

Date: September 11, 2014

The following changes/clarifications in the tender documents are effective immediately. This Addendum will form part of the Contract documents.

For direct answers to bidders' direct questions, see section 3.0 of this Addendum 2.

1.0 SPECIFICATIONS

1.1 Reference Section 01 11 55 General Instructions

.1 DELETE Hours of Work 1.6.1.1, .2 & .4

.2 ADD Hours of Work 1.6.1.1 & .2:

.1 Work shall be performed only during the hours of 6:00 PM to 6:00 AM, Monday through Friday. Work may be performed 24 hours on Saturdays, Sundays and Holidays subject to item .3 notification requirements.

.2 No work shall be performed during weekday hours of 6:00 AM to 6:00 PM.

1.2 Reference Section 01 11 55 General Instructions

.1 In 1.25 CLEANING, item .2, ADD: Upon ceasing work each day, coordinate and provide third party daily air quality monitoring. Provide monitoring results in spreadsheet format indicating allowable limits, and that results are within limits. Owner will post as information for staff in the building. Notify Owner and Users immediately if any air monitoring results are above limits. Indicate reasons for high results. Rectify conditions before re-commencing work. Notify PWGSC immediately of any breach in air quality that can affect on-site staff.

1.3 Reference Section 01 14 00 Work Restrictions

.1 DELETE references to "normal working hours". CLARIFICATION: Per item 1.1 of this Addendum 2, work is permitted only between the hours of **6:00 PM to 6:00 AM** weekdays; and 24 hours on Saturdays, Sundays and Holidays with prior written notice and Owner's approval.

.2 ADD in 1.6 Special Requirements, item .6: Submit SNC Lavalin form "Notice of Project" to commence work. Submit SNC Lavalin daily "Hot Work Permit" form each day "hot" work is to be undertaken.

1.4 Reference Section 00 00 01 Index, page 3, Mechanical specification:

- .1 ADD attached referenced Appendix F, Harry Steven's Building DDC Tune-up 2009; and Appendix G, Mechanical Equipment Manufactures.

1.5 Reference Section 00 00 01 Index:

- .1 ADD attached Section 02 50 13 Management of Toxic Waste.
- .2 ADD attached Section 02 82 00.02 Asbestos Abatement Intermediate Precautions, and Appendix H.
- .3 ADD attached Section 07 52 00 modified Bituminous Membrane Roofing. (See related drawing ASK-1.0).
- .4 ADD attached Section 07 62 00 Sheet Metal Flashing and Trim.
- .5 ADD attached Section 08 11 00 Door Metal Frames.
- .6 ADD attached Section 08 71 00-1A Door Hardware.
- .7 ADD attached Section 08 80 50 Glazing.

2.0 DRAWINGS

2.1 Reference Drawing P101-TI, General Notes 3 & 4:

- .1 CLARIFICATION: The number of dry sprinkler heads to be replaced is approximately 240. Include for seismic restraint of each head.

2.2 Reference Drawings:

- .1 ADD attached drawing ASK-1.0 Partial Roof plan & HVAC Pad Detail. HVAC condensers pad final location to be determined on site.

2.2 Reference Drawing A203-TI:

- .1 On Door Schedule, DELETE STC ratings 45 & 52. ADD STC Rating 33.
- .2 On door jamb details J1 & J3, and at frame head, fill voids between frame and doorway opening with spray acoustic insulation.
- .3 In area between grid lines B & C2 & 4, REMOVE existing flooring as part of floor preparation. NOTE: Per test results in Appendix H, existing flooring finish to be removed does not contain hazardous material.

2.3 Reference Drawing E200-TI, 3rd Floor Lighting Plan

- .1 ADD Note: Contractor shall provide cost to supply and install new luminaires with the same quantity as the difference between those shown as “relocated” in the demolition drawings and the new lighting layout. Cost shall be allocated to Base Building.
- .2 ADD Note: For Lighting Control in Boardroom 309, provide ceiling-mounted line-voltage dual technology occupancy sensor at middle-west ceiling tile. Exact location shall be determined at site. This occupancy shall provide ON-OFF control of the lights inside Boardroom 309. Provide shop drawing and/or cut sheet of occupancy sensor indicating exact brand and model.

Replace the combination occupancy sensor/3-way switch/dimmer north of the west wall of Boardroom 309 with a wall-mounted line-voltage touch dimmer to control Type ‘L’ fluorescent potlights. Touch dimmer shall restore to the last-used level when power is switched off by the sensor specified above. Provide shop drawing and/or cut sheet of touch dimmer indicating exact brand and model.

Delete the wall-mounted 3-way switch south of the west wall of Boardroom 309.

- .3 ADD Note: Type ‘L’ luminaires shall match those potlights existing in the northeast corner, grid lines 1D, of drawing E100-TI.
- .4 ADD Note: Potlights in Waiting 344 shall be those relocated from the northeast corner, grid lines 1D, of drawing E100-TI.
- .5 ADD Note: Additional remote heads shall match the voltage and wattage specifications of existing remote heads. Refer also to Key Note 2 on Drawing E200-TI
- .6 ADD Note: Battery pack may be replaced or additional batteries provided to ensure minimum 30-minute battery back-up time after normal power is made unavailable.

3.0 Direct Answers to Bidders' Direct Questions:

| Misc. Questions #1 | Replies |
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| <p>1.1 <i>What is the roof structure? Is there any post-tension cable in roof slab? What is roof assembly?</i></p> <p>1.2 <i>What is the ceiling height? How many dry valves are to be replaced?</i></p> <p>1.3 <i>Is there a manufacturer / spec for the solid surface in the millwork?</i></p> <p>1.4 <i>Please provide a photo or specification of the existing window film that is to be matched.</i></p> <p>1.5 <i>Appendix F&G were not provided as referenced in the specification index. Please provide.</i></p> <p>1.6 <i>Could we please request another site visit for sub-trades.</i></p> <p>1.7 <i>Is the existing roof under warranty?</i></p> <p>1.8 <i>How many parking stalls would be available for contractors and where could the disposal bin be located?</i></p> | <p>1.1 The roof structure is reinforced concrete slab with ribbed coffers. There is no post-tension cable in the roof structure; the roof is conventionally reinforced. The roofing assembly is a 2-ply SBS roofing membrane on rigid board substrate/insulation on concrete slab.</p> <p>1.2 The t-bar ceiling height is 3048 mm AFF. No dry valves are added or replaced. Only replace approximately 240 dry sprinkler heads, including to add seismic restraints; per item 2.1 of this Addendum 2.</p> <p>1.3 The millwork solid surface countertop product is Du Pont Corian "Granola".</p> <p>1.4 Photo to follow by Addendum. Film specified in Addendum 1, item 2.1.2.</p> <p>1.5 Appendix F&G attached, as referenced in this Addendum 2, item 1.4.</p> <p>1.6 There will be no second site visit.</p> <p>1.7 See reply item 2.4.2 in Addendum 1.</p> <p>1.8 There are no contractor-designated parking stalls. Contractor may set up protective fencing and park on the south side of the building along the planter sidewalk (Owner's property), and at the north side loading dock. Place disposal bin and portable sanitary facility at loading dock.</p> |
| <p>Electrical RFI's:</p> <p>1.9 <i>For the lighting the demo drawings have 44 to be relocated but the E200-TI has 52 being relocated. Will the base building or owner supply the difference?</i></p> <p>1.10 <i>On the walkthrough only a few 2x4 lights were installed, do we supply the missing fixtures or will they be installed and/or supplied?</i></p> <p>1.11 <i>Boardroom 309 calls for a wall occupancy sensor c/w 3-way and dimming ability. Please give part number for what the engineer wants. There is no such switch?</i></p> <p>1.12 <i>Also in room 309 we need info on the Type L potlight.</i></p> <p>1.13 <i>The three potlights in the waiting room are being relocated from somewhere; please give more info on where?</i></p> | <p>Electrical replies:</p> <p>1.9 See item 2.3.1 above.</p> <p>1.10 See item 2.3.1 above.</p> <p>1.11 See item 2.3.2 above.</p> <p>1.12 See item 2.3.3 above</p> <p>1.13 See item 2.3.4 above</p> |

