).

Follow the guidelines in this manual, the boiler/furnace manual and all applicable local codes when installing, using and maintaining NBT tanks condensate neutralizing tank.

⚠WARNING

Keep pH Power Pellets® and power pellet bags out of the reach of children and animals. pH Power Pellets® (magnesium Hydroxide) are NOT food grade and should not be consumed by humans or animals.

Always return the clear cover lockdown bolts and nuts in place and tighten for child safety.

Installation

1. Remove all bolts and nuts from the clear cover.
2. Remove shipping bubble wrap and safely discard.
3. Remove "Date of installation label" and the "red warranty tag".
4. Remove the pH Power Pellet® bags.
5. Remove porous pellet bags from plastic shipping bags before placing in the NBT tank.

Floor mounting units:

1. Place the NBT tank in a location where it will not be a foot traffic hazard.
2. Use clamps on inlet & outlet piping.

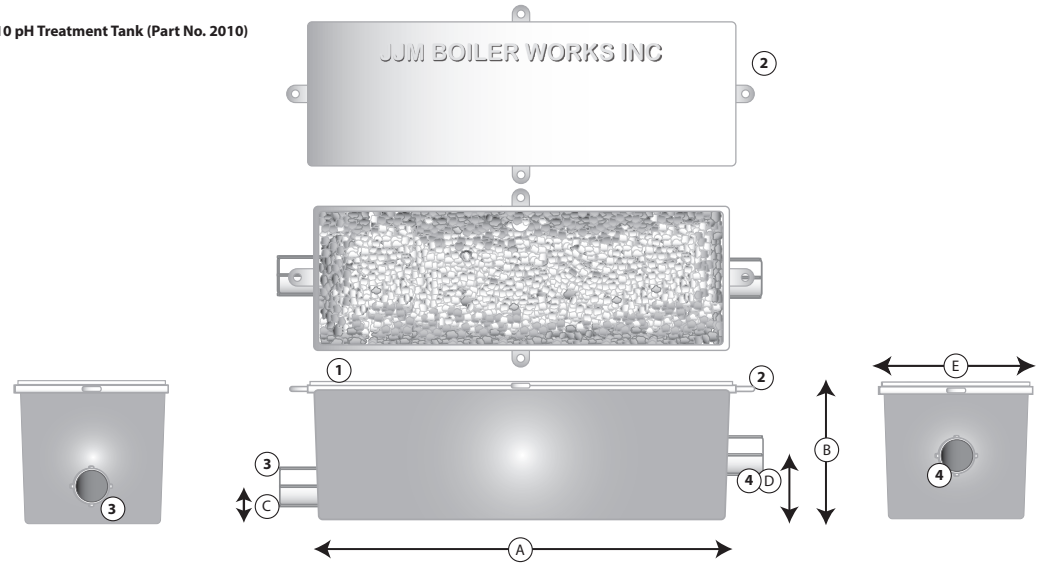
Operational Flow:

1. Once the heating unit is fired and acidic condensate is produced the condensate will flow from the heater condensate drain down into the NBT tank's inlet port. The acidic condensate enters the bottom chamber of the tank below the flow baffle. The acid will now flow up through the baffle ports via gravity and slight head pressure at which point it comes in contact with the Magnesium Hydroxide Pellet bag (pH Power Pellets®). A chemical reaction now takes place in which ions from the acid and pellets are exchanged raising the ph level of the acid in the range of 5.0 to 9.0 pH. In this ranged the condensate can be safely be put to a waste drain via the NBT's outlet port and piping.

Installation

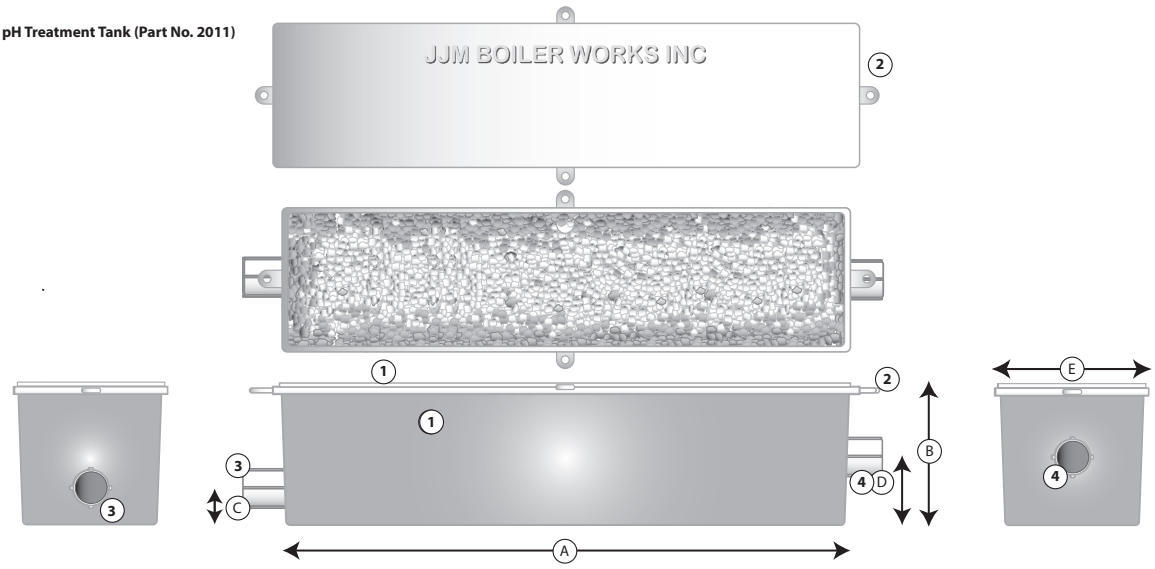
Figure 1 & 2 NBT-610 & NBT-230 pH Treatment Tank – features and dimensions

NBT-610 pH Treatment Tank (Part No. 2010)



NBT-610 pH Treatment Tank Ratings & Dimensions (in inches)							
MBH	Flow Rating	A	B	C	D	E	Active Ingredient/pH Power Pellets™ by JJM Boiler Works, Inc.
1500 Max	11 GPH Max	18.25″	6 .75″	7/8″	3.5″	6.50″	3 INLET 4 OUTLET Port Size/PVC - 3/4″ Socket (EDPM Flat Gasket)
1 Tank - Corrosion-resistant polypropylene							3C INLET 7/8″ From Base to Center 4D Outlet 3 3/4″ Base to Center
2 Cover plate - clear polycarbonate (8-32 x 1/2″ Screw/ 8-32 Nut)							

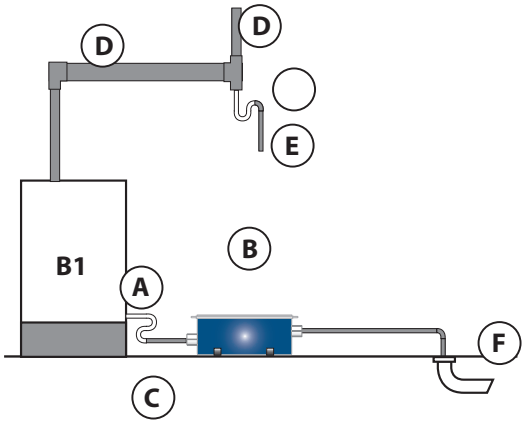
NBT-230 pH Treatment Tank (Part No. 2011)



NBT-610 pH Treatment Tank Ratings & Dimensions (in inches)							
MBH	Flow Rating	A	B	C	D	E	Active Ingredient/pH Power Pellets™ by JJM Boiler Works, Inc.
3500 Max	26.0 GPH Max	23.25″	6 .75″	7/8″	3.5″	6.50″	3 INLET 4 OUTLET Port Size/PVC - 3/4″ Socket (EDPM Flat Gasket)
1 Tank - Corrosion-resistant polypropylene							3C INLET 7/8″ From Base to Center 4D Outlet 3 1/2″ Base to Center
2 Cover plate - clear polycarbonate (8-32 x 1/2″ Screw/ 8-32 Nut)							

Installation

Figure 3 NBT-610 & NBT-230 pH Treatment Tank/Single Unit



A Boilers / Hot Water Heaters / Furnace Condensate Drains

B NBT pH Treatment Tank

C Trap

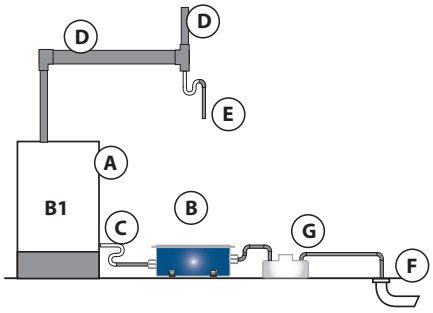
D Flue Pipe

E Trap

F Floor Drain

Note: Contact Factory for pH Treatment Tank and Piping Size

Figure 4 NBT-610 & NBT-230 pH Treatment Tank Single Unit - Condensate Pump



A Boilers / Hot Water Heaters / Furnace Condensate Drains

B NBT pH Treatment Tank

C Trap

D Flue Pipe

E Trap

F Floor Drain

G Condensate Pump

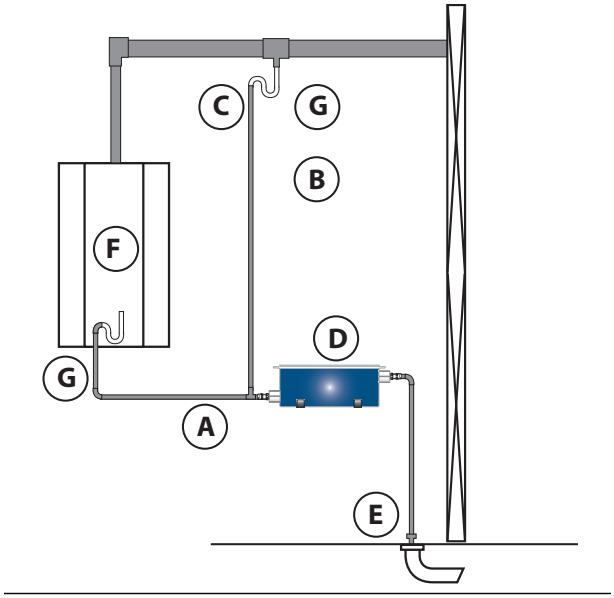
Note: Contact Factory for pH Treatment Tank and Piping Size

Piping Methods

⚠WARNING

Do not install the NBT tanks in a vertical position.
Only mount in a horizontal position on the floor.

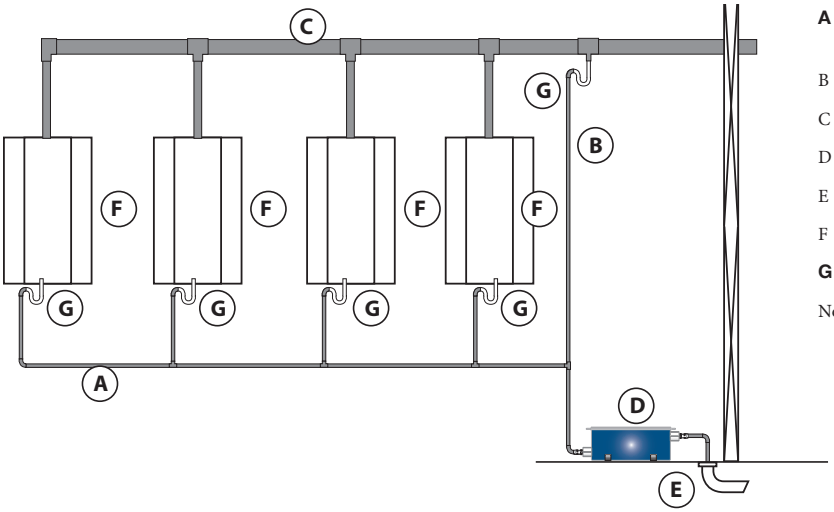
Figure 5 Piping for Single Heating Unit with Common NBT pH Treatment Tanks and Flue Drain Connection



- **A** Boilers / Hot Water Heaters / Furnace Condensate Drains
- B Flue Drain/Trapped
- C Single Flue Vent
- D NBT pH Treatment Tank
- E House Drain
- F Boilers / Hot Water Heaters / Furnaces
- G Gas/Water Trap

Note: Contact Factory for pH Treatment Tank and Piping Size

Figure 6 Piping Multiple Heating Units/Single NBT pH Treatment Kit / Common Vent Piping / Common Condensate Drain

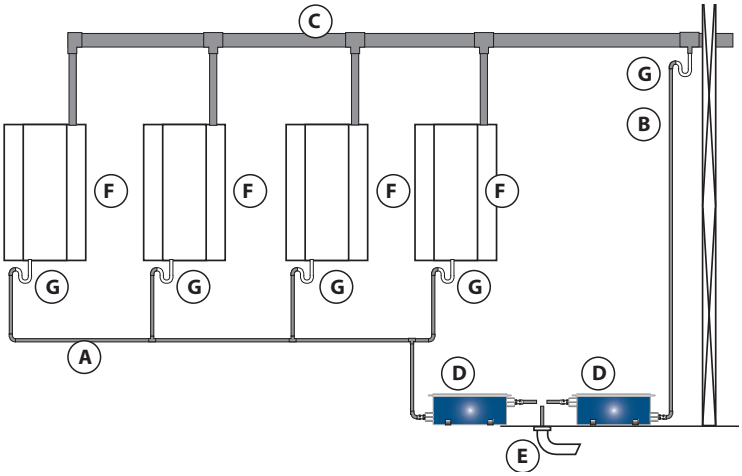


- **A** Boilers / Hot Water Heaters / Furnace Condensate Common Drain
- B Flue Drain
- C Common Flue Vent
- D NBT pH Treatment Tank
- E House Drain
- F Boilers / Hot Water Heaters / Furnaces
- **G** Condensate Trap

Note: Contact Factory for pH Treatment Tank and Piping Size

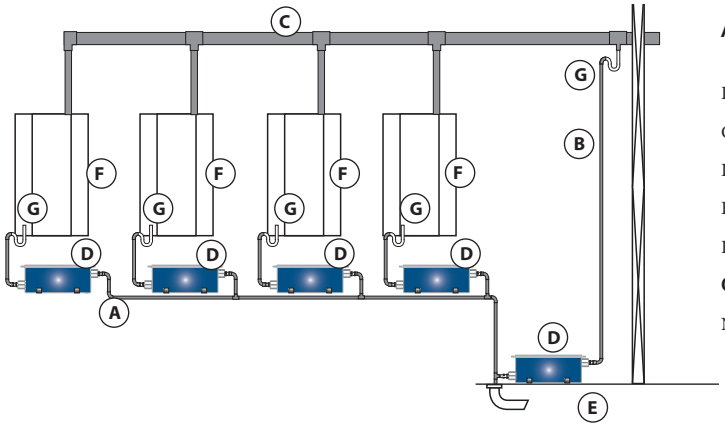
Piping Methods

Figure 7 Piping for Multiple Heating Units with Common NBT pH Treatment Tanks. Common Flue Vent with Separate NBT pH Treatment Tank.



A Boilers / Hot Water Heaters / Furnace Common Drain
B Flue Drain
C Common Flue Vent
D NBT pH Treatment Tanks
E House Drain
F Boilers / Hot Water Heaters / Furnaces
G Condensate Trap
Note: Contact Factory for pH Treatment Tank Piping Size

Figure 8 Piping for Multiple Heating Units / Single pH Treatment Kit / Common Vent Piping / Common Condensate Drain



A Boilers / Hot Water Heaters / Furnace Condensate Common Drains
B Flue Drain
C Common Flue Vent
D NBT pH Treatment Tanks
E House Drain
F Boilers / Hot Water Heaters / Furnaces
G Condensate Trap
Note: Contact Factory for pH Treatment Tank Piping Size

⚠WARNING

OUTDOOR INSTALLATIONS — provide and install electric heat tape provide and install electric heat tape and insulation on the condensate drain lines and around the NBT tanks to prevent possibility of neutralizer tube damage or line blockage due to freezing. Failure to comply with the following guidelines could result in severe personal injury, death or substantial property damage.

Maintenance

Inspect frequently

Installer — Instruct the building owner to frequently inspect the NBT tanks neutralizer and all condensate connections. The owner must notify a qualified technician if any problems are noticed.

Recharge as required

When pH tank outlet falls below 5PH. Local codes may have different requirement, check with local authority.

At least at a minimum once a year.

Cleaning

The baffle at the bottom of the NBT tanks should be lifted out every three years during re-charging for cleaning of the tank bottom. This should be done by a trained technician.

Contact your local wholesaler or manufacturer's representative for replacement parts.

Dealer listing at www.jjmboilerworks.com

Environmentally Friendly

The pH Power Pellets® (Magnesium Hydroxide) pellets are NON-Hazardous to the environment and can be disposed of as normal refuge. Do not allow children or animals to consume pH power pellets as they are not meant as a neutralizer for human or animal consumption.

Important

Remove porous pellet bag from plastic shippig bag before placing in the NBT tanks.

MSDS and SDS sheets are included with the NBT tanks or can be found on the JJM Boiler Works, Inc. website @ www.jjmboilerworks.com

Maintenance Procedures

Getting the most out of your JJM® Neutralizer

Acidic wastewater neutralizers like all filtering devices need both maintenance and replacing. The average pH level of acidic wastewater produced by today's condensing boilers, hot water heaters, furnaces, flue stack drains, and stack economizers is 3.2pH. When using a passive Inline Tube, Tank, or Canister the range of pH modification will fall in between 5.0 and 9.5 pH.

When the pH falls below 5.0 at the outlet port of any neutralizer the active ingredient must be replaced. **Media replacement schedule will depend on several factors including Operating Hours, Efficiency, System Design, and Neutralizer Piping Scheme.** The active ingredient in the case of JJM® products is Magnesium Hydroxide Pellets. The trade name is pH Power Pellets®.

Before changing the pellets when the pH level falls below 5.0 you can get the most out of your neutralizer by first agitating the pellets. In the case of an **inline tube products** try lightly tapping the outer sides of the tube with a rubber mallet several times and then check the pH level once again at the outlet port. You may find that your pH level has risen back into the 5.0 to 9.5pH range.

When your **neutralizer is a tank product with loose pellets** you can simply use a wooded dowel to stir the pellets and again use fresh tap water to flush out the tank.

If your **neutralizer pellets are incased in a porous pellet bag** there are three methods to agitating the pellets:

1. Remove the pellet bag or bags from the tank and using your hands move the pellets around inside the bags.
2. Using a five gallon bucket filled with fresh tap water, use step one with the bag under water.
3. Using a fresh water hose slowly pour fresh water over both sides of the pellet bag and also use method one.

If the pH level is has not risen back into the safe range of 5.0 to 9.5 pH the pellets must be replaced.

If you have our **Model V-250 or V-250 Combi vertical canisters** try the following method:

1. Twist off the outer canister to get access to the inner pellet cartridge and over a five gallon pail shake the Cartridge several times to agitate the pellets.
2. Again using a five gallon pail filled with fresh tap water let the cartridge soak for five minutes under water and then drain and hand shake the cartridge to agitate the pellets. Also clean out any sediment which may be held within the outer canister.

DURING ALL OF THE ABOVE PROCEDURES THE FOLLOWING SAFETY ITEMS MUST BE USED:

1. WEAR SAFETY GLASSES

2. WEAR RUBBER OR LATEX PROTECTIVE GLOVES

3. SHUT OFF ALL ELECTRICAL POWER TO THE HEATING UNIT OR UNITS BEFORE SERVICING YOUR NEUTRALIZERS.

The pellets are **Non-Hazardous** and can be disposed of in your normal refuge.

MSDS sheets can be found online at www.jjmboilerworks.com.

Any questions can be directed to JJM Boiler Works, Inc. at

413-527-1893 or at www.jjmboilerworks.com

George Carney, President, JJM Boiler Works, Inc.

Quotation 1008169529

Reference: R4

Reference From Opportunity: 4215367-Glendale SS - 145 Rainbow

Revision:

Job Name: Glendale SS - 145 Rainbow

Company Name: Ontario Business Partner
Customer ID: 3602007967

Ontario Business Partner
2941 Brighton Road
OAKVILLE ON L6H 6C9
CANADA
Contact Person: Quotations Department
Tel no:

Grundfos Canada INC.
2941 Brighton Road
Oakville, Ontario, L6H 6C9, Canada
Tel 1-800-644-9599
Fax 905-829-9512

website: www.ca.grundfos.com

Pricing Date: 24 Mar 2025
Validity Date: 22 Apr 2025

Dear Quotations Department

Please find our quotation for your evaluation. If you have any questions or concerns regarding this quote please contact us.

We appreciate this opportunity and welcome any feedback about this proposal.