| Misc. Questions #2: | Replies |
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| <p>2.1 Heavy gauge flat stock wall backing scope of work is not clear. Is this only in the kitchen area?</p> <p>2.2 P101 – Detail 2 indicates that both DCW and DHW are from below. Please provide tie-in locations.</p> <p>2.3 P101 – Detail 2 indicates that both sanitary and vent are to be connected to the nearest existing. Can you provide these locations with reference to the grid lines?</p> <p>2.4 What is the ceiling below at location of new plumbing work. Mechanical drawing shows even new water lines are from floor below. What are the hours of work on floor below?</p> <p>2.5 Drawing A203, Note 1, requires us to provide insurance for Owner's sub-trades. Construction insurance costs are based on total value of project. What is the owner contractor contract value?</p> <p>2.6 Drawing A203, Note 4, at this time it is not possible to predict and allow for the cost of storage. Also, size and cost of storage depend on size and quantity of items which we have no knowledge of. Please consider cash allowance for this item.</p> <p>2.7 Drawing A203, Floor plan legends, Note relative to breakdown costs, we have to provide these breakdowns at the time of tender or after tender? If at the time of tender, please provide a description of items for breakdown.</p> <p>2.8 Will Owner provide parking on site?</p> <p>2.9 Will Owner provide laydown area on site for garbage bin and...?</p> <p>2.10 Can we use existing sanitary facilities in building or have to allow for temporary washroom facilities?</p> <p>2.11 Where can we get water for construction? We did not see any on site and from mechanical drawing, it does not seem that there is any tie-in point on site.</p> <p>2.12 We understand that we have to pay and pick-up building permit, but, has Owner or consultants applied for building permit? If not, this may have significant impact on schedule.</p> <p>2.13 Referring to Section 011400 work restriction, item 1.7.2.6 and .7, please clarify what we should carry in tender. How would you compare a tender which includes for 1 hr of escort with another that includes for several hrs. In both cases Owner will pay the balance at the end of the project. Please consider a</p> | <p>2.1 Heavy gauge wall backing occurs behind shelving/cabinet millwork in the kitchen and storage rooms as shown on details 9 & 10, dwg A402-TI.</p> <p>2.2 There are 12 mm existing DCW and DHW pipes capped off with isolate valves in second floor ceiling space near grid lines C & 2.</p> <p>2.3 There is a 50 mm existing SAN capped off in second floor ceiling space near grid line C & 2. There is a 40 mm existing VENT pipe in third floor ceiling space near grid line C & 2.</p> <p>2.4 The ceiling below the new plumbing is completely open and accessible from the floor below. Hours of work are as indicated on this Addendum 2, item 1.1.</p> <p>2.5 Note 1 intent is for the GC's insurance to include coverage for the Owner's furniture mover-installers.</p> <p>2.6 Owner will not consider cash allowance for possibility of temporary storage. Intent of Note 4 is to avoid storage costs for the Owner if contractor does not meet schedule in time to receive Owner's furniture delivery/installation.</p> <p>2.7 Cost breakdowns are required only <u>after</u> contract award. See Addendum 1, item 1.1.</p> <p>2.8 See reply 1.7 above.</p> <p>2.9 The disposal bin (and portable sanitary station) can be placed at the loading dock.</p> <p>2.10 Temporary use of building's sanitary facilities is not permitted. Provide portable sanitary facility at loading dock.</p> <p>2.11 Construction water is available on site in a janitor closet at the bottom of Stair 2.</p> <p>2.12 Per Addendum 1, item 1.2, Owner has paid for building permit. Contractor to arrange for a Field Review Appointment as described.</p> <p>2.13 Owner will not consider a cash allowance for Commissionaire Services. Contractor is responsible to determine the estimated number of Commissionaire hours based on specified security escort requirements.</p> <p>2.14 Existing roof is under warranty only where the recently-completed renovation project patching was installed. <u>Roofing work under present project requires its own 1-year warranty.</u> Contract does not require use of previous roofing subcontractor.</p> |

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| <p><i>cash allowance for this item.</i></p> <p>2.14 <i>Is existing roof under warranty? Do we have to use the company that did the roofing to maintain the warranty or not?</i></p> | |
| <p>Misc. Questions #3</p> | <p>Replies</p> |
| <p>3.1 <i>Spray in place insulation scope.</i></p> <p>3.2 <i>Need to know the wall type definitions.</i></p> <p>3.3 <i>Room 320 is labelled as a copy room on Room Finish Schedule, but it's numbered as a stairwell on the finish plans. Which tag is correct?</i></p> <p>3.4 <i>Are there any finishes going into the stairwells?</i></p> <p>3.5 <i>If there is a copy room, where is it located?</i></p> <p>3.6 <i>Solid surface countertop?</i></p> <p>3.7 <i>P-lam spec?</i></p> <p>3.8 <i>What are the cabinets made of?</i></p> <p>3.9 <i>There is no mention of the STC Ratings issue for doors anywhere and the hardware index is apparently coming out in a future addendum?</i></p> <p>3.10 <i>Could I please get a copy of the 2 Appendix so we can bid on this job to our Mechanicals?</i></p> <p>3.11 <i>Please clarify the fire AND Acoustical ratings for doors. Are doors 310A and 310B to be acoustically rated STC52? Are all other new doors excepting bi-folds to be 45 minute rated? Please clarify the door hardware groupings. The specification does NOT list the doors in this phase. We require the hardware group numbers for each door.</i></p> <p>3.12 <i>Our millwork contractor has queried the requirement for the FSC chain of custody certificate. This is referred to in the finish carpentry and architectural woodwork. Is this a specific requirement for the millwork trade?</i></p> | <p>3.1 Intent is to spray between voids in door frames for acoustic purposes.</p> <p>3.2 Wall types W1 through W5 are listed by component on the sidebar of drawing A203-TI.</p> <p>3.3 Room 320 is Stairs 2. Delete from room finish schedule.</p> <p>3.4 There are no finishes going in stairwells. Contractor to repair any stairwell damage caused during construction.</p> <p>3.5 Clarification: There is no copy room. What was a copy room is now Business Centre 345.</p> <p>3.6 See reply 1.3 above.</p> <p>3.7 See Section 06 40 00, Part 2 Materials. P-lam colour is Wilsonart Laminate Antique White 1572.60.</p> <p>3.8 Cabinet doors, drawer fronts & shelving are 19 mm MDF core per AWMAC standard. Casework interior & drawer box to be on plywood with laminated plastic liner sheet.</p> <p>3.9 See 2.2.1 above, and attached Door Hardware section.</p> <p>3.10 Per attached.</p> <p>3.11 Doors 310A and 310B are STC 33 rated. All new doors are non-fire-rated. See attached Door Hardware for hardware groups by door number.</p> <p>3.12 FSC Chain –of-Custody Certificate number is required.</p> |
| <p>Misc. Questions #4</p> | <p>Replies</p> |
| <p>4.1 a) <i>01 11 15 .1.12 Contractor's Use of Site - I interpret this clause to mean that we do not need to provide Commissionaire for work performed within this space?</i></p> <p>4.2 b) <i>01 14 00 1.3.5 We have been told to access the 'site' from the rear fire escape stair - seems the requirement to exclusively move workers and material will be extremely disruptive. and inefficient</i></p> <p>4.3 c) <i>01 14 00 1.7.2 Security Escort: I presume the intent is that when we have workers working outside of our space we will need an escort?</i></p> <p>4.4 d) <i>01 52 00 1.13.1 Sanitary facilities are to be</i></p> | <p>5.1 Per Section 01 14 00, Work Restrictions, Security item 1.7.2.1, “All personnel engaged for the work on this project must be escorted by a Commissionaire (Security Escort) at ALL times as well as for each separate part of the building/site where work is being done at the same time.”</p> <p>5.2 In addition to NW Stair 2, the Owner will permit worker and material access via main entrance lobby Stair 302. There will be no elevator usage permitted.</p> <p>5.3 Yes, security escort is required. See item 4.1 above.</p> <p>5.4 Contractor to provide own temporary portable</p> |

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| <p><i>provided by the Contractor (We will not have access to the Building's ablutions within the Building?)</i></p> <p>4.5 e) 01 52 00 1.14 Construction Signage required ?</p> <p>4.6 f) 01 45 00 Quality Control is not included within the specifications</p> <p>4.7 g) 02 50 13 Management of Toxic waste is not included within the specifications</p> <p>4.8 h) 05 55 00 Metal Fabrications is not included within the specifications</p> <p>4.9 i) 08 71 00 Door Hardware appears to be incorrect as the references are unique to the specification and do not refer to the doors on the door schedule</p> <p>4.10 08 11 00 Metal Door and Frames in not included within the Specifications</p> <p>4.11 08 80 50 Glazing is not included within the Specifications</p> <p>4.12 There is also a conflict with Doors 357A and 358 which are described as being wood bi-fold doors framed within Metal frames.</p> <p>4.13 Could you please clarify or confirm the Bid Bond requirement of 10% and there is no Performance Bond required?</p> | <p>sanitary service at loading dock. There will be no access to building washrooms.</p> <p>5.5 Yes, a construction sign is required, per Section 01 52 00, item 1.14.</p> <p>5.6 Quality Control is addressed in Section 01 61 00 Common Product Requirements, and in each section.</p> <p>5.7 See .</p> <p>5.8 There are no metal fabrications in the project.</p> <p>5.9 See item 1.5.1 above.</p> <p>5.10 See item 1.5.5 above.</p> <p>5.11 See item 1.5.7 above</p> <p>5.12 DELETE metal frame for bi-fold closet doors 357A and 358.</p> <p>5.13 Owner to advise separately.</p> |
| <p>Misc. Questions #5</p> | <p>Replies</p> |
| <p>5.1 Is the roof where the condensing units are located directly above the third floor construction area shown on drawing M101-TI?</p> <p>5.2 How is the roof area where the condensing units are located accessed?</p> <p>5.3 The schedule on drawing M201-TI for AC/CU-2 lists those units as having R407C refrigerant. The type of unit specified is only available with R410A refrigerant. Is this acceptable?</p> <p>5.4 Referring to addendum 1, item 2.2.4, these new equipment are connected to where? What is the wiring route and.....? Can we work during normal hours on this door?</p> <p>5.5 I don't see a manufacturer for the carpet tile. Is the carpet tile owner supplied?</p> | <p>5.1 Yes. See attached drawing ASK-1.0 for proposed condenser pad location, to be finalized on site.</p> <p>5.2 The roof area is accessed through Stairs 3 in the centre of the building between grid lines H & J.</p> <p>5.3 Yes, the R410A refrigerant is acceptable.</p> <p>5.4 New security devices shall be connected to the existing security control panels in LAN Room 108, main floor at gridline 3D. Wiring shall generally be routed above the door, through the inside ceiling of Foyer 1, Corridor 117, then into LAN Room 108; all on the main floor. Exact routing shall be verified at site. Working hours are as noted in 1.1 above.</p> <p>5.5 The existing carpet tile to be matched is Tandus Flooring Circle Junction – Heel-Toe, product # 54209. The carpet tile is contractor supplied and installed.</p> |

End of Addendum No. 2

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 11 55 – General Instructions
- .2 Section 01 35 33 – Health and Safety Requirements
- .3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .4 Section 02 41 99 – Demolition for Minor Works
- .5 Section 02 81 01 – Hazardous Materials
- .6 Section 02 82 00.02 – Asbestos Abatement – Intermediate Precautions

1.2 REFERENCES

- .1 Canadian Environmental Protection Act, 1999 (CEPA 1999).
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 National Fire Code of Canada, 2005.
- .4 Transportation of Dangerous Goods Act (TDGA), 1999 c. 34.
- .5 Transportation of Dangerous Goods Regulations (TDGR), T-19.01-SOR/2003-400.
- .6 Storage of PCB Material Regulations, SOR/92-507.
- .7 PCB Waste Export Regulations, 1996, SOR/97-109.
- .8 Ozone-Depleting Substances Regulations, SOR/99-07.
- .9 Environmental Code of Practice on Halons, July 1996.
- .10 Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems, March 1996.

1.3 DEFINITIONS

- .1 Toxic: substance is considered toxic if it is listed on Toxic Substances List found in Schedule 1 of CEPA.
- .2 List of Toxic Substances: found in Schedule 1 of CEPA, lists substances that have been assessed as toxic. Federal Government can make regulations with respect to a substance specified on List of Toxic Substances. Column II of this list identifies type of regulation applicable to each substance.
- .3 PCBs: includes chlorobiphenyls referred to in Column I of item 1 of the List of Toxic Substances in Schedule I of Canadian Environmental Protection Act.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Shop Drawings, Product Data and Samples.
- .2 Product Data:
 - .1 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.
 - .2 Submit photocopy of shipping documents and waste manifests and export notices to Departmental Representative when shipping toxic wastes off site.
 - .3 Maintain 1 copy of product data in readily accessible file on site.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Store and handle toxic wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
- .2 Store and handle flammable and combustible wastes in accordance with current National Fire Code of Canada requirements.
- .3 Co-ordinate storage of toxic wastes with Departmental Representative and follow internal requirements for labelling and storage of wastes.
- .4 Observe smoking regulations, smoking is prohibited in area where toxic wastes are stored, used, or handled.
- .5 Only certified persons who have successfully completed Environment Canada Environmental Awareness Course for Environmentally Safe Handling of Refrigerants are permitted to work on refrigeration and air conditioning systems.
- .6 Report spills or accidents involving toxic wastes immediately to Departmental Representative and to appropriate regulatory authorities. Take reasonable measures to contain the release while ensuring health and safety is protected.
- .7 Transport toxic wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
- .8 Use authorized/licensed carrier to transport toxic waste.
- .9 Co-ordinate transportation and disposal of toxic wastes with Departmental Representative.
- .10 Notify appropriate regulatory authorities and obtain required permits and approvals prior to exporting toxic waste.
- .11 Dispose of toxic wastes generated on site in accordance with applicable federal and provincial acts, regulations, and guidelines.
- .12 Ensure toxic waste is shipped to authorized/licensed treatment or disposal facility and that liability insurance requirements are met.
- .13 Minimize generation of toxic waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.

PART 2 - PRODUCTS

2.1 POLYCHLORINATED BIPHENYLS

- .1 Polychlorinated Biphenyls (PCBs) were not identified within the building included in this project scope of work. However, the potential for PCBs to be present within the building exists. The contractor will provide a unit rate for the disposal of PCB-containing electrical equipment, should it be encountered during the renovation project.
- .2 PCB-containing electrical equipment shall be removed and disposed of in accordance with the Canadian Environmental Protection Act and the Transportation of Dangerous Goods Act and Regulations.