Sohil Thomas

Tel:
Email: sthomas@grundfos.com

Quotation 1008169529

Company Name: Ontario Business Partner
Reference: R4
Revision:
Job Name: Glendale SS - 145 Rainbow

Grundfos Canada INC.
2941 Brighton Road
Oakville, Ontario, L6H 6C9, Canada
Tel 1-800-644-9599
Fax 905-829-9512
website: www.ca.grundfos.com

Tag	Product Description	Qty	Unit Price	Net Total
Duty Point: Q = 600 US GPM - H = 105.2 ft				
P-1,2		1		
	HYDRO NP 2CR125-1 3x208V 60Hz HYDRO NP EC 2CR125-1 , 25HP 3/60/208V Grundfos Variable Speed Booster package system with wall mounted ABB VFDs. The system was designed for a total flow of 600 USgpm at 105.4ft TDH. ABB VFD's to be shipped loose and wall mounted by the contractor. Quoted separate. BACnet MS/TP communication card included. Tank not included as existing tank to be used. The booster package is factory tested. Pressure Transducers to be factory installed.			
		2		
	ACH580-01-075A-2+J429 ABB Variable Frequency Drive 25HP, 3x230V Base model shipped loose for customer to install and wire on site. Bacnet MS/TP included.			
	97747198 DPI/--0-4.0b/2/C/M2.00-X/EG6/-B/02B/SD-1	2		
Duty Point: Q = 250 US GPM - H = 85.2 ft				
P-3,4		1		
	HYDRO NP 2CR45-1 3x208V 60Hz			

Quotation 1008169529

Company Name: Ontario Business Partner
Reference: R4
Revision:
Job Name: Glendale SS - 145 Rainbow

Grundfos Canada INC.
2941 Brighton Road
Oakville, Ontario, L6H 6C9, Canada
Tel 1-800-644-9599
Fax 905-829-9512
website: www.ca.grundfos.com

Tag	Product Description	Qty	Unit Price	Net Total
	HYDRO NP 2CR45-1 , 10HP 3/60/208V Grundfos Variable Speed Booster package system with wall mounted ABB VFDs. The system was designed for a total flow of 250 USgpm at 85.2ft TDH. ABB VFD's to be shipped loose and wall mounted by the contractor. Quoted separate. BACnet MS/TP communication card included. c/w Non-ASME 150# expansion tank. Tank will ship loose and is to be installed on the discharge where pressure doesn't exceed tank pressure rating. The booster package is factory tested. Pressure Transducers to be shipped loose and to be installed by the contractor.			
		2		
	ACH580-01-031A-2+J429 ABB Variable Frequency Drive 10HP, 3x230V Base model shipped loose for customer to install and wire on site. Bacnet MS/TP included.			
	97747198 DPI/--0-4.0b/2/C/M2.00-X/EG6/-B/02B/SD-1	2		
Duty Point: Q = 200 US GPM - H = 85.2 ft P-5,6		1		
	HYDRO NP 2CR45-1 3x208V 60Hz			

Quotation 1008169529

Company Name: Ontario Business Partner
Reference: R4
Revision:
Job Name: Glendale SS - 145 Rainbow

Grundfos Canada INC.
2941 Brighton Road
Oakville, Ontario, L6H 6C9, Canada
Tel 1-800-644-9599
Fax 905-829-9512
website: www.ca.grundfos.com

Tag	Product Description	Qty	Unit Price	Net Total
	HYDRO NP EC 2CR45-1 , 10HP 3/60/208V Grundfos Variable Speed Booster package system with wall mounted ABB VFDs. The system was designed for a total flow of 200 USgpm at 85.2ft TDH. ABB VFD's to be shipped loose and wall mounted by the contractor. Quoted separate. BACnet MS/TP communication card included. c/w Non-ASME 150# expansion tank. Tank will ship loose and is to be installed on the discharge where pressure doesn't exceed tank pressure rating. The booster package is factory tested. Pressure Transducers to be shipped loose and to be installed by the contractor.			
		2		
	ACH580-01-031A-2+J429 ABB Variable Frequency Drive 10HP, 3x230V Base model shipped loose for customer to install and wire on site. Bacnet MS/TP included.			
	97747198	2		
	DPI/--0-4.0b/2/C/M2.00-X/EG6/-B/02B/SD-1			
Duty Point: Q = 192 US GPM - H = 30 ft P-9,10,11		3		
	40959 VL 40959 VL, 3HP 3x230V usable @ 208V Grundfos Vertical Inline close coupled pump Factory choice motor 3/60/230V usable @ 208V, suitable for VFD No VFD considered. BAS is not included as VFD is not required for this pump.			
	96877845	3		
	VALVE,COMBINATION, 4.0" 125# * EU ECCN: US ECCN: EAR 99			

Quotation 1008169529

Company Name: Ontario Business Partner
Reference: R4
Revision:
Job Name: Glendale SS - 145 Rainbow

Grundfos Canada INC.
2941 Brighton Road
Oakville, Ontario, L6H 6C9, Canada
Tel 1-800-644-9599
Fax 905-829-9512
website: www.ca.grundfos.com

Tag	Product Description	Qty	Unit Price	Net Total
	96877830 DIFFUSER,SUCT, 4.0"x 4.0",125#	3		
	Equipment Subtotal The equipment subtotal does not include the items quoted herein as Optional or Alternative. Please ensure your PO reflects these items and the appropriate quantity and costs (price shown above is unit price).			161731.13
	Startup and Commissioning Subtotal S&C is based on one visit during regular business hours. Please refer to Grundfos Terms and Conditions.	1	2268.00	2268.00
	Freight Estimate This is an estimated price for shipping. FOB Oakville, ON - delivery to Wholesalers' warehouse. The estimate is based on shipping by Standard Dock to Dock Box Truck Only, offload by others, all sent in a single shipment. Please contact your courier for an exact price.	1	3996.00	3996.00
Optional	Training - 4 Hours	1	756.00	756.00
Total				**168751.13**

NOTE:
* "ECCN" means Export Control Classification Number. If "EU ECCN" different from "None" or "N/A" the item is so-called dual-use and may be subject to restrictions if re-exported from your country. If item is intended for re-export to a country subject to special EU sanctions please

Quotation 1008169529

Company Name: Ontario Business Partner
Reference: R4
Revision:
Job Name: Glendale SS - 145 Rainbow

Grundfos Canada INC.
2941 Brighton Road
Oakville, Ontario, L6H 6C9, Canada
Tel 1-800-644-9599
Fax 905-829-9512
website: www.ca.grundfos.com

contact Grundfos for further ECCN information. If "US ECCN" different from "N/A" the item may be subject to US re-export authorization and diversion contrary to U.S. law is prohibited. "N/A" means "Not Applicable". Please note that irrespective of the "US ECCN" indicated as "N/A", all items in the order remain under the U.S. Export Administration Regulations (EAR) since they are purchased from a U.S. registered company.

For the best performance of Grundfos products, when applicable, START UP & COMMISSIONING is recommended.

The following terms shall prevail over and cancel any other or different terms or conditions proposed by a customer of Grundfos (the 'Customer') through a purchase order or otherwise. Grundfos' acceptance of the Customer's order shall not be construed as an acceptance of printed or inserted provisions on the Customer's form(s) which are inconsistent with or additional to these terms and conditions, unless specifically accepted in writing by an authorized signing officer of Grundfos. No sales representative, agent, or employee of Grundfos is authorized to alter, vary, or waive any of these terms and conditions. Such changes require the written approval of an authorized signing officer of Grundfos.

Quotation Terms: All prices shown are NET prices. Quotation is valid for 30 days. Taxes extra.
Delivery Terms: All deliveries are estimated. Lead times to commence after receipt of signed submittal drawings.
Payment Terms: Net 30 days, subject to credit approval.
Freight Terms: Freight is not included and is an additional charge. All freight FOB Grundfos Warehouse (Oakville).

Standard Terms of Sale and Warranty.
General Terms and Conditions: https://www.grundfos.com/ca/support/partners/terms-conditions.html

Note #1 - Grundfos Start Up and Commissioning (S&C) Conditions and Requirements: https://www.grundfos.com/ca/support/partners/terms-conditions.html
Note #2 - Grundfos Service Agreement Description and Requirements: https://www.grundfos.com/ca/support/partners/terms-conditions.html
Note #3 - Grundfos Remote Management (GRM) Specifications & Requirements: https://www.grundfos.com/ca/support/partners/terms-conditions.html

GRUNDFOS STANDARD LEAD TIMES:
All deliveries are estimated.
Please note that due to Global Supply Chain Disruptions we cannot guarantee deliveries listed below.
Lead times to commence after receipt of signed submittal drawings. Deliveries are applicable for standard options only. Lead times will vary for special items. Delivery may be improved on a case by case basis, subject to review. Expediting fees may apply.

1.0 - PACO PRODUCTS:
LC, VL: 13 weeks
VLS, LF (up to 6"): 13 weeks
VLS, LF (greater than 6"): 14 weeks
NBS, LCS, KP, KPV: 16 weeks
VSM, VSMS: 22 weeks
VLC, VLSC: 13 weeks
Epoxy Coating: 28 weeks
All 575 volt motors add 3 weeks to lead time above

1.1 - BOOSTER PACKAGES:

Quotation 1008169529

Grundfos Canada INC.
2941 Brighton Road
Oakville, Ontario, L6H 6C9, Canada
Tel 1-800-644-9599
Fax 905-829-9512
website: www.ca.grundfos.com

Company Name: Ontario Business Partner
Reference: R4
Revision:
Job Name: Glendale SS - 145 Rainbow

Hydrosolo-E: 10 weeks
BoosterPaq/Multi-E: 16 weeks
Multi-B: 20 weeks

1.2 - GRUNDFOS PRODUCTS:
KP, AP: 3 weeks
TP, UP, UPS, Alpha, MAGNA3: 4 weeks
Large UPS Bronze, TP Bronze, TPE: 18 weeks
JP, SP, SQ, SQE: 3 weeks
CR, CRE: 8 weeks
CM, CME, CME Plus: 18 weeks
CMBE: 12 weeks
SL, SLV, Grinder Pumps: 22 weeks

1.3 - NON-GRUNDFOS PRODUCTS:
Heat Exchangers (Plate and Frame): 22 weeks
Heat Exchangers (Brazed Plate): 20 weeks
Expansion Tanks, Air Separators: 14 weeks

1266 South Service Road, Suite C1-1
Stoney Creek ON L8E 5R9 | CANADA
t: +1.905.525.6069 | exp.com

Shop Drawing Review

Date: May 30, 2024	**Remarks applicable to the following system:** **P-1,2 ① Make Corrections Noted Resubmission Not Required** **P-3,4 ① Make Corrections Noted Resubmission Not Required** **P-5,6 ① Make Corrections Noted Resubmission Not Required** **P-9,10,11 ⓪ No Exception Taken** **See Remarks.**
Project No.: ALL-23010629-A0	
Project: HWDSB Glendale Sec Sch Boiler AHU Replacement	
Spec Section No.: M0.6, M0.7	
Submission No.: 1	
By: Jonah Leibtag	**Review is for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the contract documents. Contractor is responsible for the dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his or her work with that of all other trades; and the satisfactory performance of his or her work.**
No. of Pages in Set: 49	
No Exception Taken ⓪ Revise & Resubmit ② **Make Corrections Noted ① Rejected, Submit ③** **Resubmission Not Required Compliant Product/System**	

Remarks

.1 Coordinate with controls contractor for wiring and integration between pump, VFD and BAS.
.2 Expansion tanks to be deleted. Existing expansion tanks are to be reused.
.3 Refer to comments throughout.

No further comments

GRUNDFOS Inc.
2941 Brighton Rd.
Oakville, Ontario
L6H 6C9

www.grundfos.ca

Submittal Data for Approval

General Information

Project Name:	Glendale School - 145 Rainbow
Opp Reference #:	4215367
Submittal Revision #	R-00
Date:	24 May 2024
Created By:	Sohil Thomas

Revision History

Revision	Date	Description
R-00	24 May 2024	Initial issue

NOTE:
Please note the Purchase Order will not be released to manufacturing pending receipt of one copy of each of the above bulletins or drawings marked **"APPROVED"**, along with your anticipated delivery schedule. These drawing must be returned within 30 days or price adjustments may be applicable. Please do not hesitate to contact us should you have any questions pertaining to this order.

Grundfos reserves the right to increase the price of the ordered products, by giving notice to the Customer at any time before delivery, to reflect any increase in the cost of the products to Grundfos that is due to any factor beyond the reasonable control of Grundfos including foreign exchange fluctuations, and increases in materials, energy, and other transportation and/or manufacturing costs

Yours truly,

CSSC, CBS
Grundfos Canada Inc
SUPPORT-CA@SALES.GRUNDFOS.COM

Pump Performance Datasheet

Customer	:	Quote Number / ID	: 2185411
Customer ref. / PO	:	Model	: Hydro MPC NP 2CR 125-1 3x208V 60Hz
Tag Number	: P-1,2	Part Number	: Custom system
Service	:	Stages	: 1
Quantity	: 2 Pump System	Based on curve number	: 125-1_SB
Quantity of pumps	: 2 active + 0 standby	Date last saved	: May 24, 2024 12:03 PM

180F Design Max

Operating Conditions

System flowrate	: 600.0 USgpm
Flowrate per pump	: 300.0 USgpm
Differential head / pressure, rated (requested)	: 105.4 ft
Differential head / pressure, rated (actual)	: 105.4 ft
Suction pressure, min / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz
Power Supply	: 3ph 208V

Performance

Speed, rated	: 2981 rpm
Speed, maximum	: 3531 rpm
Speed, minimum	: 900 rpm
Pump efficiency	: 66.07 %
NPSH required / margin required	: 8.68 / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 48 / 220 Metric units
Head maximum, rated speed	: 113.6 ft
Head rise to shutoff	: 7.47 %
Flow, best eff. point	: 540.6 USgpm
Flow ratio, rated / BEP	: 55.50 %
Speed ratio (rated / max)	: 84.42 %
Head ratio (rated speed / max speed)	: 69.58 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Energy Indexes

PEI (VL)	: 0.59
ER (VL)	: 41

Liquid

Liquid type	: Cold Water
Additional liquid description	:
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

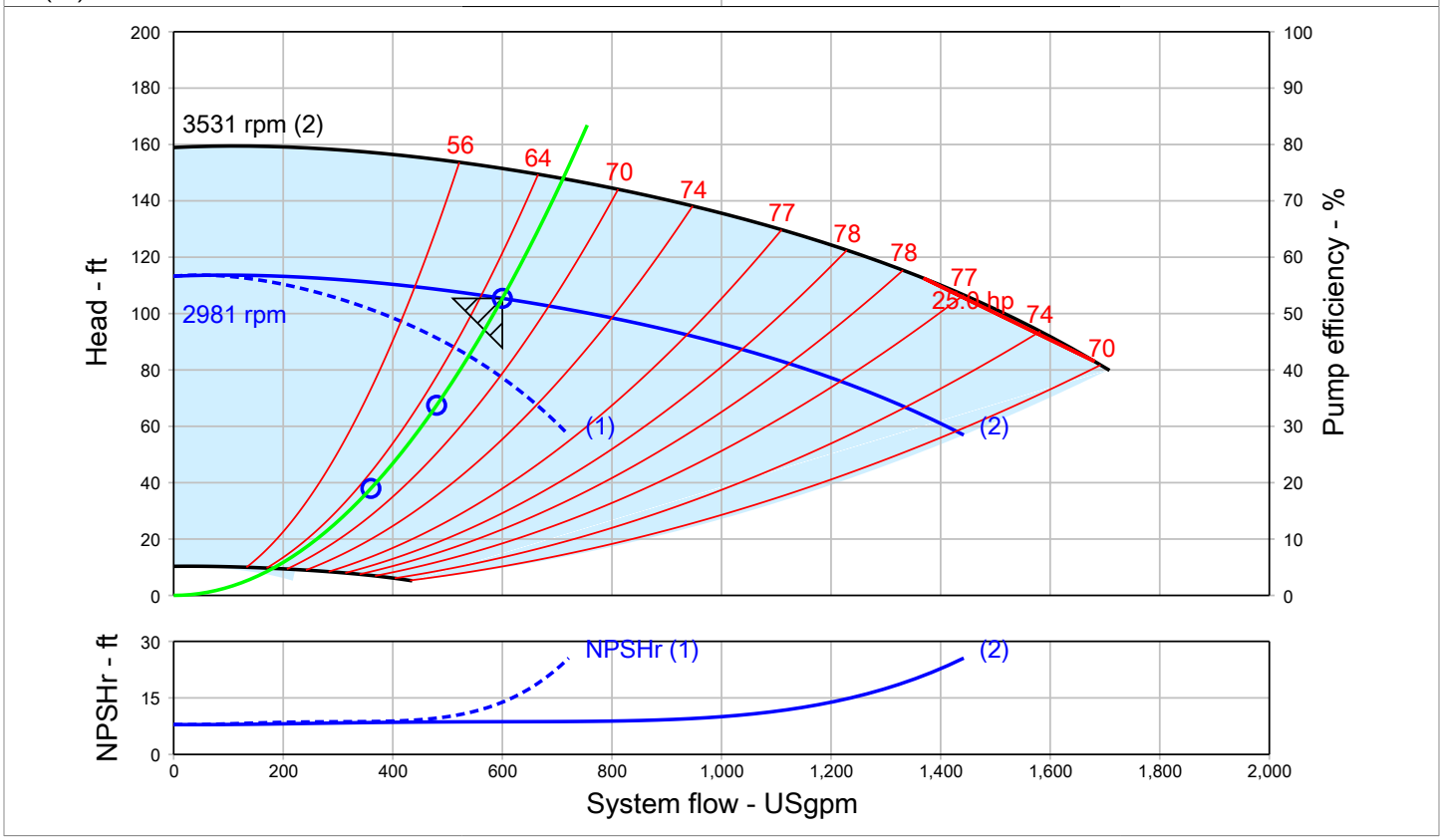
Material selected	: Standard - Cast Iron / 304 Stainless Steel

Pressure Data

Pump shut off pressure	: 49.18 psi.g
Maximum allowable suction pressure	: 145.0 psi.g

Driver & Power Data (@Max density) (Per Pump)

Motor sizing specification	: Max power (non-overloading)
Margin over specification	: 0.00 %
Service factor	: 1.00
Rated power (based on duty point)	: 12.08 hp
Max power (non-overloading)	: 15.23 hp
Motor rating	: 25.00 hp / 18.64 kW (Fixed) :



GRUNDFOS

SUBMITTAL

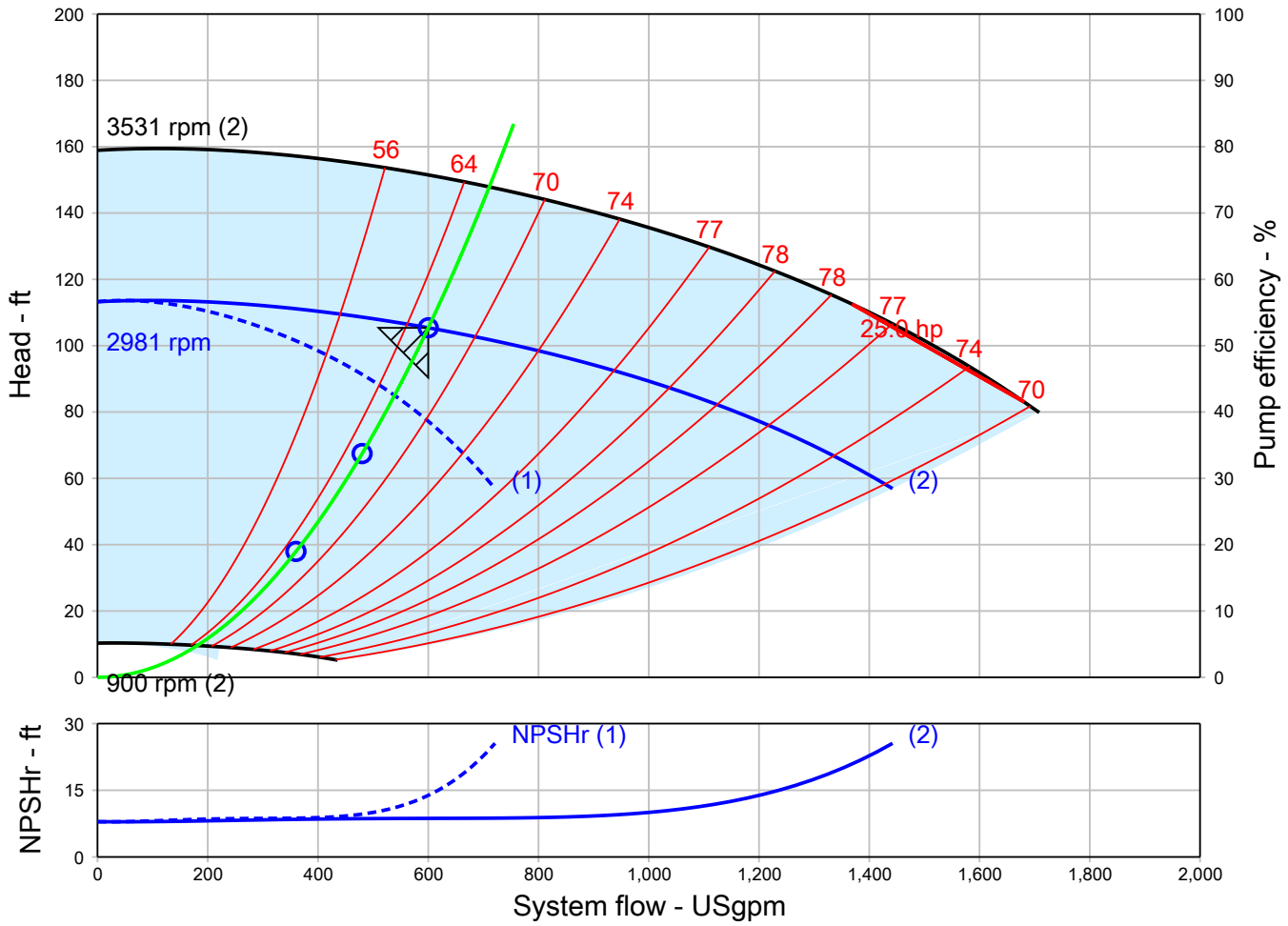
Hydro MPC NP with CR pumps

QUOTE NUMBER / ID 2185411	**UNIT TAG 001**	**QUANTITY 1**
	SERVICE	
REPRESENTATIVE	**SUBMITTED BY**	**DATE**
ENGINEER	**APPROVED BY**	**DATE**
CONTRACTOR	**ORDER #**	**DATE**