2.2 OZONE DEPLETING SUBSTANCES

- .1 Identified ozone depleting substances (roof-mounted air conditioning units) shall be removed and disposed of in accordance with the requirements of WorkSafeBC, the *Transportation of Dangerous Goods Act*, and the British Columbia Ministry of Environment, namely the requirements outlined in BC Reg. 63/88, as amended by BC Reg. 261/2006. The contractor will provide a rate for the disposal of ozone-depleting substances.

2.3 MERCURY

- .1 Mercury (known to be present within fluorescent light tubes) shall be removed and disposed of in accordance with the requirements of WorkSafeBC, the *Transportation of Dangerous Goods Act*, and the British Columbia Ministry of Environment, namely the requirements outlined in BC Reg. 63/88, as amended by BC Reg. 261/2006. The contractor will provide a rate for the disposal of mercury.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Unless otherwise determined through risk assessment conducted by a qualified person, comply with requirements of this Section when performing the following Work:
 - .1 Removal and disposal of plastic dowel inserts (with potential asbestos-containing wall plaster residue) in a row of screw holes, from which wire mold was previously removed, on the exterior asbestos-containing plaster walls within the west end of the 3rd floor.
 - .2 Patch and repair of asbestos-containing wall plaster damaged from the removal of the plastic dowel inserts noted above.
 - .3 Removal and disposal of damaged asbestos-containing mechanical pipe insulation from the following areas of the building using Glove Bag procedures:
 - .1 An approximately one-foot section of asbestos-containing mechanical straight pipe insulation within the corridor outside the fan room on the 2nd floor
 - .2 Asbestos-containing mechanical pipe insulation on approximately four fittings present on an abandoned mechanical pipe within the boiler room
 - .3 Asbestos-containing mechanical pipe insulation on three fittings within the parkade
 - .4 Removal and disposal of HVAC ducting within the west end of the 3rd floor, if such is required.
 - .1 Concealed asbestos-containing HVAC duct mastic may be present within ducts or beneath fibreglass insulation wrap on ducts in this area as this material was identified to be asbestos-containing in other areas of the building.
- .2 Photo documentation and analytical reports for the identified asbestos-containing materials noted above are provided in Appendix H.

1.2 SECTION INCLUDES

- .1 Requirements and procedures for asbestos abatement of asbestos containing materials of the type described within.

1.3 REFERENCES

- .1 British Columbia Occupational Health and Safety Regulation (BC Reg. 296/97)
- .2 WorkSafe BC
 - .1 Safe Work Practices for Handling Asbestos (2012)
- .3 Canada Labour Code
 - .1 Canada Occupational Health and Safety Regulations
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
- .6 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.205-[94], Sealer for Application of Asbestos Fibre Releasing Materials

1.4 DEFINITIONS

- .1 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow wetting of fibres.
- .2 Asbestos Containing Materials (ACMs): materials that contain 0.5 percent or more asbestos by dry weight and are identified under Existing Conditions including fallen materials and settled dust.
- .3 Asbestos Work Area: area where work takes place which will, or may disturb ACMs.
- .4 Authorized Visitors: Engineers, or designated representatives, and representatives of regulatory agencies.
- .5 Competent worker: in relation to specific work, means a worker who:
 - .1 Is qualified because of knowledge, training and experience to perform the work.
 - .2 Is familiar with the Provincial/Federal laws and with the provisions of the regulations that apply to the work.
 - .3 Has knowledge of all potential or actual danger to health or safety in the work.
- .6 Friable Materials: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.
- .7 Glove Bag: prefabricated glove bag as follows:
 - .1 Minimum thickness 0.25 mm (10 mil) polyvinyl-chloride bag.
 - .2 Integral 0.25 mm (10 mil) thick polyvinyl-chloride gloves and elastic ports.
 - .3 Equipped with reversible double pull double throw zipper on top and at approximately mid-section of the bag.
 - .4 Straps for sealing ends around pipe.
- .8 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any dimension at 99.97% efficiency.
- .9 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.
- .10 Occupied Area: any area of building or work site that is outside Asbestos Work Area.
- .11 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.
- .12 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for scope of work.

1.5 SUBMITTALS

- .1 Submit proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of asbestos containing waste in accordance with requirements of authority having jurisdiction.
- .2 Submit Provincial and/or local requirements for Notice of Project Form.
- .3 Submit proof of Contractor's Asbestos Liability Insurance.
- .4 Submit to Departmental Representative necessary permits for transportation and disposal of asbestos containing waste and proof that asbestos containing waste has been received and properly disposed.
- .5 Submit proof satisfactory to Departmental Representative that all asbestos workers have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene, entry and exit from Asbestos Work Area, aspects of work procedures and

- protective measures while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.
- .6 Submit proof that supervisory personnel have attended asbestos abatement course, of not less than two days duration, approved by Departmental Representative. Minimum of one supervisor for every ten workers.
 - .7 Submit WorkSafeBC status and transcription of insurance.
 - .8 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including:
 - .1 Encapsulants;
 - .2 Amended water; and,
 - .3 Slow drying sealer.
 - .9 Submit proof satisfactory to Departmental Representative that employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: comply with Federal/Provincial and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at the time work is performed.
- .2 Health and Safety:
 - .1 WorkSafeBC under the *Workers' Compensation Act* (the Act), as amended by the *Workers' Compensation (Occupational Health and Safety) Amendment Act* (effective June 30, 2002).
 - .2 Safety Requirements: worker and visitor protection.
 - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area at a minimum, include:
 - .1 Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker. The respirator determined to have damaged or deteriorated parts will be replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.
 - .2 Disposable type protective clothing that does not readily retain or permit penetration of asbestos fibres is to be used. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing to consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the

protective clothing. It includes suitable footwear, and it to be repaired or replaced if torn.

- .3 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.
- .4 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.
- .5 Wash basins and towels are to be provided at the entrance/exit of the Asbestos Work Area.
- .6 Ensure workers wash hands and face when leaving Asbestos Work Area.
- .7 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face. If the worker has facial hair that affects the seal of the respirator, the worker will not be allowed to enter the work area.
- .8 Visitor Protection:
 - .1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.
 - .2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.
 - .3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins or bins supplied by the contractor for recycling in accordance with Waste Management Plan.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Provincial and Municipal regulations.
- .5 Store metal in designated area for recycling.
- .6 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 ml bags or leak proof drums. The exterior bag must be yellow or black in color and state asbestos waste as the contents with a warning label. If containers are to be used, label with appropriate warning labels.
- .7 Provide manifests describing and listing waste created. Transport containers by approved means to licenced landfill for burial.

1.8 EXISTING CONDITIONS

- .1 Reports and information pertaining to ACMs to be handled, removed, or otherwise disturbed and disposed of during this Project are bound into this specification immediately after this Section.
- .2 Notify Departmental Representative of friable material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by the Departmental Representative.

1.9 SCHEDULING

- .1 Hours of Work: perform work involving asbestos abatement located at 125 East 10th Avenue, Vancouver, BC Work during working hours (as defined and noted in Division 1 – General Instructions). Include in Contract Sum additional costs due to this requirement.

1.10 OWNER'S INSTRUCTIONS

- .1 Before beginning Work, provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices for Moderate Risk asbestos abatement work (general), in use of glove bag procedures, and in use, cleaning, and disposal of respirators and protective clothing.
- .2 Instruction and training related to respirators includes, at minimum:
 - .1 Fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.
 - .4 Limitations of equipment.
- .3 Instruction and training must be provided by competent, qualified person.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Drop and Enclosure Sheets:
 - .1 Polyethylene: 0.15 mm thick.
 - .2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.
- .2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in concentration to provide thorough wetting of asbestos containing material, or an agent that is considered acceptable to the Departmental Representative.
- .3 Waste Containers: contain waste in two separate containers.
 - .1 Inner container: 0.15 mm thick sealable polyethylene bag or where glove bag method is used, glove bag itself.
 - .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 6 mm thick sealable polyethylene bag.
 - .3 Labelling requirements: affix preprinted cautionary asbestos warning, in both official languages, that is visible when ready for removal to disposal site.
- .4 Glove bag:
 - .1 Acceptable materials: safe-T-Strip products in configuration suitable for Work, or Alternative material approved by addendum during tendering period in accordance with Instructions to Tenderers.
 - .2 The glove bag to be equipped with:
 - .1 Sleeves and gloves that are permanently sealed to the body of the bag to allow the worker to access and deal with the mudded pipe insulation and maintain a sealed enclosure throughout the work period.
 - .2 Valves or openings to allow insertion of a vacuum hose and the nozzle of a water sprayer while maintaining the seal to the pipe, duct or similar structure.
 - .3 An attached tool pouch with a drain.

- .4 A seamless bottom and a means of sealing off the lower portion of the bag.
- .5 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.
- .6 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.
- .7 Encapsulant: a material that surrounds or embeds asbestos fibres in an adhesive to prevent fibre release.

PART 3 - EXECUTION

3.1 SUPERVISION

- .1 Minimum of one Supervisor for every ten workers is required.
- .2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos-containing materials.

3.2 PROCEDURES

- .1 Before beginning Work, at each access to Asbestos Work Area, install warning signs in both official languages in upper case 'Helvetica Medium' letters reading as follows, where number in parentheses indicates font size to be used:

'CAUTION ASBESTOS HAZARD AREA (25 mm) / NO UNAUTHORIZED ENTRY (19 mm) / WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) / BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)'.
- .2 Before beginning Work remove visible dust from surfaces in work area where dust is likely to be disturbed during course of work.
 - .1 Use HEPA vacuum or damp cloths where damp cleaning does not create hazard and is otherwise appropriate.
 - .2 Do not use compressed air to clean up or remove dust from any surface.
- .3 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.
 - .1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in work areas where dust or contamination cannot otherwise be safely contained.
- .4 Remove loose material by HEPA vacuum; thoroughly wet friable material containing asbestos to be removed or disturbed before and during Work unless wetting creates hazard or causes damage.
 - .1 Use garden reservoir type low - velocity sprayer or airless spray equipment capable of producing mist or fine spray.
 - .2 Perform Work in a manner to reduce dust creation to lowest levels practicable.
- .5 Pipe Insulation Removal Using Glove Bag:
 - .1 A glove bag not to be used to remove insulation from a pipe, duct or similar structure if:
 - .1 It may not be possible to maintain a proper seal for any reason including, without limitation:
 - .1 The condition of the insulation.
 - .2 The temperature of the pipe, duct or similar structure.
 - .2 The bag could become damaged for any reason including, without limitation.
 - .1 The type of jacketing.
 - .2 The temperature of the pipe, duct or similar structure.

- .2 Upon installation of the glove bag, inspect bag for any damage or defects. If any damage or defects are found, the glove bag is to be repaired or replaced. The glove bag to be inspected at regular intervals for damage and defects, and repaired or replaced as appropriate. The asbestos containing contents of the damaged or defective glove bag found during removal are to be wetted and the glove bag and its contents are to be removed and disposed of in an appropriate waste disposal container. Any damaged or defective glove bags are not to be reused.
 - .3 Place tools necessary to remove insulation in tool pouch. Wrap bag around pipe and seal. Seal bag to pipe with adhesive.
 - .4 Place hands in gloves and use necessary tools to remove insulation. Arrange insulation in bag to obtain full capacity of bag.
 - .5 Insert nozzle of garden reservoir type sprayer into bag through valve and wash down pipe and interior of bag thoroughly while wetting surface of insulation in lower section of bag.
 - .6 To remove bag after completion of stripping, wash top section and tools thoroughly. Remove air from top section through elasticized valve using a HEPA vacuum. Pull polyethylene waste container over glove bag before removing from pipe. Release one strap and remove freshly washed tools. Place tools in water. Remove second strap and zipper. Fold over into waste container and seal.
 - .7 After removal of bag ensure that pipe is free of residue. Remove residue using HEPA vacuum or wet cloths. Ensure that surfaces are free of sludge which after drying could release asbestos dust into atmosphere. Seal exposed surfaces of pipe and ends of insulation with slow drying sealer to seal in any residual fibres.
 - .8 Upon completion of Work shift, cover exposed ends of remaining pipe insulation with polyethylene taped in place.
- .6 Work is subject to visual inspection and air monitoring. Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.
- .7 Cleanup:
- .1 Frequently during Work and immediately after completion of work, clean up dust and asbestos containing waste using HEPA vacuum or by damp mopping.
 - .2 Place dust and asbestos containing waste in sealed dust tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.
 - .3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.
 - .4 Seal and remove double bagged waste from site. Dispose of in accordance with requirements of Provincial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.
 - .5 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.

3.3 AIR MONITORING

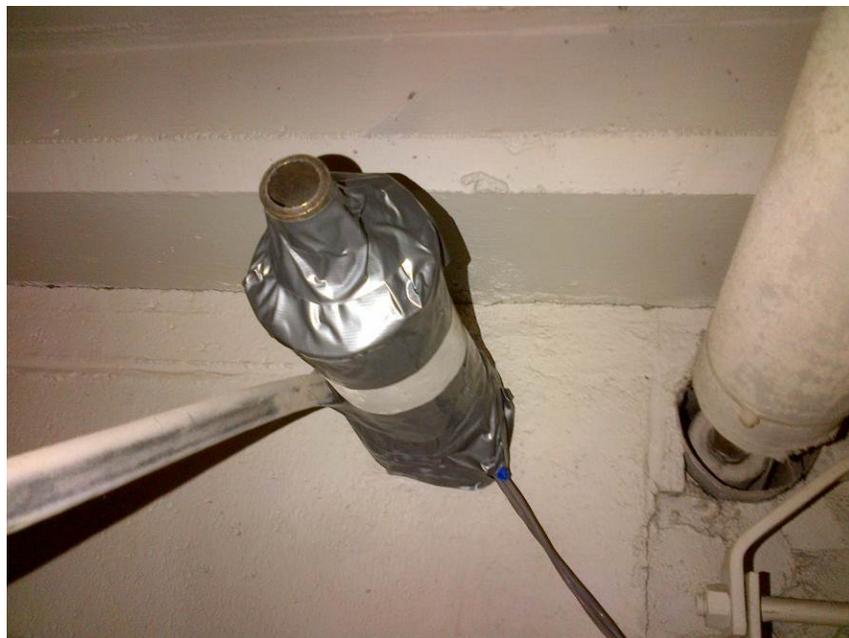
- .1 From beginning of Work until completion of cleaning operations, Departmental Representative to take air samples on daily basis outside and inside of Asbestos Work Area enclosures in accordance with WorkSafeBC Regulations.
- .2 If air monitoring shows that areas outside Asbestos Work Area enclosures are contaminated, enclose, maintain and clean these areas in same manner as that applicable to Asbestos Work Area at no cost to the Owner.