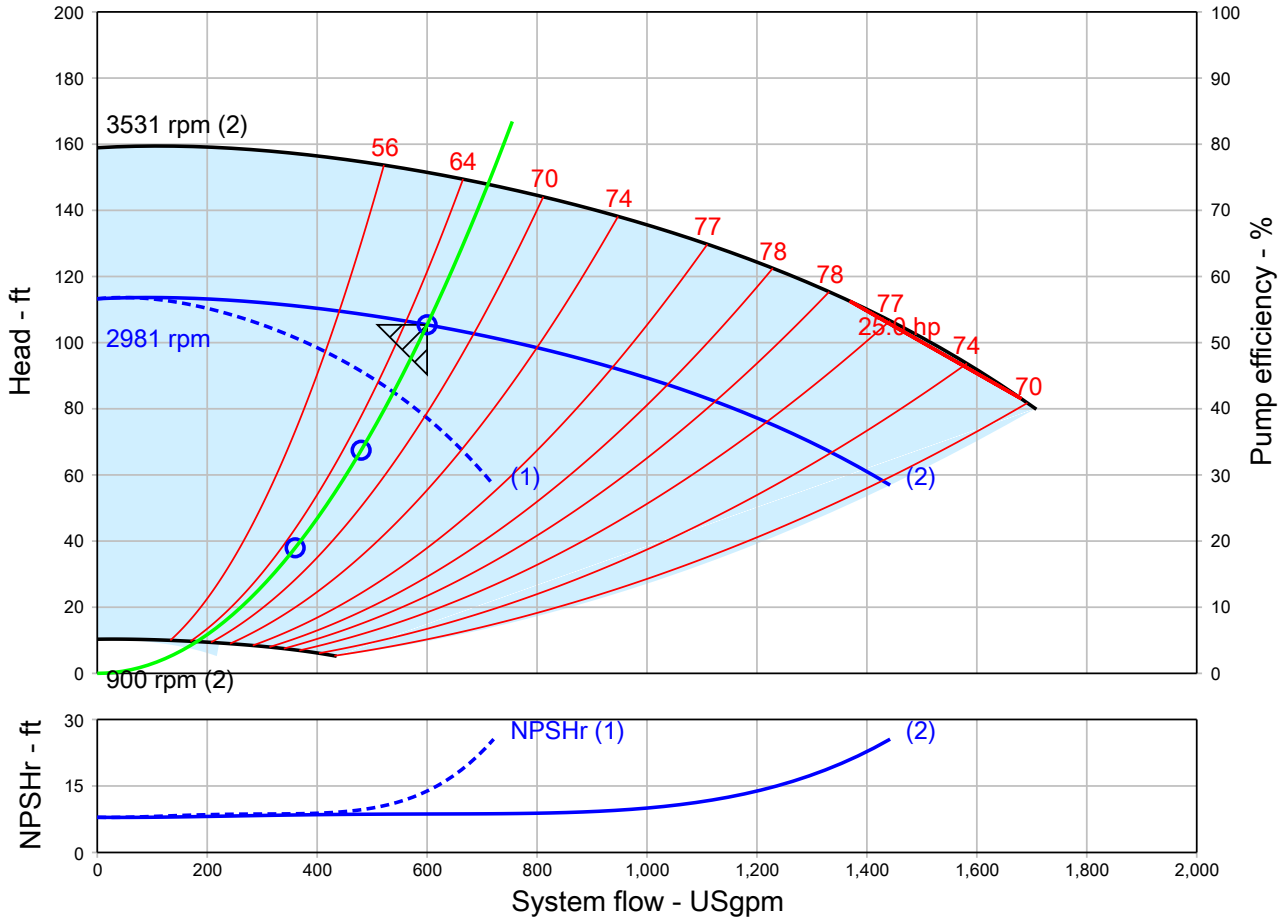
Hydro MPC-NP
2CR 125-1 3x208V 60Hz
3531 rpm

Part Number N/A

Conditions of Service		Pump Data		Motor Data	
Flow Per Pump	300.0 USgpm	Material	Standard - Cast Iron / 304 Stainless Steel	Nameplate HP	25 HP
Head	105.4 ft			Rated Power	12.08 HP
Liquid	Cold Water			Enclosure	TEFC
Temperature	68.00 deg F	Pump shut off pressure	49.18 psi.g	Voltage	208-230/460 V
NPSHr	8.68 ft	Max Allowable Suction Pressure	145.0 psi.g	Phase	3 Phase
Viscosity	1.00 cP	Pump Efficiency	66.07 %		
Specific Gravity	1.000 SG	PEI (VL)	0.59		
		ER (VL)	41		



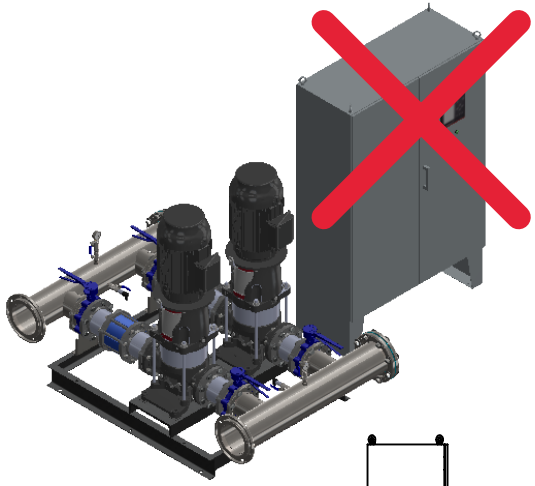
Pump Performance Curve

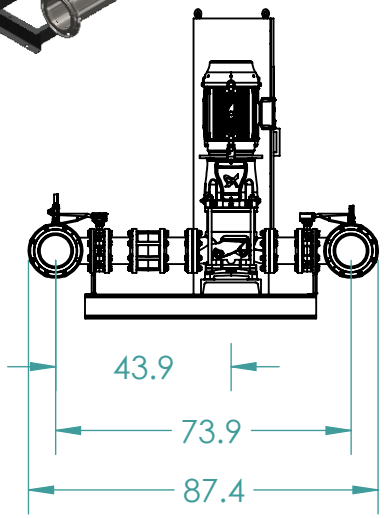


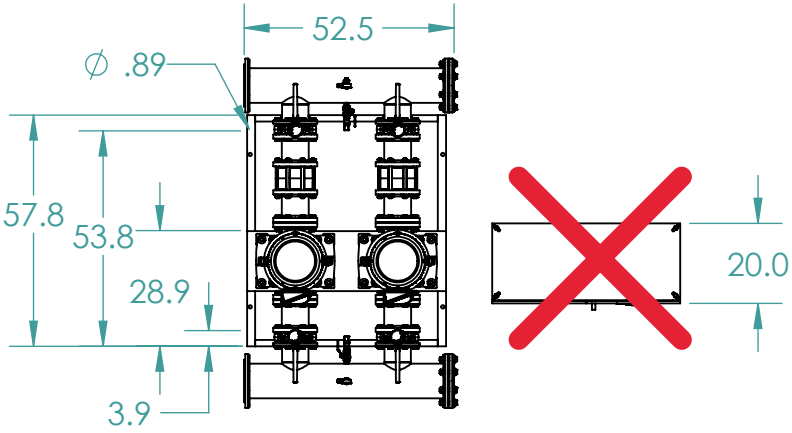
Customer	:
Customer ref. / PO	:
Tag Number	: P-1,2
Service	:
Quantity	: 2 Pump Package
Quote Number / ID	: 2185411
Date last saved	: May 24, 2024 1:39 PM
System flowrate	: 600.0 USgpm
Flowrate per pump	: 300.0 USgpm
Differential head / pressure, rated	: 105.4 ft
Pressure control curve	:

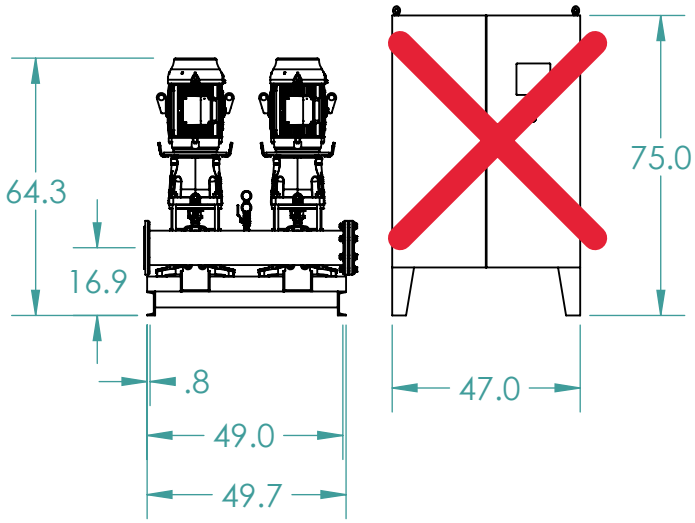
Model	: Hydro MPC NP 2CR 125-1 3x208V 60Hz
Stages	: 1
Speed, rated	: 2981 rpm
Based on curve number	: 125-1_SB
Pump efficiency	: 66.07 %
Rated power (based on duty point)	: 2 x 12.08 hp
NPSH required	: 8.68 ft
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity	: 1.00 cP

1. Manifolds 8" Class 150 AISI 316SS Schedule 10s ASTM A312 or ∅219.1mm x2mm
2. Base/Frame ASTM A36 Steel
3. 6" lug style ANSI 150# class butterfly valve









*** Panel is not included in our Package.**
*** ABB Drive to be shipped loose and wall mounted.**
*** Pressure Sensors shall be factory installed to be wired to the drive by Contractor**

GRUNDFOS
FRESNO, CALIFORNIA 93727 USA

Note:
All dimensions are ±0.5"
Not for Construction
All dimensions subject to change without notice.

Model: HYDRO NP 2CR125-1
Power: 3x208-230 60HZ 2x25HP
Job:
Scale: 1:48
Dwg No:
Rev: 0
Date: 6/5/2023
Drawer: 79690
Page: 1 of 1

Submittal Schedule Details for

Item	Tag / Equipment ID	Product ID
1		**ACH580-01-075A-2+J429**

Item Description
Input Voltage: 208 VAC Three Phase **Rated Output Current:** 75A **Enclosure:** UL (NEMA) Type 1 **Nominal Horsepower:** 25 HP **Frame Size:** R4 **Input Disconnecting Means:** None

Bypass: None

Input Impedance: 5% equivalent impedance

Short Circuit Current Rating: 100 kA with fusing

Communication Protocols: Johnson Controls N2,
Modbus RTU,
BACnet (MS/TP)

Other Options:

* Differential Pressure Sensor shall be factory installed on the manifold.
* To be wired to the Drive by the contractor.

PRODUCT OVERVIEW

ACH580-01/-31

The ACH580 drive sets new standards in both simplicity and reliability, and ensures smooth, energy-efficient operation of your HVAC systems in normal and mission-critical situations.

ACH580-01, wall-mounted base drives
The ACH580-01 wall-mounted drives are available from 1 to 100 HP at 208/240 V, 1 to 350 HP at 480 V, and 2 to 250 HP at 575 V. The ACH580-01 drives are available in UL (NEMA) Type 1 and 12 configurations. In standard installations, the drive is mounted directly onto a wall and uses the provided conduit box. Conduit openings are provided for bottom conduit entry & exit. For mounting in a customer-supplied cabinet, the conduit box may be removed. The drive has a 100 kA SCCR rating when paired with appropriately sized upstream fuses.

ACH580-31, ultra low harmonic wall-mounted base drives
The ACH580-31 wall-mounted drives are available from 5 to 150 HP at 480 V. The ACH580-31 are available in UL (NEMA) Type 1 and 12 configurations. In standard installations, the drive is mounted directly onto a wall and uses the provided conduit box. Conduit openings are provided for bottom conduit entry and exit. For mounting in a customer-supplied cabinet, the conduit plate may be removed.

Features for HVAC
The ACH580 comes standard with an intuitive control panel used to configure, control, and monitor the drive. An optional Bluetooth control panel allows the drive to be configured via the control panel or the DriveTune app.

A robust HVAC firmware package provides drive, motor, and application protection features. Examples of drive protection features include undervoltage, overvoltage, overcurrent, and ground fault protection. The ACH580 also has a variety of motor protection features including overload and stall protections.

Application specific features, such as accepting four separate start interlocks (safeties), along with broken belt detection, are also included. The drive includes BACnet MS/TP, Modbus RTU, and Johnson N2 as standard. Additional protocols, such as BACnet/IP and LonWorks (coming 2019), are available with optional fieldbus adapters.

Technical specifications

Product compliance (complete list on following page)	
ACH580-01/-31	CE, UL, cUL, and EAC
Supply connection	
Input voltage (U_1) ACH580-xx-xxxA-2 ACH580-xx-xxxA-4 ACH580-xx-xxxA-6 Input voltage tolerance Phase	 208/240V 480V 600V +10% / -15% 3-phase (1-phase, 240 V)
Frequency	48 to 63 Hz
Line Limitations	Max ±3% of nominal phase to phase input voltage
Power Factor (cos φ) at nominal load ACH580-01 ACH580-31	 0.98 1.0
Efficiency at rated power ACH580-01 ACH580-31	 98.0% 96.5%
Power Loss	Approximately 2% of rated power
Motor connection	
Supported motor control	Scalar and vector
Supported motor types	Asynchronous motor, permanent magnet motor (vector), SynRM (vector)
Voltage	3-phase, from 0 to supply voltage
Frequency	0 to 500 Hz
Short Term Overload Capacity Variable Torque	110% for 1 min/10min
Peak Overload Capacity Variable Torque	1.35 for 2 second (2 sec / 10 min)
Switching Frequency	2, 4, 8 or 12 kHz Automatic fold back in case of overload
Acceleration/Deceleration Time	0 to 1800 s
Short Circuit Current Rating (SCCR)	100 ka with fusing
Inputs and outputs (drive)	
2 analog inputs	Selection of Current/Voltage input mode is user programmable.
Voltage reference	0 (2) to 10 V, R_{in} > 200 kΩ
Current reference	0 (4) to 20 mA, R_{in} = 100 Ω
Potentiometer reference value	10 V ±1% max. 20 mA
2 analog outputs	AO1 is user programmable for current or voltage. AO2 current
Voltage reference	0 to 10 V, R_{load}: > 100 kΩ
Current reference	0 to 20 mA, R_{load}: < 500 Ω
Applicable potentiometer	1 kΩ to 10 kΩ
Internal auxiliary voltage	24 V DC ±10%, max. 250 mA
Accuracy	+/- 1% full scale range at 25°C (77°F)
Output updating time	2 ms
6 digital inputs	12 to 24 V DC, 10 to 24 V AC, Connectivity of PTC sensors supported by a single digital input.

	PNP or NPN connection (5 DIs with NPN connection). Programmable
Input Updating Time	2 ms
3 relay outputs	Maximum switching voltage 250 V AC/30 V DC. Maximum continuous current 2 A rms. Programmable, Form C
Adjustable filters on analog inputs and outputs	
All control inputs isolated from ground and power	
Operation	
Air temperature	0 to -15 °C (32 to 5 °F). -15 to +50 °C (5 to 122 °F): No frost allowed. Output derated above +40 °C (104 °F)
Installation site altitude	0 to 4000 m (13123 ft) above sea level Output derated above 1000 m (3281 ft)
Relative humidity	5 to 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Atmospheric pressure	70 to 106 kPa (10.2 to 15.4 PSI) 0.7 to 1.05 atmospheres
Vibration	Risk category IV Certified (IBC 2018)
Environmental protections	
Chemical Gasses	Class 3C2
Solid Particles	Class 3S2 No conductive dust allowed
Pollution degree (IEC/EN 61800-5-1)	Pollution degree 2
Product compliance	
Standards and directives	Low Voltage Directive 2006/95/EC EMC Directive 2004/108/EC 60721-3-3: 2002 60721-3-1:1997 Quality assurance system ISO 9001 and Environmental system ISO 14001 CE, UL, cUL, and EAC approvals Galvanic isolation according to PELV RoHS2 (Restriction of Hazardous Substances) EN 61800-5-1: 2007; IEC/EN 61000-3-12; EN61800-3: 2017 + A1: 2012 Category C2 (1st environment restricted distribution); Safe torque off (EN 61800-5-2) BACnet Testing Laboratory (BTL) Seismic (IBC, OSHPD) Plenum (ACH580-01 only)
EMC (according to EN61800-3)	ACH580-01 and ACH580-31 class C2 (1st environment restricted distribution)

Storage (in Protective Shipping Package)	
Air Temperature	-40 to +70 °C (-40 to +158 °F)
Relative Humidity	Less than 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Chemical Gasses	Class 1C2
Solid Particles	Class 1S2 Contact ABB regarding Class 1S3
Atmospheric pressure	70 to 106 kPa 0.7 to 1.05 atmospheres
Vibration (ISTA) R1…R4 R5…R9	 In accordance with ISTA 1A In accordance with ISTA 3E
Transportation (in Protective Shipping Package)	
Air Temperature	-40° to 70°C (-40° to 158°F)
Relative Humidity	Less than 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Atmospheric Pressure	60 to 106 kPa (8.7 to 15.4 PSI) 0.6 to 1.05 atmospheres
Free Fall	R1: 76 cm (30 in) R2: 61 cm (24 in) R3: 46 cm (18 in) R4: 31 cm (12 in) R5: 25 cm (10 in)
Chemical Gasses	Class 2C2
Solid Particles	Class 2S2
Shock/ Drop (ISTA) R1…R4 R5…R9	 In accordance with ISTA 1A In accordance with ISTA 3E
Vibration (ISTA) R1…R4 R5…R9	 In accordance with ISTA 1A In accordance with ISTA 3E

Feature overview

Communication
Protocols as standard (EIA-485): BACnet MS/TP, Modbus RTU, Johnson Controls N2
Available as plug-in options: BACnet/IP, Modbus TCP, PROFIBUS-DP, DeviceNet, EtherNet/IP, LonWorks (coming 2019)

Application functions
Start interlock
Delayed start
Run permissive (damper monitoring)
Override operation mode
Real-time clock (scheduling)
PID controllers for motor and process
Motor flying start
Motor preheating
Energy optimizer and calculators
Timer
2 or 3 wire start/stop
Ramp to stop
2 independent adjustable accel/decel ramp

Protection functions
Overvoltage controller
Undervoltage controller
Motor earth-leakage monitoring
Motor short-circuit protection
Motor overtemperature protection
Output and input switch supervision
Motor overload protection (UL508C)
Phase-loss detection (both motor and supply)
Under load supervision (belt loss detection)
Overload supervision
Stall protection
Loss of reference
Panel loss
Ground fault
External events
Overcurrent
Current limit regulator
Transient/Surge protection (MOV and choke)

Panel functions
First start assistant
Primary settings for HVAC applications
Hand-Off-Auto operation mode
HVAC quick set-up
Includes Day, Date and Time
Operator Panel Parameter Backup (read/write)
Full Graphic and Multilingual Display for Operator Control, Parameter Set-Up and Operating Data Display:
- Output Frequency (Hz)
- Speed (RPM)
- Motor Current
- Calculated % Motor Torque
- Calculated Motor Power (kW)
- DC Bus Voltage
- Output Voltage
- Heatsink Temperature
- Elapsed Time Meter (resettable)
- kWh (resettable)
- Input / Output Terminal Monitor
- PID Actual Value (Feedback) & Error Fault Text
- Warning Text
- Three (3) Scalable Process Variable Displays
- User-Definable Engineering Units

Motor control features
Scalar (V/Hz) and vector modes of motor control
V/Hz shapes
- Linear
- Squared

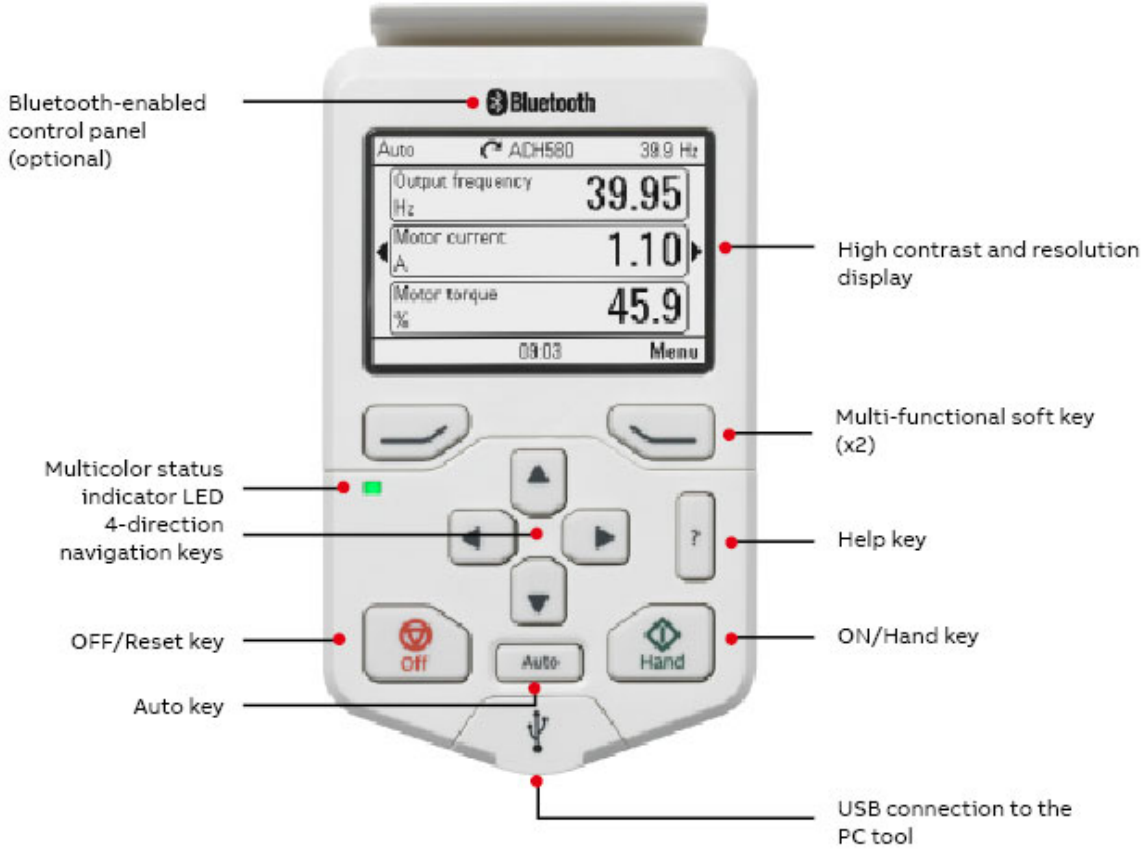
Energy optimization
IR compensation
Slip compensation
Three (3) Critical Frequency Lockout Bands

P**ID control**
One (1) Process PID
Four (4) Integral Independent Programmable PID
Setpoint Controllers (Process and External)
External Selection between Two (2) Sets of Process
PID Controller Parameters
PID Sleep/Wake-Up

Control panel features

The ACH580 Assistant Control Panel features:

- Intuitive to operate
- Primary Setting menu to ease drive commissioning
- Real-time clock
- Diagnostic and maintenance functions
- Full-graphic display, including chart, graph, and meter options
- 21 editable home views
- USB interface for PC and tool connection as standard
- Parameters are alpha-numeric
- North American version supports 14 languages as standard
- Dedicated “Help” key
- 4 user sets
- Parameter are stored in control panel memory for later transfer to other drives or for backup of a particular system
- Back-up and restore parameters and/or motor data
- Automatic back-up 2 hours after parameter change
- Modified parameter display
- Creates unique short menu
- Shows parameters that differ from the default
- Bluetooth connectivity for use with mobile device (requires +J429 option)



For P-1,2

GRUNDFOS

EXPANSION TANK NOT REQUIRED

SUBMITTAL

NT-SERIES

HVAC EXPANSION TANKS

Models: NT-15 to NT-280
Submittal Sheet No. A-1004C **Rev.** 4 4/6/2020

Job Name		Submitted By		Date	
Location		Approved By		Date	
		Order No.		Date	
Engineer		Notes			
Contractor					
Sales Rep.					