- .3 Ensure that respiratory safety factors are not exceeded based on fibre in air results.
- .4 During the course of Work, Departmental Representative or certified third party to measure fibre content of air outside and inside Work areas by means of air samples analyzed by Phase Contrast Microscopy (PCM).
 - .1 Stop Work when PCM measurements exceed 50% of the OEL (based on respiratory protection factor) inside work areas or when PCM measurements exceed 0.01 f/cc outside of work areas, and correct procedures.

END OF SECTION



Asbestos-containing wall plaster on exterior walls – West end of the 3rd floor.



Approximately one foot section of damaged asbestos-containing straight pipe insulation – Corridor outside the fan room on the 2nd floor.



Damaged asbestos-containing mechanical pipe insulation on approximately four fittings on an abandoned pipe – Boiler room



Damaged asbestos-containing mechanical pipe insulation on three fittings – Parkade



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EMSL Canada Order 551404023
Customer ID: 55JACQ30L
Customer PO: 115614212
Project ID:

Attn: Zack Kranjec Phone: (604) 696-8272
Stantec Consulting, Ltd. Fax:
1100- 111 Dunsmuir Street Collected:
Vancouver, BC V6B 6A3 Received: 6/12/2014
Analyzed: 6/12/2014
Proj: 115614212 TASK 200

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: PC-01A **Lab Sample ID:** 551404023-0001

Sample Description: BOILER ROOM (ABANDONED PIPE)/PARGING CEMENT APPLIED TO PIPE FITTINGS

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|----------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 6/12/2014 | Gray | 0% | 65% | 35% Chrysotile | |

Client Sample ID: PC-01B **Lab Sample ID:** 551404023-0002

Sample Description: PARKADE/PARGING CEMENT APPLIED TO PIPE FITTINGS

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|----------|------------------------------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 6/12/2014 | | | | | Stop Positive (Not Analyzed) |

Client Sample ID: PC-01C **Lab Sample ID:** 551404023-0003

Sample Description: HALLWAY OUTSIDE FAN ROOM 2ND FLOOR/PARGING CEMENT APPLIED TO PIPE FITTINGS

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|----------|------------------------------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 6/12/2014 | | | | | Stop Positive (Not Analyzed) |

Analyst(s)
Nicole Yeo PLM (1)

Kevin Pang
or other Approved Signatory

Any questions please contact Kevin Pang.

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 06/13/2014 08:49:13



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EMSL Canada Order 551404022
Customer ID: 55JACQ30L
Customer PO: 115614212
Project ID:

Attn: Zack Kranjec Phone: (604) 696-8272
Stantec Consulting, Ltd. Fax:
1100- 111 Dunsmuir Street Collected:
Vancouver, BC V6B 6A3 Received: 6/12/2014
Analyzed: 6/19/2014
Proj: 115614212

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: DM-01A **Lab Sample ID:** 551404022-0001

Sample Description: IN PARKADE/HVAC DUCT MASTIC - SILVER COLOUR (ON SQUARE DUCT)

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|---------------------|---------------|-------------|--------------|-------------|-----------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM Grav. Reduction | 6/19/2014 | Gray /Black | 0.0% | 98.0% | 2.0% Chrysotile | |

Client Sample ID: DM-01B **Lab Sample ID:** 551404022-0002

Sample Description: IN PARKADE/HVAC DUCT MASTIC - SILVER COLOUR (ON SQUARE DUCT)

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|---------------------|---------------|-------|--------------|-------------|------------------------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM Grav. Reduction | 6/19/2014 | | | | Positive Stop (Not Analyzed) | |

Client Sample ID: DM-01C **Lab Sample ID:** 551404022-0003

Sample Description: IN PARKADE/HVAC DUCT MASTIC - SILVER COLOUR (ON SQUARE DUCT)

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|---------------------|---------------|-------|--------------|-------------|------------------------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM Grav. Reduction | 6/19/2014 | | | | Positive Stop (Not Analyzed) | |

Client Sample ID: DM-02A **Lab Sample ID:** 551404022-0004

Sample Description: IN FAN ROOM ON THE 2ND FLOOR/HVAC DUCT MASTIC - BLACK COLOUR (INSIDE DUCTING)

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|---------------------|---------------|-------|--------------|-------------|-----------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM Grav. Reduction | 6/19/2014 | Black | 0.0% | 96.5% | 3.5% Chrysotile | |

Client Sample ID: DM-02B **Lab Sample ID:** 551404022-0005

Sample Description: IN FAN ROOM ON THE 2ND FLOOR/HVAC DUCT MASTIC - BLACK COLOUR (INSIDE DUCTING)

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|---------------------|---------------|-------|--------------|-------------|------------------------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM Grav. Reduction | 6/19/2014 | | | | Positive Stop (Not Analyzed) | |

Client Sample ID: DM-02C **Lab Sample ID:** 551404022-0006

Sample Description: IN FAN ROOM ON THE 2ND FLOOR/HVAC DUCT MASTIC - BLACK COLOUR (INSIDE DUCTING)

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|---------------------|---------------|-------|--------------|-------------|------------------------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM Grav. Reduction | 6/19/2014 | | | | Positive Stop (Not Analyzed) | |



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EMSL Canada Order 551404022
Customer ID: 55JACQ30L
Customer PO: 115614212
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Analyst(s)

Arabee Sathiasaelan PLM Grav. Reduction (2)

Kevin Pang
or other Approved Signatory

Any questions please contact Kevin Pang.

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 06/19/2014 14:24:08



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EMSL Canada Order 551403147
 Customer ID: 55JACQ30L
 Customer PO: 115614212
 Project ID:

Attn: Zack Kranjec Phone: (604) 696-8272
 Stantec Consulting, Ltd. Fax:
 1100- 111 Dunsmuir Street Collected:
 Vancouver, BC V6B 6A3 Received: 5/07/2014
 Analyzed: 5/08/2014
Proj: 115614212

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: SF-01A **Lab Sample ID:** 551403147-0001

Sample Description: 3RD FLOOR (WEST SIDE) FLOORING/SHEET FLOORING BEIGE COLOUR WITH SWRILS

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | Beige | 0% | 100% | None Detected | |

Client Sample ID: SF-01A-Mastic **Lab Sample ID:** 551403147-0001A

Sample Description: 3RD FLOOR (WEST SIDE) FLOORING/SHEET FLOORING BEIGE COLOUR WITH SWRILS

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | Brown | 0% | 100% | None Detected | |

Client Sample ID: SF-02A **Lab Sample ID:** 551403147-0002

Sample Description: 3RD FLOOR (WEST SIDE) FLOORING/SHEET FLOORING GREY COLOUR WITH GREY/WHITE SMEARS

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | Gray | 0% | 100% | None Detected | |

Client Sample ID: SF-02A-Mastic **Lab Sample ID:** 551403147-0002A

Sample Description: 3RD FLOOR (WEST SIDE) FLOORING/SHEET FLOORING GREY COLOUR WITH GREY/WHITE SMEARS

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | Brown | 0% | 100% | None Detected | |

Client Sample ID: SF-03A **Lab Sample ID:** 551403147-0003

Sample Description: 3RD FLOOR (WEST SIDE) FLOORING/SHEET FLOORING GREY COLOUR WITH SMALL SQUARES

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | Gray | 25% | 75% | None Detected | |

Client Sample ID: SF-03A-Mastic **Lab Sample ID:** 551403147-0003A

Sample Description: 3RD FLOOR (WEST SIDE) FLOORING/SHEET FLOORING GREY COLOUR WITH SMALL SQUARES

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-----------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | Brown/Tan | 0% | 100% | None Detected | |

Client Sample ID: SF-04A **Lab Sample ID:** 551403147-0004

Sample Description: 3RD FLOOR (WEST SIDE) EMERGENCY EXIT STAIRWELL/SHEET FLOORING BLACK COLOUR WITH WHITE STREAKS

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | Black | 0% | 100% | None Detected | |



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EMSL Canada Order 551403147
Customer ID: 55JACQ30L
Customer PO: 115614212
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

| | | | |
|----------------------------|---|-----------------------|--|
| Client Sample ID: | SF-04A-Mastic | Lab Sample ID: | 551403147-0004A |
| Sample Description: | 3RD FLOOR (WEST SIDE) EMERGENCY EXIT STAIRWELL/SHEET FLOORING BLACK COLOUR WITH WHITE STREAKS | | |
| TEST | Analyzed Date | Color | Non-Asbestos Fibrous Non-Fibrous Asbestos Comment |
| PLM | 5/08/2014 | Gray | 0% 100% None Detected |

| | | | |
|----------------------------|---|-----------------------|--|
| Client Sample ID: | SF-04B | Lab Sample ID: | 551403147-0005 |
| Sample Description: | 3RD FLOOR (WEST SIDE) EMERGENCY EXIT STAIRWELL/SHEET FLOORING BLACK COLOUR WITH WHITE STREAKS | | |
| TEST | Analyzed Date | Color | Non-Asbestos Fibrous Non-Fibrous Asbestos Comment |
| PLM | 5/08/2014 | Black/Blue | 0% 100% None Detected |

| | | | |
|----------------------------|---|-----------------------|--|
| Client Sample ID: | SF-04B-Mastic | Lab Sample ID: | 551403147-0005A |
| Sample Description: | 3RD FLOOR (WEST SIDE) EMERGENCY EXIT STAIRWELL/SHEET FLOORING BLACK COLOUR WITH WHITE STREAKS | | |
| TEST | Analyzed Date | Color | Non-Asbestos Fibrous Non-Fibrous Asbestos Comment |
| PLM | 5/08/2014 | Gray | 0% 100% None Detected |

| | | | |
|----------------------------|---|-----------------------|--|
| Client Sample ID: | FT-01A | Lab Sample ID: | 551403147-0006 |
| Sample Description: | 3RD FLOOR (WEST SIDE) STAIRWELL 3RD FL. LANDING/FLOOR TILE (12"X12" SIZE) BLACK COLOUR WITH WHITE STREAKS | | |
| TEST | Analyzed Date | Color | Non-Asbestos Fibrous Non-Fibrous Asbestos Comment |
| PLM | 5/08/2014 | White/Various/Blac | 0% 100% None Detected |

| | | | |
|----------------------------|---|-----------------------|--|
| Client Sample ID: | FL-01A | Lab Sample ID: | 551403147-0007 |
| Sample Description: | 3RD FLOOR (WEST SIDE) FLOORING/FLOOR LEVELING COMPOUND WHITE COLOUR | | |
| TEST | Analyzed Date | Color | Non-Asbestos Fibrous Non-Fibrous Asbestos Comment |
| PLM | 5/07/2014 | White | 0% 100% None Detected |

| | | | |
|----------------------------|---|-----------------------|--|
| Client Sample ID: | FL-01B | Lab Sample ID: | 551403147-0008 |
| Sample Description: | 3RD FLOOR (WEST SIDE) FLOORING/FLOOR LEVELING COMPOUND WHITE COLOUR | | |
| TEST | Analyzed Date | Color | Non-Asbestos Fibrous Non-Fibrous Asbestos Comment |
| PLM | 5/07/2014 | Gray/White | 0% 100% None Detected |

| | | | |
|----------------------------|---|-----------------------|--|
| Client Sample ID: | FL-01C | Lab Sample ID: | 551403147-0009 |
| Sample Description: | 3RD FLOOR (WEST SIDE) FLOORING/FLOOR LEVELING COMPOUND WHITE COLOUR | | |
| TEST | Analyzed Date | Color | Non-Asbestos Fibrous Non-Fibrous Asbestos Comment |
| PLM | 5/08/2014 | Gray/White | 0% 100% None Detected |

| | | | |
|----------------------------|--|-----------------------|--|
| Client Sample ID: | FL-02A | Lab Sample ID: | 551403147-0010 |
| Sample Description: | 3RD FLOOR (WEST SIDE) FLOORING/FLOOR LEVELING COMPOUND GREY COLOUR | | |
| TEST | Analyzed Date | Color | Non-Asbestos Fibrous Non-Fibrous Asbestos Comment |
| PLM | 5/07/2014 | Gray | 0% 100% None Detected |



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EMSL Canada Order 551403147
Customer ID: 55JACQ30L
Customer PO: 115614212
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: FL-02B **Lab Sample ID:** 551403147-0011

Sample Description: 3RD FLOOR (WEST SIDE) FLOORING/FLOOR LEVELING COMPOUND GREY COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | Gray | 0% | 100% | None Detected | |

Client Sample ID: FL-02C **Lab Sample ID:** 551403147-0012

Sample Description: 3RD FLOOR (WEST SIDE) FLOORING/FLOOR LEVELING COMPOUND GREY COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | Gray | 0% | 100% | None Detected | |

Client Sample ID: MAS-01A **Lab Sample ID:** 551403147-0013

Sample Description: 3RD FLOOR (WEST SIDE) FLOORING (ON TOP OF SF-01)/RESIDUAL FLOORING MASTIC BLACK COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | Black | 0% | 100% | None Detected | |

Client Sample ID: MAS-01B **Lab Sample ID:** 551403147-0014

Sample Description: 3RD FLOOR (WEST SIDE) FLOORING (ON TOP OF SF-01)/RESIDUAL FLOORING MASTIC BLACK COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | Black | 0% | 100% | None Detected | |

Client Sample ID: MAS-01C **Lab Sample ID:** 551403147-0015

Sample Description: 3RD FLOOR (WEST SIDE) FLOORING (ON TOP OF SF-01)/RESIDUAL FLOORING MASTIC BLACK COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | Black | 0% | 100% | None Detected | |

Client Sample ID: CB-01A **Lab Sample ID:** 551403147-0016

Sample Description: 3RD FLOOR (WEST SIDE) WALL BASE/COVE BASE MASTIC LIGHT BROWN COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|--------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | Yellow | 0% | 100% | None Detected | |

Client Sample ID: CB-01B **Lab Sample ID:** 551403147-0017

Sample Description: 3RD FLOOR (WEST SIDE) WALL BASE/COVE BASE MASTIC LIGHT BROWN COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|--------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | Yellow | 0% | 100% | None Detected | |

Client Sample ID: CB-01C **Lab Sample ID:** 551403147-0018

Sample Description: 3RD FLOOR (WEST SIDE) WALL BASE/COVE BASE MASTIC LIGHT BROWN COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | Tan | 0% | 100% | None Detected | |



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EMSL Canada Order 551403147
Customer ID: 55JACQ30L
Customer PO: 115614212
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: CB-02A **Lab Sample ID:** 551403147-0019
Sample Description: 3RD FLOOR (WEST SIDE) WALL BASE/COVE BASE MASTIC DARK BROWN COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | Brown | 0% | 100% | None Detected | |

Client Sample ID: CB-02B **Lab Sample ID:** 551403147-0020
Sample Description: 3RD FLOOR (WEST SIDE) WALL BASE/COVE BASE MASTIC DARK BROWN COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | Brown | 0% | 100% | None Detected | |