Description:
Wessels NT series are Non-ASME fixed diaphragm type pre-charged HVAC expansion tanks. They are designed to absorb the expansion forces and control the pressure in heating / cooling systems. The system's expanded water (fully compatible with water / glycol mixtures) is contained in a heavy-duty diaphragm that prevents tank corrosion and waterlogging problems. All NTA expansion tanks can be installed vertically or horizontally.

Construction:
Shell: Carbon Steel
Heads: Carbon Steel
Exterior: Red Oxide Primer
Interior: Heavy-duty Butyl

Design Parameters:
Maximum Design Pressure:
150 PSIG (NT-15 thru NT-60)* 150 PSIG (NT-80 thru NT-280)*
Temperature Range: -20°F to 240°F
*200 and 250 PSIG available

Model Number	Part Number	Tank Volume (Gallons)	Acceptance Volume (Gallons)	Tagging Information	Quantity
NT-15		7.8	6.3		
NT-20		11	8.8		
NT-40		25	20.2		
NT-60		35	28		
NT-80		45	36		
NT-100		60	48.5		
NT-120		70	56.5		
NT-144		80	65		
NT-180		90	73		
NT-200		115	93		
NT-240		140	113.5		
NT-260		158	128		
NT-280		211	171	For P-1,2	

Typical Specification
Furnish and install, as shown on plans, a _____ gallon _____" diameter X _____" tall pre-charged HVAC expansion tank with a fixed heavy-duty butyl diaphragm. The tank shall be equipped with a NPT system connection, and a 0.302"-32 charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet system requirements.

SINCE 1908 wessels company
101 Tank Street Greenwood, IN 46143
P: 317-888-9800 F: 317-865-7411
www.westank.com

GRUNDFOS

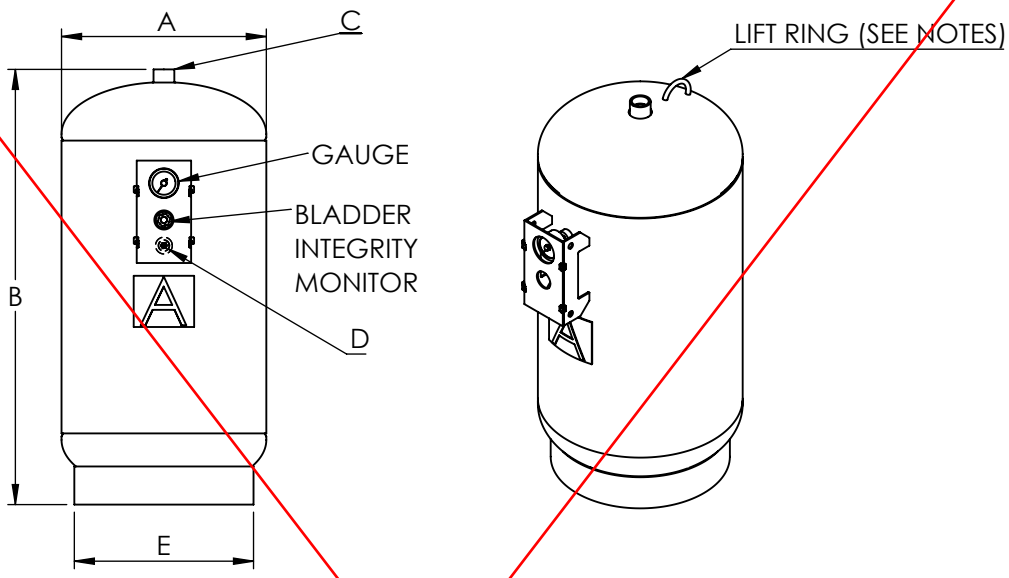
EXPANSION TANK
NOT REQUIRED

SUBMITTAL

NT-SERIES

HVAC EXPANSION TANKS

Models: NT-15 to NT-280
Submittal Sheet No. A-1004C **Rev.** 4 4/6/2020



NT 15 thru NT 280

Dimensions & Weights:

Model Number	Dimensions in Inches					Approx. Weight (lbs)
	A	B	System Connection C	Charging Valve D	E	
NT-15	12	19	3/4	0.302"-32NC	10	42
NT-20		25				52
NT-40	16	33	1		14	84
NT-60		44				97
NT-80	20	38			18	177
NT-100		49				210
NT-120	24	46	1 1/2		22	311
NT-144		49				322
NT-180		52				340
NT-200		66				390
NT-240		78				434
NT-260	30	63			24	709
NT-280		81				902

Notes:

- Tanks are factory pre-charged at 40 PSIG and field adjustable.
- California code-sight glass is available upon request.
- Lift ring on models NTA-40 thru NTA-280.
- Mounting clips are available upon request.

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Pump Performance Datasheet

Customer	:	Quote Number / ID	: 2185411
Customer ref. / PO	:	Model	: Hydro MPC-NP 2CR 45-1 3x208V 60Hz
Tag Number	: P-3,4	Part Number	: Custom system
Service	:	Stages	: 1
Quantity	: 2 Pump Package	Based on curve number	: RC10014_SB Rev 0
Quantity of pumps	: 2 active + 0 standby	Date last saved	: May 24, 2024 1:50 PM

180F Design Max

Operating Conditions

System flowrate	: 250.0 USgpm
Flowrate per pump	: 125.0 USgpm
Differential head / pressure, rated (requested)	: 85.35 ft
Differential head / pressure, rated (actual)	: 85.40 ft
Suction pressure, min / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz
Power Supply	: 3ph 208V

Performance

Speed, rated	: 3072 rpm
Speed, maximum	: 3467 rpm
Speed, minimum	: 900 rpm
Pump efficiency	: 68.14 %
NPSH required / margin required	: 4.94 / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 33 / 177 Metric units
Head maximum, rated speed	: 97.75 ft
Head rise to shutoff	: 14.47 %
Flow, best eff. point	: 189.6 USgpm
Flow ratio, rated / BEP	: 65.92 %
Speed ratio (rated / max)	: 88.61 %
Head ratio (rated speed / max speed)	: 76.72 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Energy Indexes

PEI (VL)	: 0.46
ER (VL)	: 54

Liquid

Liquid type	: Cold Water
Additional liquid description	:
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

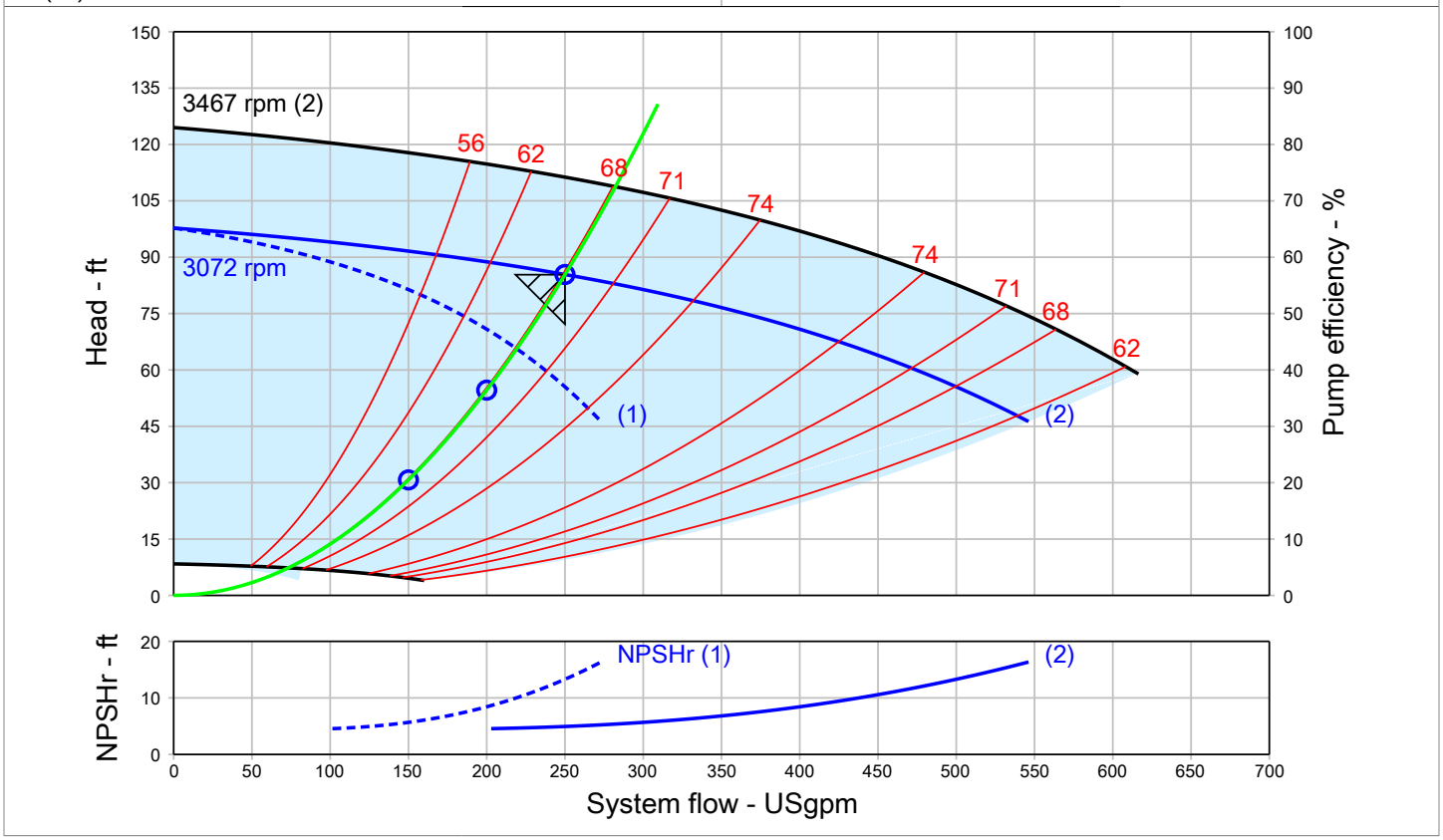
Material selected	: Standard - Cast Iron / 304 Stainless Steel

Pressure Data

Pump shut off pressure	: 42.30 psi.g
Maximum allowable suction pressure	: 58.00 psi.g

Driver & Power Data (@Max density) (Per Pump)

Motor sizing specification	: Max power (non-overloading)
Margin over specification	: 0.00 %
Service factor	: 1.00
Rated power (based on duty point)	: 3.95 hp
Max power (non-overloading)	: 5.26 hp
Motor rating	: 10.00 hp / 7.46 kW (Fixed)
	:



GRUNDFOS

SUBMITTAL

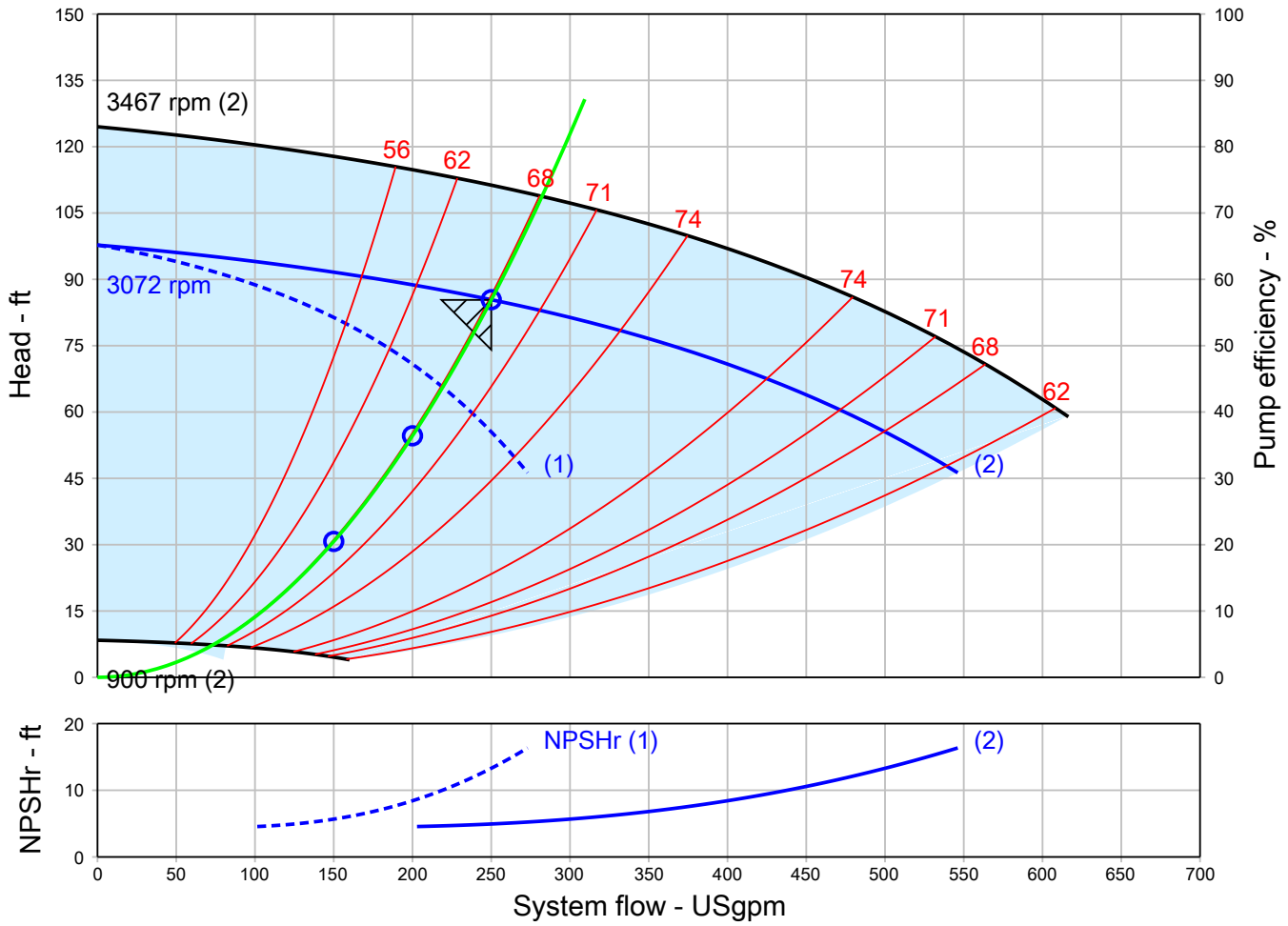
Hydro MPC NP with CR pumps

QUOTE NUMBER / ID 2185411	**UNIT TAG 002**	**QUANTITY 1**
	SERVICE	
REPRESENTATIVE	**SUBMITTED BY**	**DATE**
ENGINEER	**APPROVED BY**	**DATE**
CONTRACTOR	**ORDER #**	**DATE**

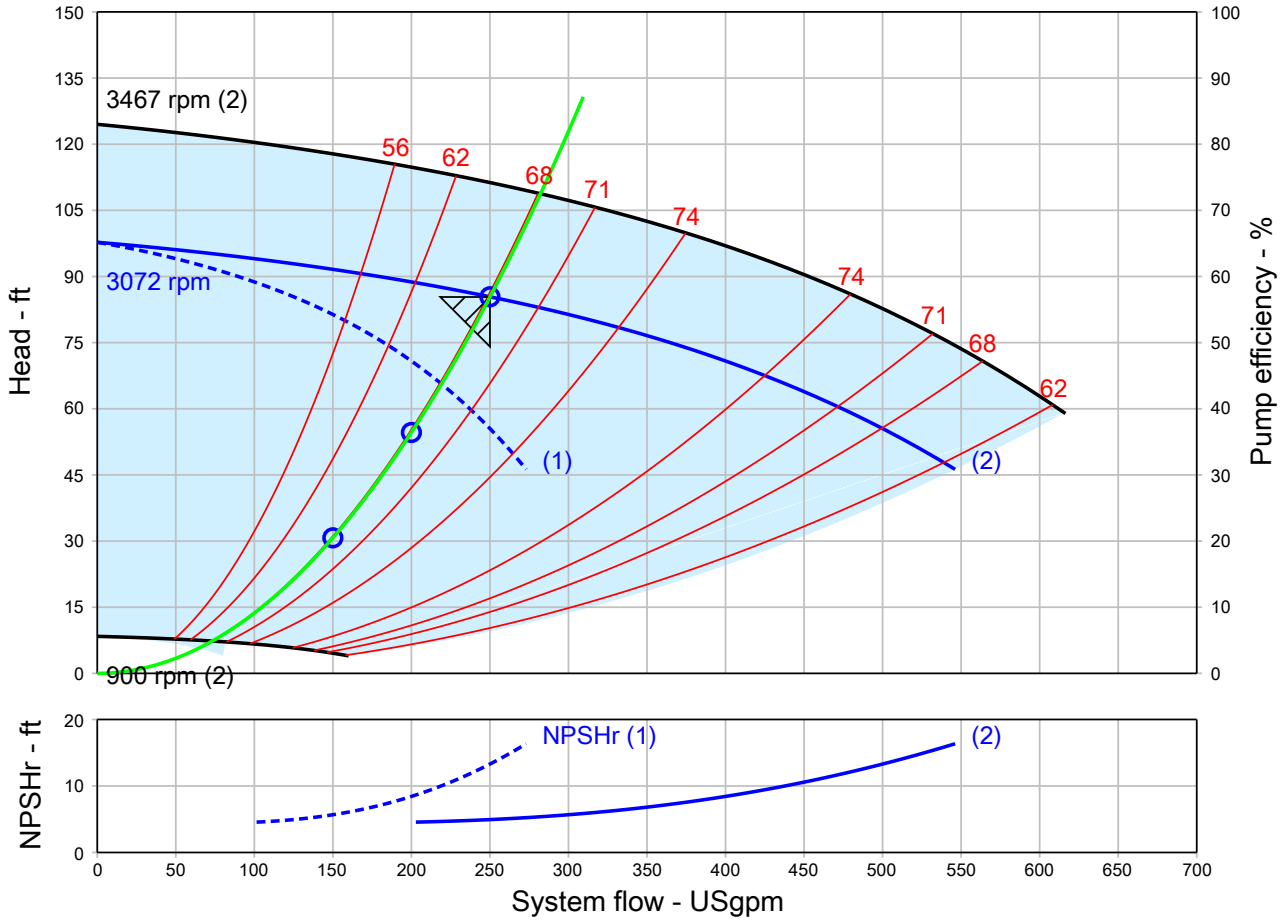
Hydro MPC-NP
2CR 45-1 3x208V 60Hz
3467 rpm

Part Number N/A

Conditions of Service		Pump Data		Motor Data	
Flow Per Pump	125.0 USgpm	Material	Standard - Cast Iron / 304 Stainless Steel	Nameplate HP	10 HP
Head	85.35 ft			Rated Power	3.95 HP
Liquid	Cold Water			Enclosure	TEFC
Temperature	68.00 deg F	Pump shut off pressure	42.30 psi.g	Voltage	208-230/460 V
NPSHr	4.94 ft	Max Allowable Suction Pressure	58.00 psi.g	Phase	3 Phase
Viscosity	1.00 cP	Pump Efficiency	68.14 %		
Specific Gravity	1.000 SG	PEI (VL)	0.46		
		ER (VL)	54		



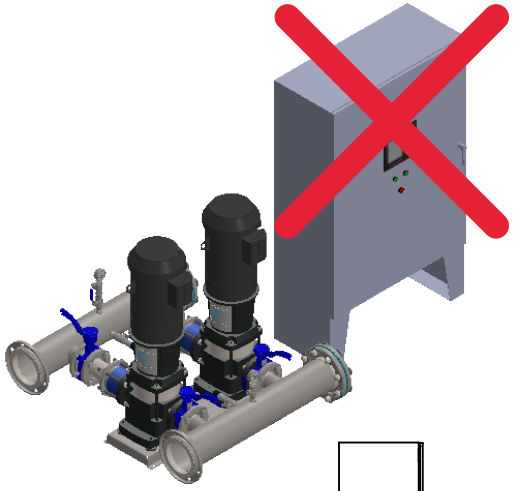
Pump Performance Curve

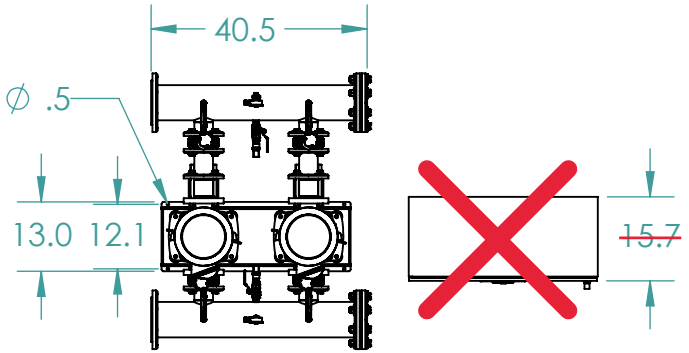


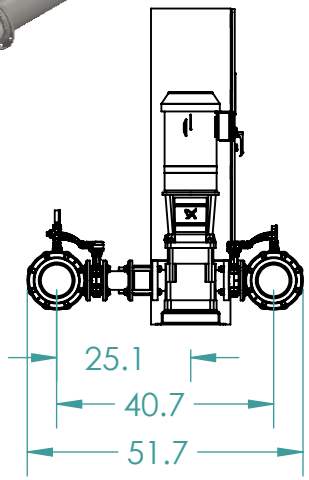
Customer	:
Customer ref. / PO	:
Tag Number	: P-3,4
Service	:
Quantity	: 2 Pump Package
Quote Number / ID	: 2185411
Date last saved	: May 24, 2024 1:50 PM
System flowrate	: 250.0 USgpm
Flowrate per pump	: 125.0 USgpm
Differential head / pressure, rated	: 85.35 ft
Pressure control curve	:

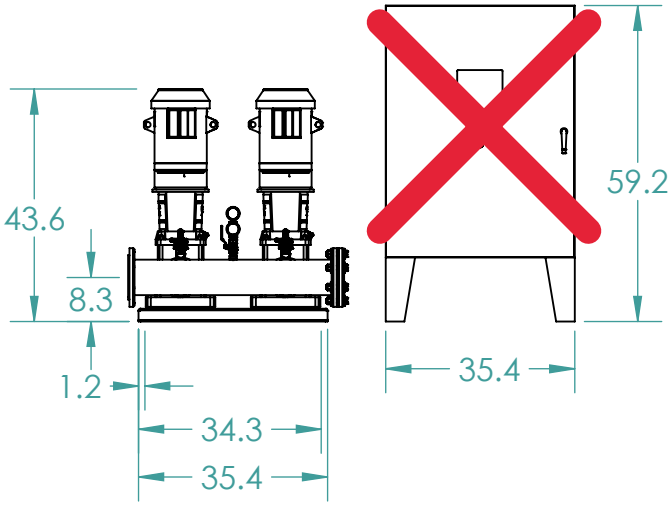
Model	: Hydro MPC NP 2CR 45-1
	3x208V 60Hz
Stages	: 1
Speed, rated	: 3072 rpm
Based on curve number	: RC10014_SB Rev 0
Pump efficiency	: 68.14 %
Rated power (based on duty point)	: 2 x 3.95 hp
NPSH required	: 4.94 ft
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity	: 1.00 cP

1. Manifolds 6" Class 150 AISI 316SS Schedule 10s ASTM A312 or ∅168.3mm x2mm
2. Base/Frame AISI 304SS
3. 3" lug style ANSI 150# class butterfly valve









*** Panel is not included in our Package.**
*** ABB Drive to be shipped loose and wall mounted.**
*** Pressure Sensors shall be factory installed to be wired to the drive by Contractor**

GRUNDFOS
FRESNO, CALIFORNIA 93727 USA

Note:
All dimensions are ±0.5"
Not for Construction
All dimensions subject to change without notice.

Model: HYDRO NP E 2CR45-1
Power: 3x208-230 60HZ 2x10HP
Job:
Scale: 1:36
Dwg No:
Rev: 0
Date: 4/19/2023
Drawer: 79690
Page: 1 of 1

Submittal Schedule Details for

Item	Tag / Equipment ID	Product ID
1	P-3,4	**ACH580-01-031A-2+J429**

Item Description
Input Voltage: 208 VAC Three Phase
Rated Output Current: 31A
Enclosure: UL (NEMA) Type 1
Nominal Horsepower: 10 HP
Frame Size: R2
Input Disconnecting Means: None

Bypass: None

Input Impedance: 5% equivalent impedance

Short Circuit Current Rating: 100 kA with fusing

Communication Protocols: Johnson Controls N2,
Modbus RTU,
BACnet (MS/TP)

Other Options:

* Differential Pressure Sensor shall be factory installed on the manifold.
* To be wired to the Drive by the contractor.

PRODUCT OVERVIEW

ACH580-01/-31

The ACH580 drive sets new standards in both simplicity and reliability, and ensures smooth, energy-efficient operation of your HVAC systems in normal and mission-critical situations.

ACH580-01, wall-mounted base drives
The ACH580-01 wall-mounted drives are available from 1 to 100 HP at 208/240 V, 1 to 350 HP at 480 V, and 2 to 250 HP at 575 V. The ACH580-01 drives are available in UL (NEMA) Type 1 and 12 configurations. In standard installations, the drive is mounted directly onto a wall and uses the provided conduit box. Conduit openings are provided for bottom conduit entry & exit. For mounting in a customer-supplied cabinet, the conduit box may be removed. The drive has a 100 kA SCCR rating when paired with appropriately sized upstream fuses.

ACH580-31, ultra low harmonic wall-mounted base drives
The ACH580-31 wall-mounted drives are available from 5 to 150 HP at 480 V. The ACH580-31 are available in UL (NEMA) Type 1 and 12 configurations. In standard installations, the drive is mounted directly onto a wall and uses the provided conduit box. Conduit openings are provided for bottom conduit entry and exit. For mounting in a customer-supplied cabinet, the conduit plate may be removed.

Features for HVAC
The ACH580 comes standard with an intuitive control panel used to configure, control, and monitor the drive. An optional Bluetooth control panel allows the drive to be configured via the control panel or the DriveTune app.

A robust HVAC firmware package provides drive, motor, and application protection features. Examples of drive protection features include undervoltage, overvoltage, overcurrent, and ground fault protection. The ACH580 also has a variety of motor protection features including overload and stall protections.

Application specific features, such as accepting four separate start interlocks (safeties), along with broken belt detection, are also included. The drive includes BACnet MS/TP, Modbus RTU, and Johnson N2 as standard. Additional protocols, such as BACnet/IP and LonWorks (coming 2019), are available with optional fieldbus adapters.

Technical specifications

Product compliance (complete list on following page)	
ACH580-01/-31	CE, UL, cUL, and EAC
Supply connection	
Input voltage (U_1) ACH580-xx-xxxA-2 ACH580-xx-xxxA-4 ACH580-xx-xxxA-6 Input voltage tolerance Phase	 208/240V 480V 600V +10% / -15% 3-phase (1-phase, 240 V)
Frequency	48 to 63 Hz
Line Limitations	Max ±3% of nominal phase to phase input voltage
Power Factor (cos φ) at nominal load ACH580-01 ACH580-31	 0.98 1.0
Efficiency at rated power ACH580-01 ACH580-31	 98.0% 96.5%
Power Loss	Approximately 2% of rated power
Motor connection	
Supported motor control	Scalar and vector
Supported motor types	Asynchronous motor, permanent magnet motor (vector), SynRM (vector)
Voltage	3-phase, from 0 to supply voltage
Frequency	0 to 500 Hz
Short Term Overload Capacity Variable Torque	110% for 1 min/10min
Peak Overload Capacity Variable Torque	1.35 for 2 second (2 sec / 10 min)
Switching Frequency	2, 4, 8 or 12 kHz Automatic fold back in case of overload
Acceleration/Deceleration Time	0 to 1800 s
Short Circuit Current Rating (SCCR)	100 ka with fusing
Inputs and outputs (drive)	
2 analog inputs	Selection of Current/Voltage input mode is user programmable.
Voltage reference	0 (2) to 10 V, R_{in} > 200 kΩ
Current reference	0 (4) to 20 mA, R_{in} = 100 Ω
Potentiometer reference value	10 V ±1% max. 20 mA
2 analog outputs	AO1 is user programmable for current or voltage. AO2 current
Voltage reference	0 to 10 V, R_{load}: > 100 kΩ
Current reference	0 to 20 mA, R_{load}: < 500 Ω
Applicable potentiometer	1 kΩ to 10 kΩ
Internal auxiliary voltage	24 V DC ±10%, max. 250 mA
Accuracy	+/- 1% full scale range at 25°C (77°F)
Output updating time	2 ms
6 digital inputs	12 to 24 V DC, 10 to 24 V AC, Connectivity of PTC sensors supported by a single digital input.

	PNP or NPN connection (5 DIs with NPN connection). Programmable
Input Updating Time	2 ms
3 relay outputs	Maximum switching voltage 250 V AC/30 V DC. Maximum continuous current 2 A rms. Programmable, Form C
Adjustable filters on analog inputs and outputs	
All control inputs isolated from ground and power	
Operation	
Air temperature	0 to -15 °C (32 to 5 °F). -15 to +50 °C (5 to 122 °F): No frost allowed. Output derated above +40 °C (104 °F)
Installation site altitude	0 to 4000 m (13123 ft) above sea level Output derated above 1000 m (3281 ft)
Relative humidity	5 to 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Atmospheric pressure	70 to 106 kPa (10.2 to 15.4 PSI) 0.7 to 1.05 atmospheres
Vibration	Risk category IV Certified (IBC 2018)
Environmental protections	
Chemical Gasses	Class 3C2
Solid Particles	Class 3S2 No conductive dust allowed
Pollution degree (IEC/EN 61800-5-1)	Pollution degree 2
Product compliance	
Standards and directives	Low Voltage Directive 2006/95/EC EMC Directive 2004/108/EC 60721-3-3: 2002 60721-3-1:1997 Quality assurance system ISO 9001 and Environmental system ISO 14001 CE, UL, cUL, and EAC approvals Galvanic isolation according to PELV RoHS2 (Restriction of Hazardous Substances) EN 61800-5-1: 2007; IEC/EN 61000-3-12; EN61800-3: 2017 + A1: 2012 Category C2 (1st environment restricted distribution); Safe torque off (EN 61800-5-2) BACnet Testing Laboratory (BTL) Seismic (IBC, OSHPD) Plenum (ACH580-01 only)
EMC (according to EN61800-3)	ACH580-01 and ACH580-31 class C2 (1st environment restricted distribution)

Storage (in Protective Shipping Package)	
Air Temperature	-40 to +70 °C (-40 to +158 °F)
Relative Humidity	Less than 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Chemical Gasses	Class 1C2
Solid Particles	Class 1S2 Contact ABB regarding Class 1S3
Atmospheric pressure	70 to 106 kPa 0.7 to 1.05 atmospheres
Vibration (ISTA) R1…R4 R5…R9	 In accordance with ISTA 1A In accordance with ISTA 3E
Transportation (in Protective Shipping Package)	
Air Temperature	-40° to 70°C (-40° to 158°F)
Relative Humidity	Less than 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Atmospheric Pressure	60 to 106 kPa (8.7 to 15.4 PSI) 0.6 to 1.05 atmospheres
Free Fall	R1: 76 cm (30 in) R2: 61 cm (24 in) R3: 46 cm (18 in) R4: 31 cm (12 in) R5: 25 cm (10 in)
Chemical Gasses	Class 2C2
Solid Particles	Class 2S2
Shock/ Drop (ISTA) R1…R4 R5…R9	 In accordance with ISTA 1A In accordance with ISTA 3E
Vibration (ISTA) R1…R4 R5…R9	 In accordance with ISTA 1A In accordance with ISTA 3E

Feature overview

Communication
Protocols as standard (EIA-485): BACnet MS/TP, Modbus RTU, Johnson Controls N2
Available as plug-in options: BACnet/IP, Modbus TCP, PROFIBUS-DP, DeviceNet, EtherNet/IP, LonWorks (coming 2019)

Application functions
Start interlock
Delayed start
Run permissive (damper monitoring)
Override operation mode
Real-time clock (scheduling)
PID controllers for motor and process
Motor flying start
Motor preheating
Energy optimizer and calculators
Timer
2 or 3 wire start/stop
Ramp to stop
2 independent adjustable accel/decel ramp

Protection functions
Overvoltage controller
Undervoltage controller
Motor earth-leakage monitoring
Motor short-circuit protection
Motor overtemperature protection
Output and input switch supervision
Motor overload protection (UL508C)
Phase-loss detection (both motor and supply)
Under load supervision (belt loss detection)
Overload supervision
Stall protection
Loss of reference
Panel loss
Ground fault
External events
Overcurrent
Current limit regulator
Transient/Surge protection (MOV and choke)

Panel functions
First start assistant
Primary settings for HVAC applications
Hand-Off-Auto operation mode
HVAC quick set-up
Includes Day, Date and Time
Operator Panel Parameter Backup (read/write)
Full Graphic and Multilingual Display for Operator Control, Parameter Set-Up and Operating Data Display:
- Output Frequency (Hz)
- Speed (RPM)
- Motor Current
- Calculated % Motor Torque
- Calculated Motor Power (kW)
- DC Bus Voltage
- Output Voltage
- Heatsink Temperature
- Elapsed Time Meter (resettable)
- kWh (resettable)
- Input / Output Terminal Monitor
- PID Actual Value (Feedback) & Error Fault Text
- Warning Text
- Three (3) Scalable Process Variable Displays
- User-Definable Engineering Units

Motor control features
Scalar (V/Hz) and vector modes of motor control
V/Hz shapes
- Linear
- Squared

Energy optimization
IR compensation
Slip compensation
Three (3) Critical Frequency Lockout Bands

P**ID control**
One (1) Process PID
Four (4) Integral Independent Programmable PID
Setpoint Controllers (Process and External)
External Selection between Two (2) Sets of Process
PID Controller Parameters
PID Sleep/Wake-Up

Control panel features

The ACH580 Assistant Control Panel features:

- Intuitive to operate
- Primary Setting menu to ease drive commissioning
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- Modified parameter display
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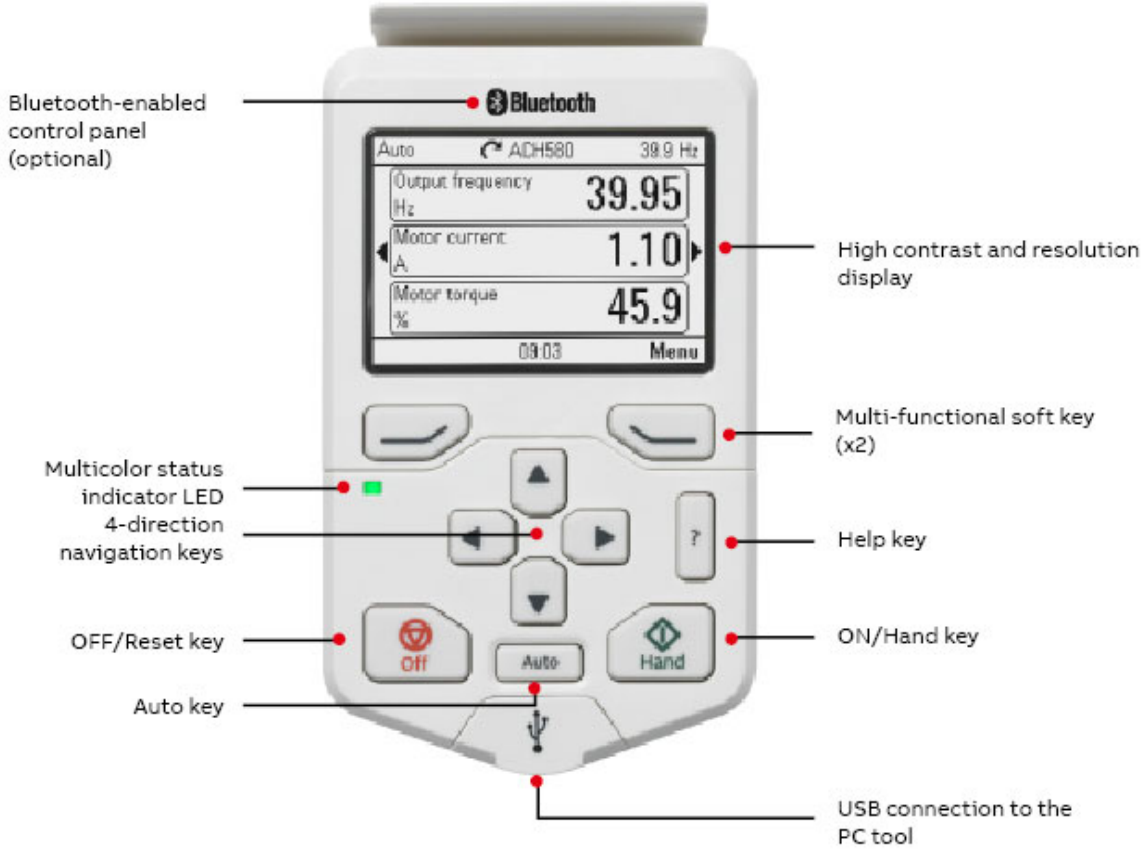


For P-3,4

GRUNDFOS

EXPANSION TANK
NOT REQUIRED

SUBMITTAL

NT-SERIES

HVAC EXPANSION TANKS

Models: NT-15 to NT-280
Submittal Sheet No. A-1004C **Rev.** 4 4/6/2020

Job Name		Submitted By		Date	
Location		Approved By		Date	
		Order No.		Date	
Engineer		Notes			
Contractor					
Sales Rep.					

Description:
Wessels NT series are Non-ASME fixed diaphragm type pre-charged HVAC expansion tanks. They are designed to absorb the expansion forces and control the pressure in heating / cooling systems. The system's expanded water (fully compatible with water / glycol mixtures) is contained in a heavy-duty diaphragm that prevents tank corrosion and waterlogging problems. All NTA expansion tanks can be installed vertically or horizontally.

Construction:
Shell: Carbon Steel
Heads: Carbon Steel
Exterior: Red Oxide Primer
Interior: Heavy-duty Butyl

Design Parameters:
Maximum Design Pressure:
150 PSIG (NT-15 thru NT-60)* 150 PSIG (NT-80 thru NT-280)*
Temperature Range: -20°F to 240°F
*200 and 250 PSIG available

Model Number	Part Number	Tank Volume (Gallons)	Acceptance Volume (Gallons)	Tagging Information	Quantity
NT-15	19010015	7.8	6.3		
NT-20	19010020	11	8.8		
NT-40	19010040	25	20.2		
NT-60	19010060	35	28		
NT-80		45	36		
NT-100		60	48.5		
NT-120		70	56.5		
NT-144		80	65		
NT-180		90	73	For P-3,4	
NT-200		115	93		
NT-240		140	113.5		
NT-260		158	128		
NT-280		211	171		

Typical Specification
Furnish and install, as shown on plans, a _____ gallon _____" diameter X _____" tall pre-charged HVAC expansion tank with a fixed heavy-duty butyl diaphragm. The tank shall be equipped with a NPT system connection, and a 0.302"-32 charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet system requirements.

SINCE 1908 wessels company
101 Tank Street Greenwood, IN 46143
P: 317-888-9800 F: 317-865-7411
www.westank.com

GRUNDFOS

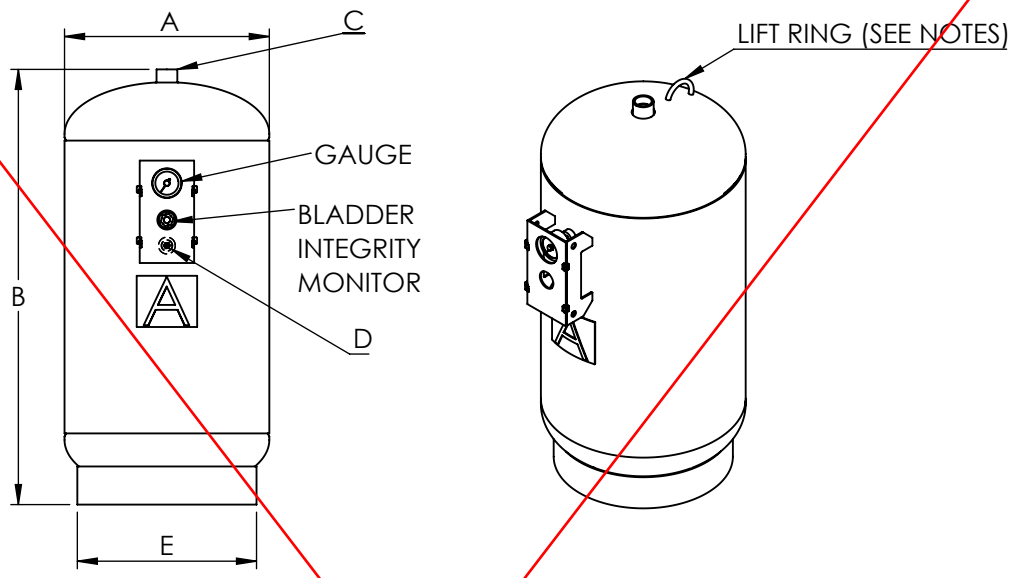
SUBMITTAL

NT-SERIES

HVAC EXPANSION TANKS

EXPANSION TANK
NOT REQUIRED

Models: NT-15 to NT-280
Submittal Sheet No. A-1004C **Rev.** 4 4/6/2020



NT 15 thru NT 280

Dimensions & Weights:

Model Number	Dimensions in Inches					Approx. Weight (lbs)
	A	B	System Connection C	Charging Valve D	E	
NT-15	12	19	3/4		10	42
NT-20		25				52
NT-40	16	33	1		14	84
NT-60		44				97
NT-80	20	38			18	177
NT-100		49				210
NT-120	24	46	1 1/2	0.302"-32NC	22	311
NT-144		49				322
NT-180		52				340
NT-200		66				390
NT-240		78				434
NT-260	30	63			24	709
NT-280		81				902

Notes:

- Tanks are factory pre-charged at 40 PSIG and field adjustable.
- California code-sight glass is available upon request.
- Lift ring on models NT-40 thru NTA-280.
- Mounting clips are available upon request.

SINCE 1908 wessels company
101 Tank Street Greenwood, IN 46143
P: 317-888-9800 F: 317-865-7411
www.westank.com

Pump Performance Datasheet

Customer	:	Quote Number / ID	: 2185411
Customer ref. / PO	:	Model	: Hydro MPC-NP 2CR 45-1 3x208V 60Hz
Tag Number	: P-5,6		
Service	:	Part Number	: Custom system
Quantity	: 2 Pump Package	Stages	: 1
Quantity of pumps	: 2 active + 0 standby	Based on curve number	: RC10014_SB Rev 0
		Date last saved	: May 24, 2024 1:29 PM

1 Active, 1 Standby

180F Design Max

Operating Conditions

System flowrate	: 200.0 USgpm
Flowrate per pump	: 100.0 USgpm
Differential head / pressure, rated (requested)	: 86.91 ft
Differential head / pressure, rated (actual)	: 86.92 ft
Suction pressure, min / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz
Power Supply	: 3ph 208V

Performance

Speed, rated	: 3042 rpm
Speed, maximum	: 3467 rpm
Speed, minimum	: 900 rpm
Pump efficiency	: 61.93 %
NPSH required / margin required	: - / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 33 / 177 Metric units
Head maximum, rated speed	: 95.85 ft
Head rise to shutoff	: 10.27 %
Flow, best eff. point	: 187.8 USgpm
Flow ratio, rated / BEP	: 53.26 %
Speed ratio (rated / max)	: 87.74 %
Head ratio (rated speed / max speed)	: 75.72 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Energy Indexes

PEI (VL)	: 0.46
ER (VL)	: 54

Liquid

Liquid type	: Cold Water
Additional liquid description	:
Temperature, max	: 150.0 deg F
Fluid density, rated / max	: 0.982 / 0.982 SG
Viscosity, rated	: 0.43 cP
Vapor pressure, rated	: 3.72 psi.a

Material

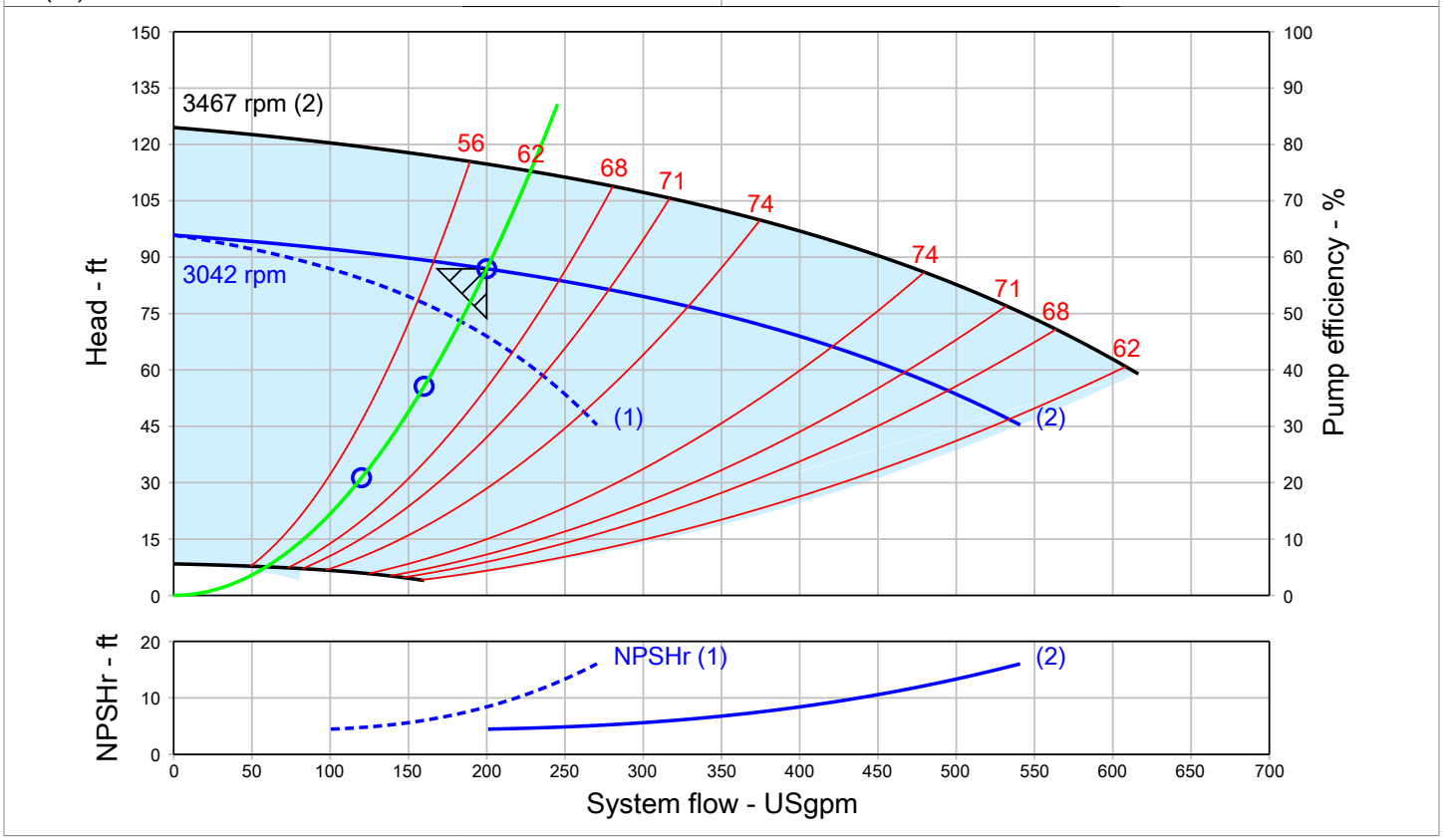
Material selected	: Standard - Cast Iron / 304 Stainless Steel

Pressure Data

Pump shut off pressure	: 40.74 psi.g
Maximum allowable suction pressure	: 58.00 psi.g

Driver & Power Data (@Max density) (Per Pump)

Motor sizing specification	: Max power (non-overloading)
Margin over specification	: 0.00 %
Service factor	: 1.00
Rated power (based on duty point)	: 3.48 hp
Max power (non-overloading)	: 5.01 hp
Motor rating	: 10.00 hp / 7.46 kW (Fixed)



GRUNDFOS

SUBMITTAL

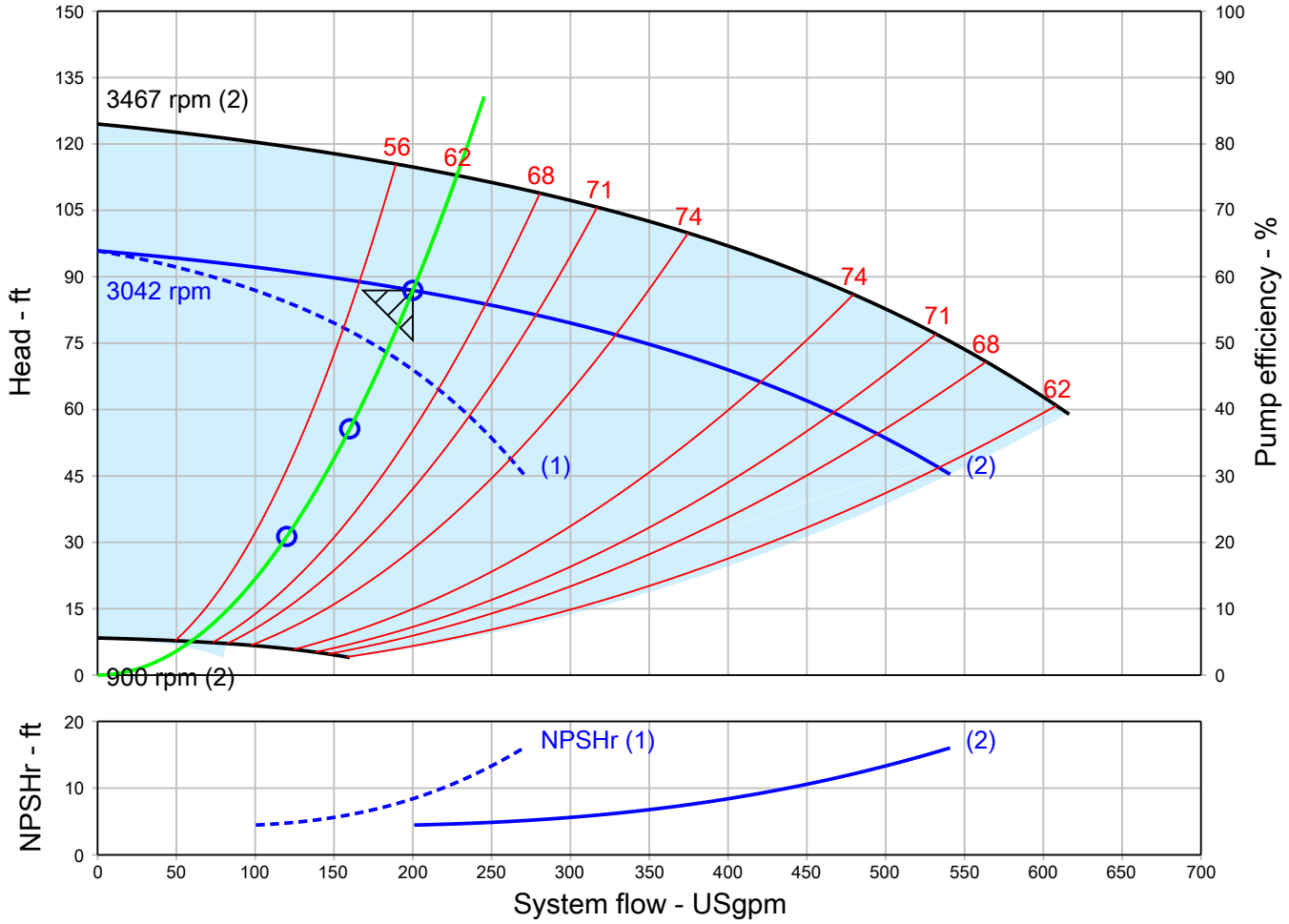
Hydro MPC NP with CR pumps

QUOTE NUMBER / ID 2185411	**UNIT TAG 003**	**QUANTITY 1**
	SERVICE	
REPRESENTATIVE	**SUBMITTED BY**	**DATE**
ENGINEER	**APPROVED BY**	**DATE**
CONTRACTOR	**ORDER #**	**DATE**

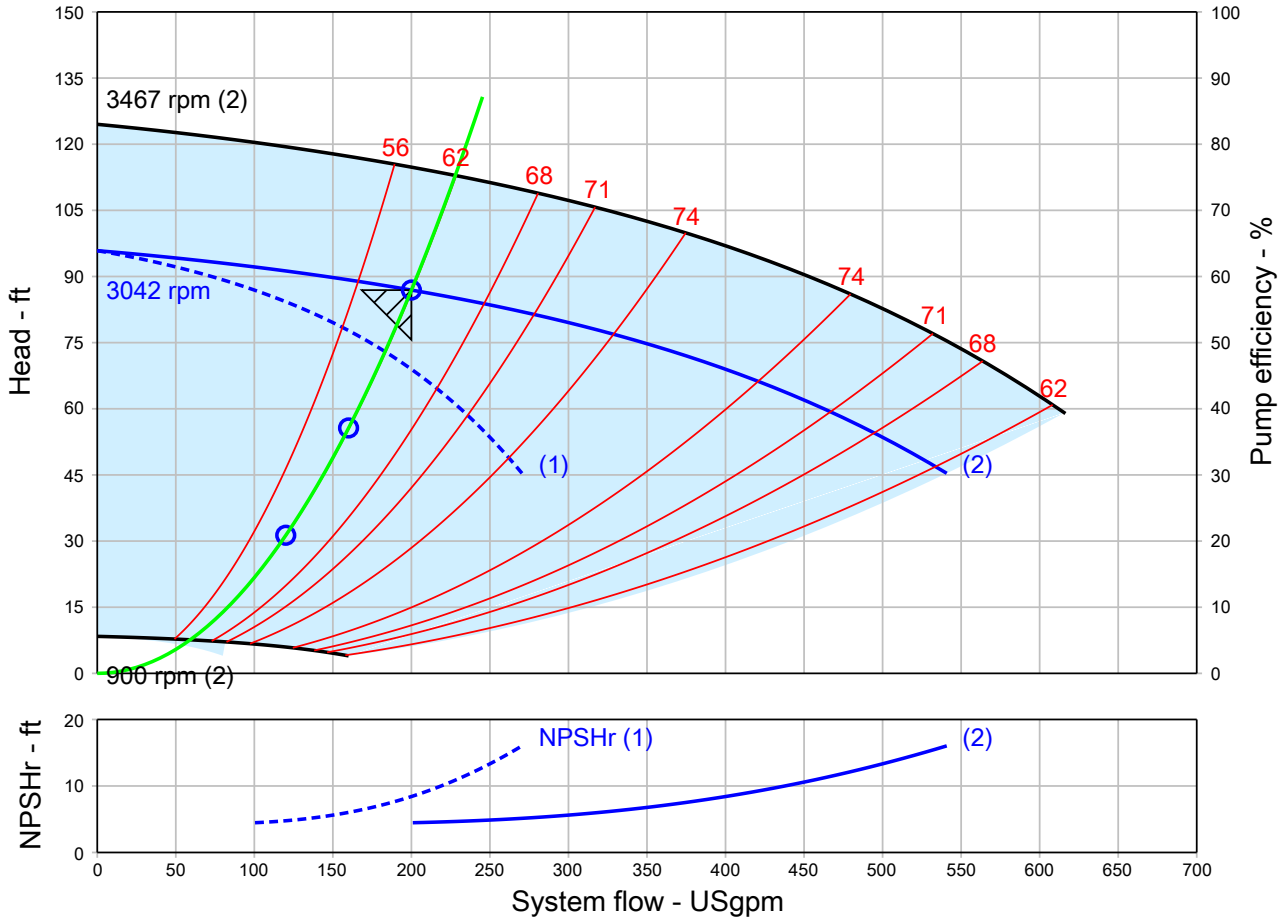
Hydro MPC NP
2CR 45-1 3x208V 60Hz
3467 rpm

Part Number N/A

Conditions of Service		Pump Data		Motor Data	
Flow Per Pump	100.0 USgpm	Material	Standard - Cast Iron / 304 Stainless Steel	Nameplate HP	10 HP
Head	86.91 ft			Rated Power	3.48 HP
Liquid	Cold Water			Enclosure	TEFC
Temperature	150.0 deg F	Pump shut off pressure	40.74 psi.g	Voltage	208-230/460 V
NPSHr	4.47 ft	Max Allowable Suction Pressure	58.00 psi.g	Phase	3 Phase
Viscosity	0.43 cP	Pump Efficiency	61.93 %		
Specific Gravity	0.982 SG	PEI (VL)	0.46		
		ER (VL)	54		



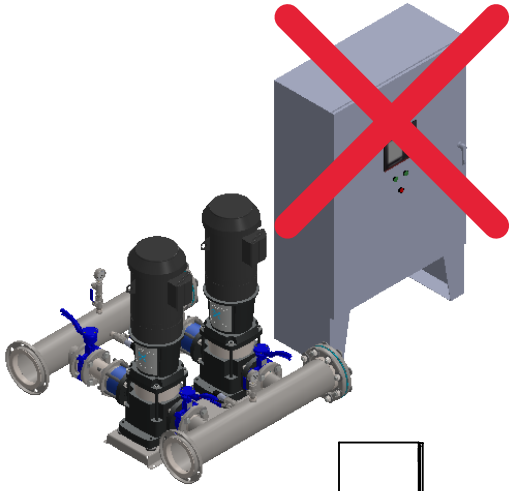
Pump Performance Curve

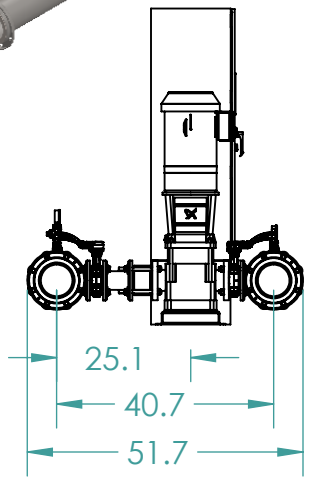


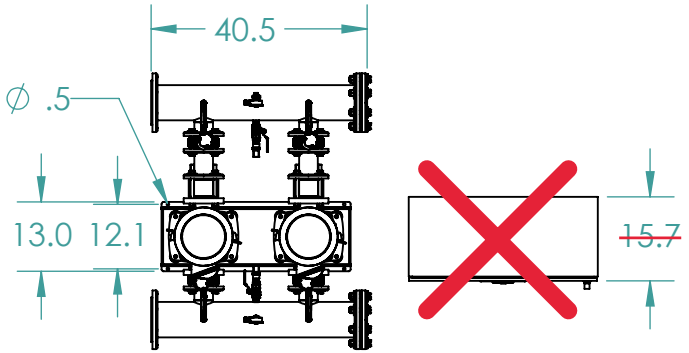
Customer	:
Customer ref. / PO	:
Tag Number	: 003
Service	:
Quantity	: 2 Pump Package
Quote Number / ID	: 2185411
Date last saved	: May 24, 2024 1:29 PM
System flowrate	: 200.0 USgpm
Flowrate per pump	: 100.0 USgpm
Differential head / pressure, rated	: 86.91 ft
Pressure control curve	:

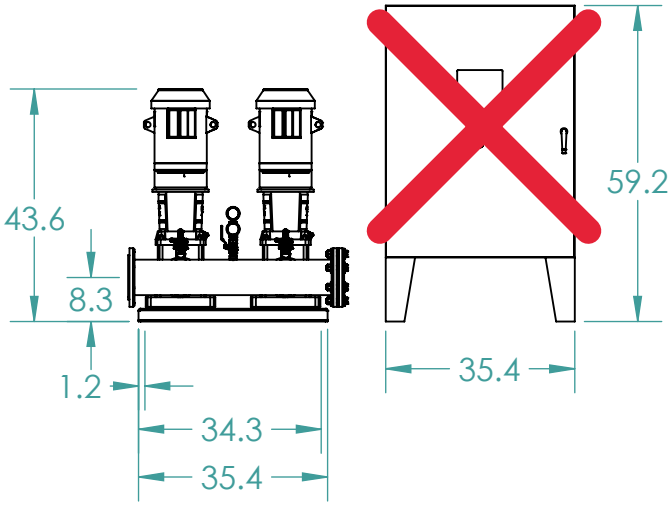
Model	: Hydro MPC-NP 2CR 45-1
	3x208V 60Hz
Stages	: 1
Speed, rated	: 3042 rpm
Based on curve number	: RC10014_SB Rev 0
Pump efficiency	: 61.93 %
Rated power (based on duty point)	: 2 x 3.48 hp
NPSH required	: - ft
Fluid density, rated / max	: 0.982 / 0.982 SG
Viscosity	: 0.43 cP

1. Manifolds 6" Class 150 AISI 316SS Schedule 10s ASTM A312 or ∅168.3mm x2mm
2. Base/Frame AISI 304SS
3. 3" lug style ANSI 150# class butterfly valve









*** Panel is not included in our Package.**
*** ABB Drive to be shipped loose and wall mounted.**
*** Pressure Sensors shall be factory installed to be wired to the drive by Contractor**

GRUNDFOS
FRESNO, CALIFORNIA 93727 USA

Note:
All dimensions are ±0.5"
Not for Construction
All dimensions subject to change without notice.

Model: HYDRO NP E 2CR45-1
Power: 3x208-230 60HZ 2x10HP
Job:
Scale: 1:36
Dwg No:
Rev: 0
Date: 4/19/2023
Drawer: 79690
Page: 1 of 1

Submittal Schedule Details for

Item	Tag / Equipment ID	Product ID
1	P-5,6	**ACH580-01-031A-2+J429**

Item Description
Input Voltage: 208 VAC Three Phase
Rated Output Current: 31A
Enclosure: UL (NEMA) Type 1
Nominal Horsepower: 10 HP
Frame Size: R2
Input Disconnecting Means: None

Bypass: None

Input Impedance: 5% equivalent impedance

Short Circuit Current Rating: 100 kA with fusing

Communication Protocols: Johnson Controls N2,
Modbus RTU,
BACnet (MS/TP)

Other Options:

* Differential Pressure Sensor shall be factory installed on the manifold.
* To be wired to the Drive by the contractor.

PRODUCT OVERVIEW

ACH580-01/-31

The ACH580 drive sets new standards in both simplicity and reliability, and ensures smooth, energy-efficient operation of your HVAC systems in normal and mission-critical situations.

ACH580-01, wall-mounted base drives
The ACH580-01 wall-mounted drives are available from 1 to 100 HP at 208/240 V, 1 to 350 HP at 480 V, and 2 to 250 HP at 575 V. The ACH580-01 drives are available in UL (NEMA) Type 1 and 12 configurations. In standard installations, the drive is mounted directly onto a wall and uses the provided conduit box. Conduit openings are provided for bottom conduit entry & exit. For mounting in a customer-supplied cabinet, the conduit box may be removed. The drive has a 100 kA SCCR rating when paired with appropriately sized upstream fuses.

ACH580-31, ultra low harmonic wall-mounted base drives
The ACH580-31 wall-mounted drives are available from 5 to 150 HP at 480 V. The ACH580-31 are available in UL (NEMA) Type 1 and 12 configurations. In standard installations, the drive is mounted directly onto a wall and uses the provided conduit box. Conduit openings are provided for bottom conduit entry and exit. For mounting in a customer-supplied cabinet, the conduit plate may be removed.

Features for HVAC
The ACH580 comes standard with an intuitive control panel used to configure, control, and monitor the drive. An optional Bluetooth control panel allows the drive to be configured via the control panel or the DriveTune app.

A robust HVAC firmware package provides drive, motor, and application protection features. Examples of drive protection features include undervoltage, overvoltage, overcurrent, and ground fault protection. The ACH580 also has a variety of motor protection features including overload and stall protections.

Application specific features, such as accepting four separate start interlocks (safeties), along with broken belt detection, are also included. The drive includes BACnet MS/TP, Modbus RTU, and Johnson N2 as standard. Additional protocols, such as BACnet/IP and LonWorks (coming 2019), are available with optional fieldbus adapters.

Technical specifications

Product compliance (complete list on following page)	
ACH580-01/-31	CE, UL, cUL, and EAC
Supply connection	
Input voltage (U_1) ACH580-xx-xxxA-2 ACH580-xx-xxxA-4 ACH580-xx-xxxA-6 Input voltage tolerance Phase	 208/240V 480V 600V +10% / -15% 3-phase (1-phase, 240 V)
Frequency	48 to 63 Hz
Line Limitations	Max ±3% of nominal phase to phase input voltage
Power Factor (cos φ) at nominal load ACH580-01 ACH580-31	 0.98 1.0
Efficiency at rated power ACH580-01 ACH580-31	 98.0% 96.5%
Power Loss	Approximately 2% of rated power
Motor connection	
Supported motor control	Scalar and vector
Supported motor types	Asynchronous motor, permanent magnet motor (vector), SynRM (vector)
Voltage	3-phase, from 0 to supply voltage
Frequency	0 to 500 Hz
Short Term Overload Capacity Variable Torque	110% for 1 min/10min
Peak Overload Capacity Variable Torque	1.35 for 2 second (2 sec / 10 min)
Switching Frequency	2, 4, 8 or 12 kHz Automatic fold back in case of overload
Acceleration/Deceleration Time	0 to 1800 s
Short Circuit Current Rating (SCCR)	100 ka with fusing
Inputs and outputs (drive)	
2 analog inputs	Selection of Current/Voltage input mode is user programmable.
Voltage reference	0 (2) to 10 V, R_{in} > 200 kΩ
Current reference	0 (4) to 20 mA, R_{in} = 100 Ω
Potentiometer reference value	10 V ±1% max. 20 mA
2 analog outputs	AO1 is user programmable for current or voltage. AO2 current
Voltage reference	0 to 10 V, R_{load}: > 100 kΩ
Current reference	0 to 20 mA, R_{load}: < 500 Ω
Applicable potentiometer	1 kΩ to 10 kΩ
Internal auxiliary voltage	24 V DC ±10%, max. 250 mA
Accuracy	+/- 1% full scale range at 25°C (77°F)
Output updating time	2 ms
6 digital inputs	12 to 24 V DC, 10 to 24 V AC, Connectivity of PTC sensors supported by a single digital input.

	PNP or NPN connection (5 DIs with NPN connection). Programmable
Input Updating Time	2 ms
3 relay outputs	Maximum switching voltage 250 V AC/30 V DC. Maximum continuous current 2 A rms. Programmable, Form C
Adjustable filters on analog inputs and outputs	
All control inputs isolated from ground and power	
Operation	
Air temperature	0 to -15 °C (32 to 5 °F). -15 to +50 °C (5 to 122 °F): No frost allowed. Output derated above +40 °C (104 °F)
Installation site altitude	0 to 4000 m (13123 ft) above sea level Output derated above 1000 m (3281 ft)
Relative humidity	5 to 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Atmospheric pressure	70 to 106 kPa (10.2 to 15.4 PSI) 0.7 to 1.05 atmospheres
Vibration	Risk category IV Certified (IBC 2018)
Environmental protections	
Chemical Gasses	Class 3C2
Solid Particles	Class 3S2 No conductive dust allowed
Pollution degree (IEC/EN 61800-5-1)	Pollution degree 2
Product compliance	
Standards and directives	Low Voltage Directive 2006/95/EC EMC Directive 2004/108/EC 60721-3-3: 2002 60721-3-1:1997 Quality assurance system ISO 9001 and Environmental system ISO 14001 CE, UL, cUL, and EAC approvals Galvanic isolation according to PELV RoHS2 (Restriction of Hazardous Substances) EN 61800-5-1: 2007; IEC/EN 61000-3-12; EN61800-3: 2017 + A1: 2012 Category C2 (1st environment restricted distribution); Safe torque off (EN 61800-5-2) BACnet Testing Laboratory (BTL) Seismic (IBC, OSHPD) Plenum (ACH580-01 only)
EMC (according to EN61800-3)	ACH580-01 and ACH580-31 class C2 (1st environment restricted distribution)

Storage (in Protective Shipping Package)	
Air Temperature	-40 to +70 °C (-40 to +158 °F)
Relative Humidity	Less than 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Chemical Gasses	Class 1C2
Solid Particles	Class 1S2 Contact ABB regarding Class 1S3
Atmospheric pressure	70 to 106 kPa 0.7 to 1.05 atmospheres
Vibration (ISTA) R1…R4 R5…R9	 In accordance with ISTA 1A In accordance with ISTA 3E
Transportation (in Protective Shipping Package)	
Air Temperature	-40° to 70°C (-40° to 158°F)
Relative Humidity	Less than 95% No condensation allowed Maximum relative humidity is 60% in the presence of corrosive gasses
Atmospheric Pressure	60 to 106 kPa (8.7 to 15.4 PSI) 0.6 to 1.05 atmospheres
Free Fall	R1: 76 cm (30 in) R2: 61 cm (24 in) R3: 46 cm (18 in) R4: 31 cm (12 in) R5: 25 cm (10 in)
Chemical Gasses	Class 2C2
Solid Particles	Class 2S2
Shock/ Drop (ISTA) R1…R4 R5…R9	 In accordance with ISTA 1A In accordance with ISTA 3E
Vibration (ISTA) R1…R4 R5…R9	 In accordance with ISTA 1A In accordance with ISTA 3E

Feature overview

Communication
Protocols as standard (EIA-485): BACnet MS/TP, Modbus RTU, Johnson Controls N2
Available as plug-in options: BACnet/IP, Modbus TCP, PROFIBUS-DP, DeviceNet, EtherNet/IP, LonWorks (coming 2019)

Application functions
Start interlock
Delayed start
Run permissive (damper monitoring)
Override operation mode
Real-time clock (scheduling)
PID controllers for motor and process
Motor flying start
Motor preheating
Energy optimizer and calculators
Timer
2 or 3 wire start/stop
Ramp to stop
2 independent adjustable accel/decel ramp

Protection functions
Overvoltage controller
Undervoltage controller
Motor earth-leakage monitoring
Motor short-circuit protection
Motor overtemperature protection
Output and input switch supervision
Motor overload protection (UL508C)
Phase-loss detection (both motor and supply)
Under load supervision (belt loss detection)
Overload supervision
Stall protection
Loss of reference
Panel loss
Ground fault
External events
Overcurrent
Current limit regulator
Transient/Surge protection (MOV and choke)

Panel functions
First start assistant
Primary settings for HVAC applications
Hand-Off-Auto operation mode
HVAC quick set-up
Includes Day, Date and Time
Operator Panel Parameter Backup (read/write)
Full Graphic and Multilingual Display for Operator Control, Parameter Set-Up and Operating Data Display:
- Output Frequency (Hz)
- Speed (RPM)
- Motor Current
- Calculated % Motor Torque
- Calculated Motor Power (kW)
- DC Bus Voltage
- Output Voltage
- Heatsink Temperature
- Elapsed Time Meter (resettable)
- kWh (resettable)
- Input / Output Terminal Monitor
- PID Actual Value (Feedback) & Error Fault Text
- Warning Text
- Three (3) Scalable Process Variable Displays
- User-Definable Engineering Units

Motor control features
Scalar (V/Hz) and vector modes of motor control
V/Hz shapes
- Linear
- Squared

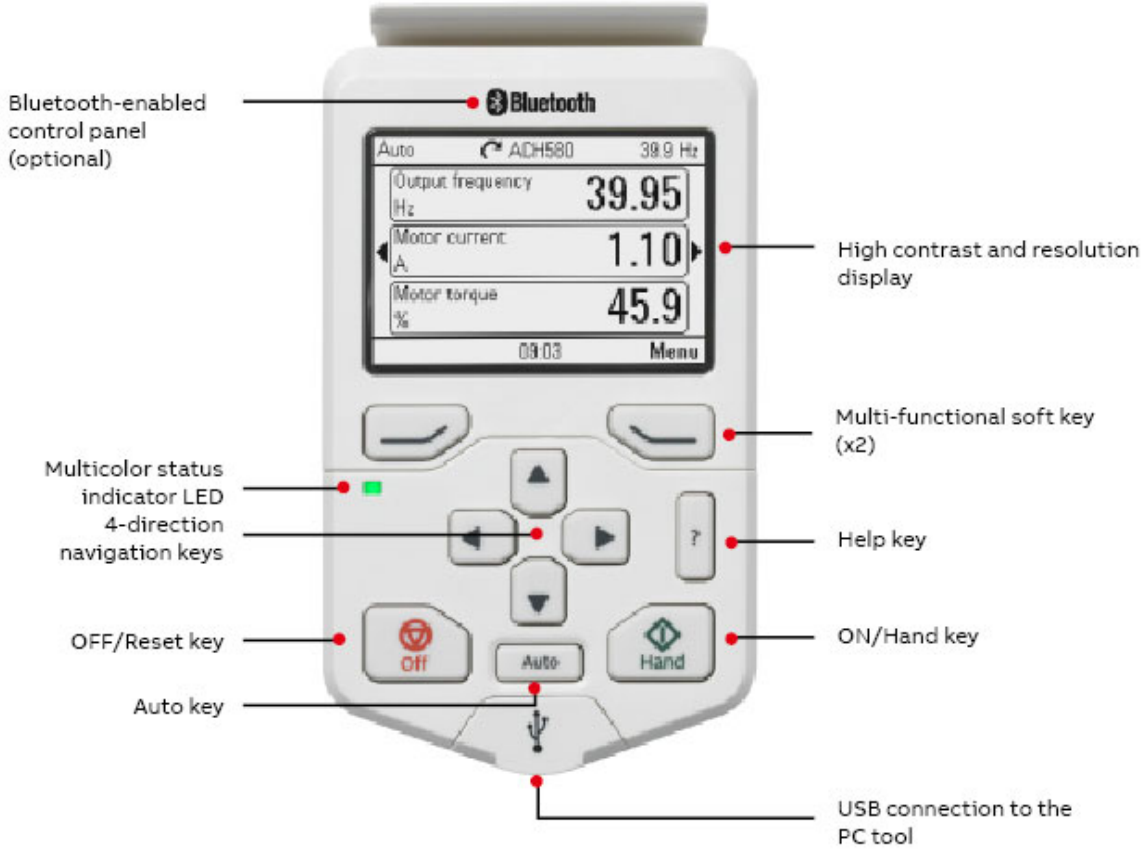
Energy optimization
IR compensation
Slip compensation
Three (3) Critical Frequency Lockout Bands

P**ID control**
One (1) Process PID
Four (4) Integral Independent Programmable PID
Setpoint Controllers (Process and External)
External Selection between Two (2) Sets of Process
PID Controller Parameters
PID Sleep/Wake-Up

Control panel features

The ACH580 Assistant Control Panel features:

- Intuitive to operate
- Primary Setting menu to ease drive commissioning
- Real-time clock
- Diagnostic and maintenance functions
- Full-graphic display, including chart, graph, and meter options
- 21 editable home views
- USB interface for PC and tool connection as standard
- Parameters are alpha-numeric
- North American version supports 14 languages as standard
- Dedicated “Help” key
- 4 user sets
- Parameter are stored in control panel memory for later transfer to other drives or for backup of a particular system
- Back-up and restore parameters and/or motor data
- Automatic back-up 2 hours after parameter change
- Modified parameter display
- Creates unique short menu
- Shows parameters that differ from the default
- Bluetooth connectivity for use with mobile device (requires +J429 option)



For P-5,6

GRUNDFOS

EXPANSION TANK
NOT REQUIRED

SUBMITTAL

NT-SERIES

HVAC EXPANSION TANKS

Models: NT-15 to NT-280
Submittal Sheet No. A-1004C **Rev.** 4 4/6/2020

Job Name _____ Submitted By _____ Date _____
Location _____ Approved By _____ Date _____
_____ Order No. _____ Date _____
Engineer _____ Notes _____
Contractor _____ _____
Sales Rep. _____ _____

Description:
Wessels NT series are Non-ASME fixed diaphragm type pre-charged HVAC expansion tanks. They are designed to absorb the expansion forces and control the pressure in heating / cooling systems. The system's expanded water (fully compatible with water / glycol mixtures) is contained in a heavy-duty diaphragm that prevents tank corrosion and waterlogging problems. All NTA expansion tanks can be installed vertically or horizontally.

Construction:
Shell: Carbon Steel
Heads: Carbon Steel
Exterior: Red Oxide Primer
Interior: Heavy-duty Butyl

Design Parameters:
Maximum Design Pressure:
150 PSIG (NT-15 thru NT-60)* 150 PSIG (NT-80 thru NT-280)*
Temperature Range: -20°F to 240°F
*200 and 250 PSIG available

Model Number	Part Number	Tank Volume (Gallons)	Acceptance Volume (Gallons)	Tagging Information	Quantity
NT-15	19010015	7.8	6.3		
NT-20	19010020	11	8.8		
NT-40	19010040	25	20.2		
NT-60	19010060	35	28		
NT-80		45	36		
NT-100		60	48.5		
NT-120		70	56.5		
NT-144		80	65		
NT-180		90	73	For P-5,6	
NT-200		115	93		
NT-240		140	113.5		
NT-260		158	128		
NT-280		211	171		

Typical Specification
Furnish and install, as shown on plans, a _____ gallon _____" diameter X _____" tall pre-charged HVAC expansion tank with a fixed heavy-duty butyl diaphragm. The tank shall be equipped with a NPT system connection, and a 0.302"-32 charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet system requirements.

SINCE 1908 wessels company
101 Tank Street Greenwood, IN 46143
P: 317-888-9800 F: 317-865-7411
www.westank.com

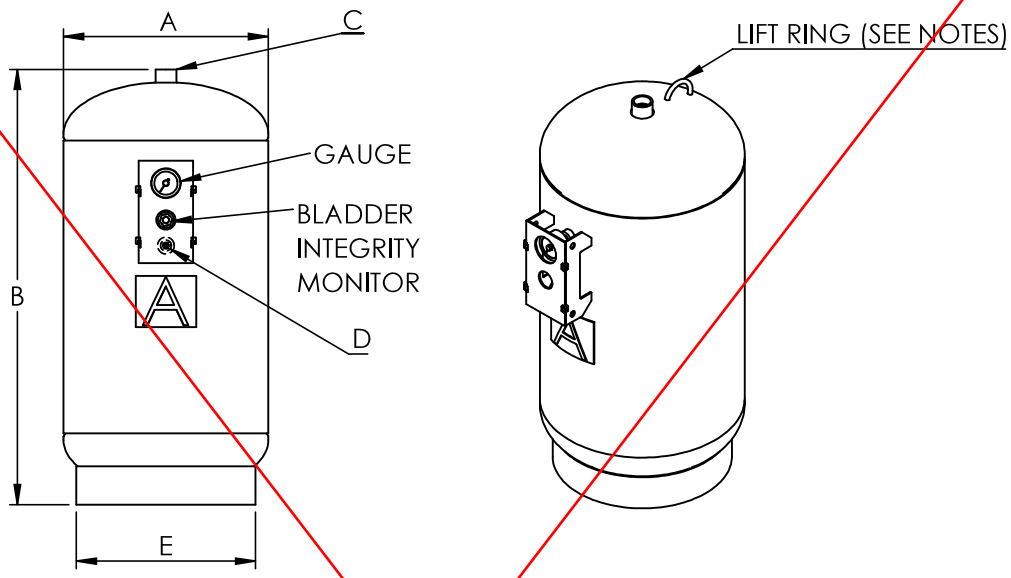
GRUNDFOS

EXPANSION TANK
NOT REQUIRED

SUBMITTAL

NT-SERIES
HVAC EXPANSION TANKS

Models: NT-15 to NT-280
Submittal Sheet No. A-1004C **Rev.** 4 4/6/2020



NT 15 thru NT 280

Dimensions & Weights:

Model Number	Dimensions in Inches					Approx. Weight (lbs)
	A	B	System Connection C	Charging Valve D	E	
NT-15	12	19	3/4		10	42
NT-20		25				52
NT-40	16	33	1		14	84
NT-60		44				97
NT-80	20	38			18	177
NT-100		49				210
NT-120	24	46	1 1/2	0.302"-32NC	22	311
NT-144		49				322
NT-180		52				340
NT-200		66				390
NT-240		78				434
NT-260	30	63			24	709
NT-280		81				902

Notes:

- Tanks are factory pre-charged at 40 PSIG and field adjustable.
- California code-sight glass is available upon request.
- Lift ring on models NT-40 thru NTA-280.
- Mounting clips are available upon request.

SINCE 1908 wessels company
101 Tank Street Greenwood, IN 46143
P: 317-888-9800 F: 317-865-7411
www.westank.com

Pump Performance Datasheet

Customer	:	Quote Number / ID	: 2185411
Customer ref. / PO	:	Model	: 40959 VL
Tag Number	: P-9,10,11	Stages	: 1
Service	:	Based on curve number	: VL_40959_4P Rev Aug21
Quantity	: 3	Basic model number	: -
		Date last saved	: February 27, 2024 3:59 PM

Operating Conditions

Flow, rated	: 192.0 USgpm
Differential head / pressure, rated (requested)	: 30.00 ft
Differential head / pressure, rated (actual)	: 30.07 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz

Performance

Speed, rated	: 1173 rpm
Impeller diameter, rated	: 8.46 in
Impeller diameter, maximum	: 9.60 in
Impeller diameter, minimum	: 6.90 in
Efficiency	: 73.25 %
NPSH required / margin required	: 2.14 / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 29 / 124 Metric units
MCSF	: -
Head, maximum, rated diameter	: 32.47 ft
Head rise to shutoff	: 5.42 %
Flow, best eff. point	: 277.3 USgpm
Flow ratio, rated / BEP	: 69.24 %
Diameter ratio (rated / max)	: 88.13 %
Head ratio (rated dia / max dia)	: 73.41 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Energy Indexes

PEI (CL)	: Out of scope
ER (CL)	: Out of scope

Liquid

Liquid type	: Cold Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg.F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

180F Design Max

Material

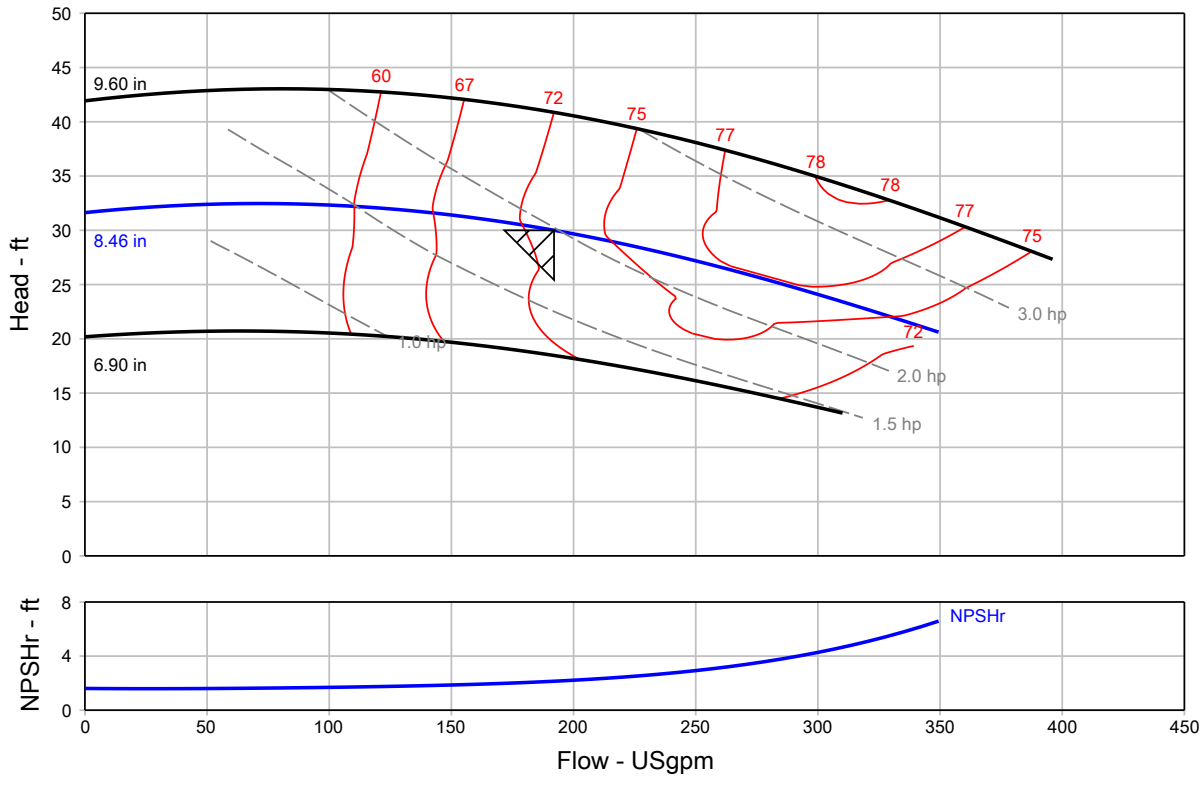
Material selected	: Cast iron - 125#

Pressure Data

Maximum working pressure	: 14.05 psi.g
Maximum allowable working pressure	: 175.0 psi.g
Maximum allowable suction pressure	: 175.0 psi.g
Hydrostatic test pressure	: 263.0 psi.g

Driver & Power Data (@Max density)

Motor sizing specification	: Max power (non-overloading)
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 1.45 hp
Rated power (based on duty point)	: 1.99 hp
Max power (non-overloading)	: 2.49 hp
Nameplate motor rating	: 3.00 hp / 2.24 kW



Construction Datasheet

Project name	: Glendale School	Tag Number	: P-9,10,11
Consulting engineer	:	Service	:
Customer	: GRUNDFOS Canada Inc. (GCA)	Model	: 40959 VL
Customer ref. / PO	:	Quantity	: 3
Quote Number / ID	: 2185411	Quoted By (Sales Office)	: Grundfos Canada Inc. (GCA)
Date last saved	: February 27, 2024 3:59 PM	Quoted By (Sales Engineer)	: Sohil Thomas

Construction

Nozzle	Size (in.)	Nozzle Configuration	Pos'n
Suction	4	125# ANSI	Side
Discharge	4	125# ANSI	Side

Orientation / Configuration	: Vertical
Rotation	: Clockwise
Wear Ring Configuration	: Single - Case
Discharge Elbow Size	: -
Subplate	: -
Sump Depth (feet)	: -
Bearing Frame	: -
Bearing Frame Foot	: -
Bearing Type (Radial/Thrust)	: In motor
Bearing Lubrication	: Regreasable
Thrust Bearing	: -
Intermediate Bearing	: -
Lower Bearing	: -
Bearing Housing Accessories	: -
PACO Construction code	: 16-40959-130108-2623P

Baseplate, Coupling and Guard

Baseplate	: Not Applicable
Drip Pan	: -
Coupling	: -
Guard	: OSHA Approved

Seal & Packing Construction

Sealing Method	: Single Seal, Type 21S
Seal Material	: Buna Carbon Ceramic SS-Spring and Hardware
Packing Gland	: -
Lantern Ring	: -
Recirculation Lines	: Copper Tubing with Brass Fittings

Weights (Approx.)

Pump	: 197.0 lb
Baseplate	: -
Driver	: 131.0 lb
Estimated Shipping gross weight	: 328.0 lb

Motor Information

Manufacturer	: Factory Choice
Frame Size	: 213JM
Power	: 3.00 hp
RPM	: 1200 rpm
Enclosure	: TEFC
Operating Power Supply	: 230/460/3/60
Efficiency	: Premium
Service factor	: 1.15
Motor Application	: General Purpose
Motor Options/Accessories	: -
Cord Length (feet)	: -

Materials

Case	: Cast Iron, ASTM A48 - Class 30
Motor Bracket	: Cast Iron, ASTM-A48, CL 30
Impeller	: Stainless Steel, AISI-304 (H304)
Impeller Cap Screw and Washer	: Stainless Steel, AISI-303
Impeller Key	: Stainless Steel, AISI 316
Case wear ring	: Tin Bronze, ASTM B584-90500 (B18)
Impeller wear ring	: -
Pump Shaft	: Steel, AISI-1040
Sleeve	: Bronze, III932, C89835
Line Shaft	: -
Column	: -
Discharge Pipe	: -
Discharge Elbow	: -
Suction Elbow	: -
Subplate	: -
Hardware	: Steel, Grade 5
O Rings	: Buna N
Pump Coatings	: Standard Manufacturers Paint

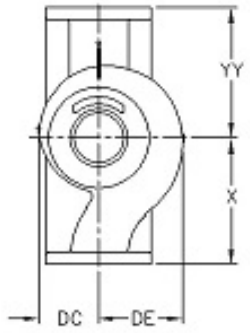
General Arrangement

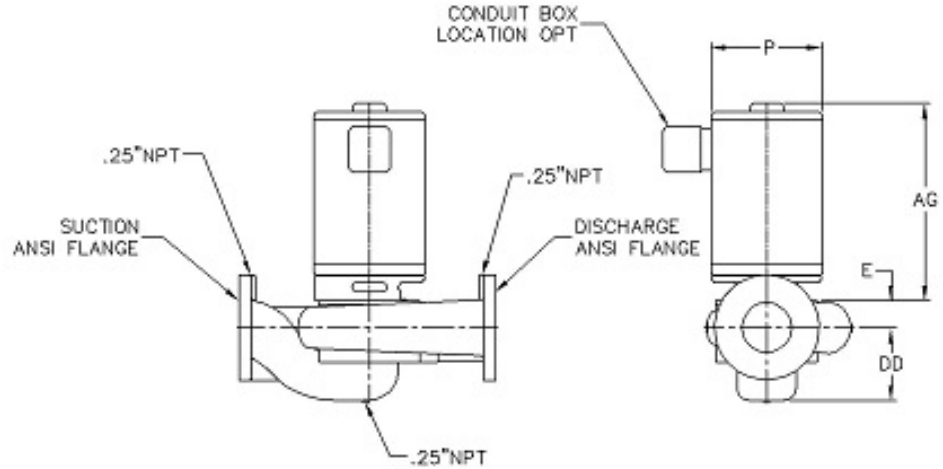
Project name	: Glendale School	Tag Number	: P-9,10,11
Consulting engineer	:	Service	:
Customer	:	Model	: 40959 VL
Customer ref. / PO	:	Quantity of pumps	: 3
Quote Number / ID	: 2185411	Quoted By (Sales Office)	: Grundfos Canada Inc. (GCA)
Date last saved	: February 27, 2024 3:59 PM	Quoted By (Sales Engineer)	: Sohil Thomas

Do not install pump larger than 215JM in vertical piping.

Pressure and drain tap locations are approximate.

Suction and discharge flanges, are cast per 250# ANSI thickness and diameter. All flanges are flat face. Some holes may be threaded because of nut clearances.





NOT FOR CONSTRUCTION, UNLESS CERTIFIED AND REFERENCED ON ORDER

Units	Frame	S x D (in.)	AG (Max)	DC	DD	DE	E	P (Max)	X	YY	Weight ea
inches	**213JM**	**4 X 4**	**22.00**	**6.63**	**6.75**	**8.88**	**1.78**	**12.00**	**12.00**	**12.50**	**328.0**

Conditions of Service		Motor Data			
Flow: 192.0 USgpm	Fluid: Cold Water	HP: 3	Encl: TEFC	Phase: 3	Efficiency: Premium
TDH: 30.00 ft	Temp.: 68.00 deg F	RPM: 1173 rpm	Hz: 60	Voltage: 230/460	S.F.: 1.15

Combination valve

TM 04 7386 2010

Fig. 1 Combination valve

General information

A combination valve fitted between the discharge pipe and the discharge flange of a Grundfos pump gives the following advantages:

- The combination valve combines three valves in one: shut-off valve, balancing valve and check valve.
- The combination valve provides the feature of changing the flange orientation to allow 90 ° pipe connection.
- The combination valve makes it possible to reduce the overall system pressure drop since fewer individual components are needed when installing a pump.
- The combination valve is easy to dismantle and service. Internal parts, such as the disc can be easily removed and/or replaced.
- The combination valve has a built-in bypass valve allowing for drainage of water upstream of the check valve. (See Fig 3. and Fig 4.)
  The bypass valve MUST be CLOSED at all times in normal operation.
  The bypass valve should ONLY be used by authorized personel to drain water from the piping above.

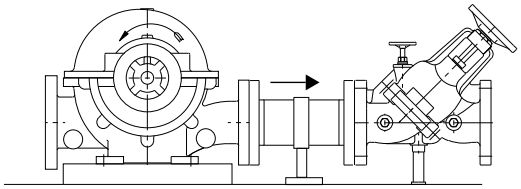
Combination valve range

Combination valves are available with ANSI 125 flanges and ANSI 250 flanges, see technical data below, and a variety of sizes ranging from 2 inches to 14 inches suction and discharge ports, see dimensional table.

Technical data

	ANSI 125	ANSI 250
Pumped liquid	Water	Water
Max. pressure	175 psi	250 psi
Max. liquid temperature	248 °F	248 °F
Test pressure	265 psi	426 psi
Materials:		
Upper body	ASTM A395 (ductile iron) / ASTM A126 Class B (cast iron)	ASTM A395 (ductile iron)
Lower body	ASTM A395 (ductile iron) / ASTM A126 Class B (cast iron)	ASTM A395 (ductile iron)
Stem	ASTM B124 C37700 (bronze)	ASTM A240-304 (stainless steel)
Hand wheel	ASTM A395 (ductile iron)	
Disc	ASTM A395 (ductile iron) / ASTM B124 C37700 (bronze) / ASTM A240- 304 (stainless steel)	
Soft seat	EPDM / ASTM B124 C37900 (bronze)	
Sleeve	ASTM B124 C37700 (bronze)	
Bush	ASTM B124 C37700 (bronze)	
Gland	ASTM B124 C37700 (bronze)	
Spring	ASTM A240-304 (stainless steel)	
Gasket	PTFE	
O-Ring	EPDM	
Disc ring	ASTM B584 C85400 (bronze)	
Disc bush	ASTM B124 C37700 (bronze)	
Bonnet	ASTM B124 C37700 (bronze)	
Disc packing	PTFE	

Installation



TM04 7387 2410

Fig. 2 Pump installation with combination valve

Accessories

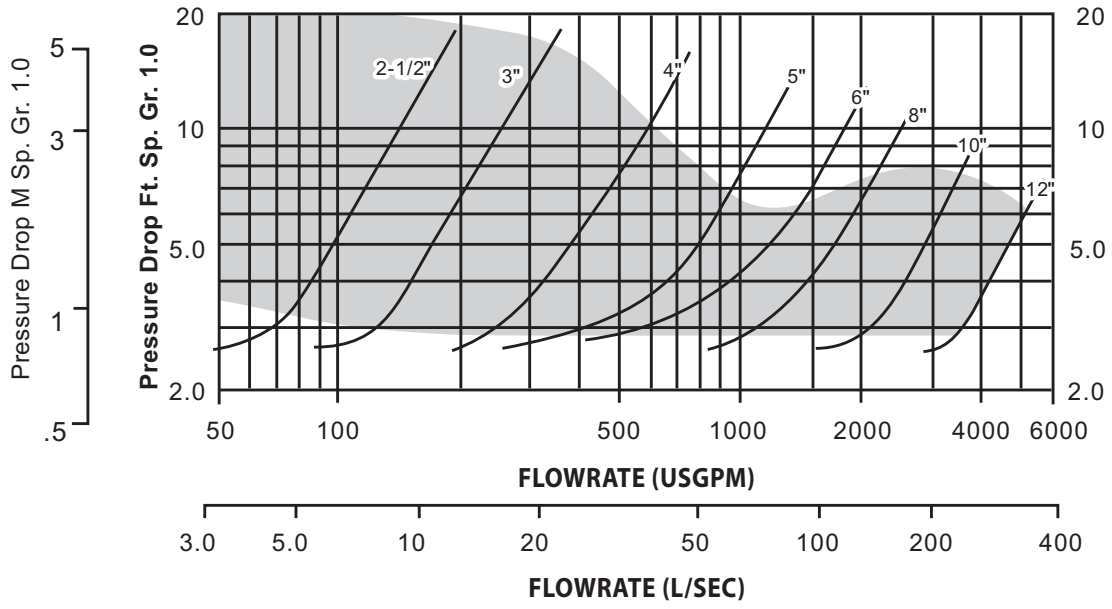
Part numbers

Combination valves can be ordered using these part numbers.
Straight type valve shipped from factory only.See IOM for conversion to angle type valve.

Inlet/outlet [inches]	ANSI 125		ANSI 250	
	Reference No.	Part No.	Reference No.	Part No.
2 x 2	CV20-125	97523122	CV20-250	97523104
2.5 x 2.5	CV25-125	97523123	CV25-250	97523105
3 x 3	CV30-125	96877844	CV30-250	97523106
4 x 4	CV40-125	96877845	CV40-250	97523107
5 x 5	CV50-125	97523124	CV50-250	97523108
6 x 6	CV60-125	96877846	CV60-250	97523109
8 x 8	CV80-125	96877847	CV80-250	97523141
10 x 10	CV10-125	97523125	CV10-250	97523142
12 x 12	CV12-125	97523126	CV12-250	97523143
14 x 14	CV14-125	97523127	CV14-250	97523144

NOTE: Use part no. to order the combination valve.
250# flanges are available upon request with 14 weeks delivery.

Pressure drop



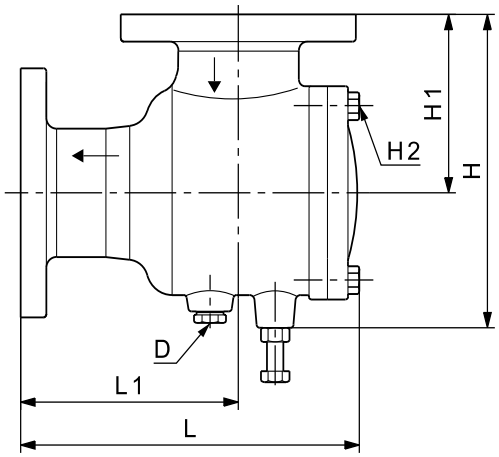
TM04 7390 2010

Fig. 9 Pressure drop graph for combination valves.
Valve in full open position. Size valves in shaded area only.

Series SD
SUCTION DIFFUSERS

FEATURES

- Provides a uniform flow pattern to the suction side of the pump, which ensures a stable NPSH.
- Incorporates a cylindrical strainer preventing impurities from entering the pump.
- Comes with a disposable, fine mesh, stainless steel start-up screen for capture and removal of foreign particulates in system piping.
- Provides flexibility through an adjustable support for mounting.
- Simplifies dismantling and servicing. Internal parts, such as strainer, can be easily removed, cleaned, and/or replaced.



TECHNICAL DATA

	ANSI 125	ANSI 250
Pumped liquid	Water	Water
Max. pressure	175 psi	250 psi
Max. liquid temperature	248 °F	248 °F
Test pressure	265 psi	426 psi

125 PSIG ANSI

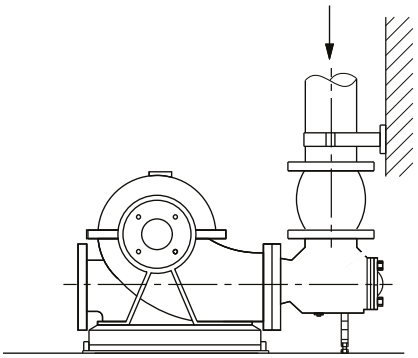
Part No.	Inlet/Outlet	L	L1	H	H1	D-NPT	(No. of bolts) H2	Wgt. (lbs)
97523145	2 x 1.5	8.2	5.0	7.2	4.0	1/2	4	21
97523146	2 x 2	8.3	5.1	7.2	4.0	1/2	4	24
97523147	2.5 x 2	9.7	6.0	8.6	5.0	1/2	4	29
97523148	2.5 x 2.5	9.7	6.0	8.6	5.0	1/2	4	34
97523149	3 x 2	11.1	7.1	9.6	5.6	1/2	4	39
97523150	3 x 2.5	11.1	7.1	9.6	5.6	1/2	4	39
96877828	3 x 3	11.1	7.1	9.6	5.6	1/2	4	40
97523151	4 x 3	12.9	8.3	11.4	6.5	3/4	6	60
96877830	4 x 4	12.9	8.3	11.4	6.5	3/4	6	64
99329310	5 x 4	14.1	9.4	12.4	6.9	3/4	6	91
99329680	5 x 5	13.6	9.0	12.4	6.9	3/4	6	93
99329685	6 x 4	15.4	10.1	13.9	8.0	3/4	6	120
99329704	6 x 5	15.6	10.3	13.9	8.0	3/4	6	122
99329708	6 x 6	15.4	10.1	13.9	8.0	3/4	6	137
99329724	8 x 6	18.2	11.9	17.3	10.0	3/4	6	188
99329725	8 x 8	18.2	11.9	17.3	10.0	3/4	6	201
97523156	10 x 8	23.5	14.3	20.6	11.5	1	6	305
97523157	10 x 10	23.5	14.3	20.6	11.5	1	6	314
97523158	12 x 8	28.0	17.9	23.5	12.9	1	8	441
97523159	12 x 10	28.0	17.9	23.5	12.9	1	8	448
97523160	12 x 12	28.0	17.9	23.5	12.9	1	8	455

250 PSIG ANSI

Part No.	Inlet /Outlet	L	L1	H	H1	D-NPT	(No. of bolts) H2	Wgt. (lbs)
97523428	2 x 1.5	8.4	5.2	7.4	4.2	1/2	4	21
97523429	2 x 2	8.5	5.3	7.4	4.2	1/2	4	24
97523430	2.5 x 2	9.7	6.0	8.6	5.0	1/2	4	29
97523441	2.5 x 2.5	9.7	6.0	8.6	5.0	1/2	4	34
97523443	3 x 2	11.1	7.1	9.6	4.0	1/2	4	39
97523444	3 x 2.5	11.1	7.1	9.6	5.6	1/2	4	39
97523445	3 x 3	11.1	7.1	9.6	5.6	1/2	4	40
97523446	4 x 3	12.9	8.3	11.4	6.5	3/4	6	60
97523463	4 x 4	12.9	8.3	11.4	6.5	3/4	6	64
99343938	5 x 4	14.1	9.4	12.1	6.9	3/4	6	91
99343940	5 x 5	14.1	9.0	12.1	6.9	3/4	6	93
99343941	6 x 4	15.4	10.1	13.9	8.0	3/4	6	120
99343942	6 x 5	15.6	10.3	13.9	8.0	3/4	6	122
99345703	6 x 6	15.4	10.1	13.9	8.0	3/4	6	137
99345704	8 x 6	18.6	12.3	17.8	10.5	3/4	6	188
99345705	8 x 8	18.6	12.4	17.8	10.5	3/4	6	201
97523481	10 x 8	23.5	14.3	20.6	11.5	1	6	305
97523482	10 x 10	23.5	14.3	20.6	11.5	1	6	314
97523483	12 x 8	28.0	14.3	23.5	12.9	1	8	441
97523484	12 x 10	28.0	17.9	23.5	12.9	1	8	448
97534549	12 x 12	28.0	17.9	23.5	12.9	1	8	455

PUMP INSTALLATION WITH SUCTION DIFFUSER

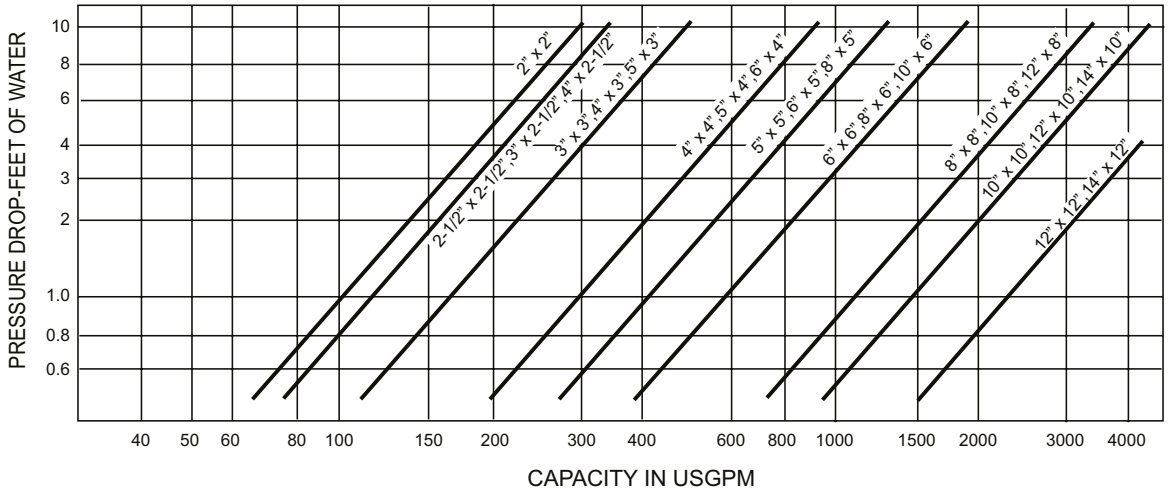
Drawing shows a suction diffuser installed with a Grundfos pump. Available in 125 PSIG ANSI flanges and 250 PSIG ANSI flanges, suction diffusers range in a variety of sizes from 1.5 x 2 inches to 12 x 12 inches suction and discharge ports.



PRESSURE DROP

In operation the suction diffuser causes a minor pressure drop.

Pressure drop graph for suction diffusers.



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