Client Sample ID: CB-02C **Lab Sample ID:** 551403147-0021
Sample Description: 3RD FLOOR (WEST SIDE) WALL BASE/COVE BASE MASTIC DARK BROWN COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | Brown | 0% | 100% | None Detected | |

Client Sample ID: DJC-01A **Lab Sample ID:** 551403147-0022
Sample Description: 3RD FLOOR (WEST SIDE) COLUMN (AT NORTH PERIMETER)/DRYWALL JOINT COMPOUND

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | White | 0% | 100% | None Detected | |

Client Sample ID: DJC-01B **Lab Sample ID:** 551403147-0023
Sample Description: 3RD FLOOR (WEST SIDE) COLUMN (AT NORTH PERIMETER)/DRYWALL JOINT COMPOUND

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | White | 0% | 100% | None Detected | |

Client Sample ID: DJC-01C **Lab Sample ID:** 551403147-0024
Sample Description: 3RD FLOOR (WEST SIDE) EAST PERIMETER WALL/DRYWALL JOINT COMPOUND

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | White | 0% | 100% | None Detected | |

Client Sample ID: DJC-01D **Lab Sample ID:** 551403147-0025
Sample Description: 3RD FLOOR (WEST SIDE) EAST PERIMETER WALL/DRYWALL JOINT COMPOUND

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | White | 0% | 100% | None Detected | |

Client Sample ID: DJC-01E **Lab Sample ID:** 551403147-0026
Sample Description: 3RD FLOOR (WEST SIDE) STORAGE CLOSET/DRYWALL JOINT COMPOUND

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | White | 0% | 100% | None Detected | |



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EMSL Canada Order 551403147
Customer ID: 55JACQ30L
Customer PO: 115614212
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: DJC-01F **Lab Sample ID:** 551403147-0027

Sample Description: 3RD FLOOR (WEST SIDE) COLUMN (AT EAST PARTITION)/DRYWALL JOINT COMPOUND

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | White | 0% | 100% | None Detected | |

Client Sample ID: DJC-01G **Lab Sample ID:** 551403147-0028

Sample Description: 3RD FLOOR (WEST SIDE) EAST PERIMETER WALL/DRYWALL JOINT COMPOUND

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | White | 0% | 100% | None Detected | |

Client Sample ID: OS-01A **Lab Sample ID:** 551403147-0029

Sample Description: 3RD FLOOR (WEST SIDE) UPPER PORTION OF WALL/CEMENTICIOUS OVER-SPRAY GREY COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | Gray | 0% | 100% | None Detected | |

Client Sample ID: OS-01B **Lab Sample ID:** 551403147-0030

Sample Description: 3RD FLOOR (WEST SIDE) UPPER PORTION OF WALL/CEMENTICIOUS OVER-SPRAY GREY COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | Gray | 0% | 100% | None Detected | |

Client Sample ID: OS-01C **Lab Sample ID:** 551403147-0031

Sample Description: 3RD FLOOR (WEST SIDE) UPPER PORTION OF WALL/CEMENTICIOUS OVER-SPRAY GREY COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | Gray | 0% | 100% | None Detected | |

Client Sample ID: PM-01A **Lab Sample ID:** 551403147-0032

Sample Description: 3RD FLOOR (WEST SIDE) MECHANICAL PIPE/PIPE INSULATION MASTIC BLACK COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | Black | 0% | 100% | None Detected | |

Client Sample ID: PM-01B **Lab Sample ID:** 551403147-0033

Sample Description: 3RD FLOOR (WEST SIDE) MECHANICAL PIPE/PIPE INSULATION MASTIC BLACK COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | Black | 0% | 100% | None Detected | |

Client Sample ID: PM-01C **Lab Sample ID:** 551403147-0034

Sample Description: 3RD FLOOR (WEST SIDE) MECHANICAL PIPE/PIPE INSULATION MASTIC BLACK COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|--------------------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | arious/Black/Silve | 13% | 87% | None Detected | |



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EMSL Canada Order 551403147
Customer ID: 55JACQ30L
Customer PO: 115614212
Project ID:

Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

Client Sample ID: DM-01A **Lab Sample ID:** 551403147-0035

Sample Description: 3RD FLOOR (WEST SIDE) MECHANICAL DUCT WORK/DUCT MASTIC LIGHT GREY COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | Gray | 0% | 100% | None Detected | |

Client Sample ID: DM-01B **Lab Sample ID:** 551403147-0036

Sample Description: 3RD FLOOR (WEST SIDE) MECHANICAL DUCT WORK/DUCT MASTIC LIGHT GREY COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/07/2014 | Gray | 0% | 100% | None Detected | |

Client Sample ID: DM-01C **Lab Sample ID:** 551403147-0037

Sample Description: 3RD FLOOR (WEST SIDE) MECHANICAL DUCT WORK/DUCT MASTIC LIGHT GREY COLOUR

| TEST | Analyzed Date | Color | Non-Asbestos | | Asbestos | Comment |
|------|---------------|-------|--------------|-------------|---------------|---------|
| | | | Fibrous | Non-Fibrous | | |
| PLM | 5/08/2014 | Gray | 0% | 100% | None Detected | |

Analyst(s)

| | | |
|---------------------|-----|------|
| Arabee Sathiaseelan | PLM | (22) |
| Nicole Yeo | PLM | (20) |

Kevin Pang
or other Approved Signatory

Any questions please contact Kevin Pang.

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.
Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 05/08/2014 10:37:14

Area-Specific Asbestos-Containing Materials Assessment

3rd Floor (West) 125 East 10th Avenue, Vancouver, BC

Draft Report

Appendix B: Summary Table – Suspected ACM Bulk Samples

| Sample Number | Material Description | Sample Location | Result (% Asbestos) |
|----------------------|--|--|----------------------------|
| SF-01A | Sheet flooring Beige colour with swirls | 3 rd floor (west side) Flooring | None Detected |
| SF-01A Mastic | Sheet flooring mastic | 3 rd floor (west side) Flooring | None Detected |
| SF-02A | Sheet flooring Grey colour with grey/white smears | 3 rd floor (west side) Flooring | None Detected |
| SF-02A Mastic | Sheet flooring mastic | 3 rd floor (west side) Flooring | None Detected |
| SF-03A | Sheet flooring Grey colour with small squares | 3 rd floor (west side) Flooring | None Detected |
| SF-03A Mastic | Sheet flooring mastic | 3 rd floor (west side) Flooring | None Detected |
| SF-04A | Sheet flooring Black colour with white streaks | 3 rd floor (west side) Emergency exit stairwell Flooring - Stairs | None Detected |
| SF-04A Mastic | Sheet flooring mastic | 3 rd floor (west side) Emergency exit stairwell Flooring - Stairs | None Detected |
| SF-04B | Sheet flooring Black colour with white streaks | 3 rd floor (west side) Emergency exit stairwell Flooring – 3 rd floor landing | None Detected |
| SF-04B Mastic | Sheet flooring mastic | 3 rd floor (west side) Emergency exit stairwell Flooring – 3 rd floor landing | None Detected |
| FT-01A | Floor tile (12" x 12" size) Black colour with white streaks | 3 rd floor (west side) Stairwell 3 rd floor landing Flooring – 3 rd floor landing | None Detected |
| FL-01A | Floor levelling compound White colour | 3 rd floor (west side) Flooring | None Detected |
| FL-01B | Floor levelling compound White colour | 3 rd floor (west side) Flooring | None Detected |
| FL-01C | Floor levelling compound White colour | 3 rd floor (west side) Flooring | None Detected |
| FL-02A | Floor levelling compound Grey colour | 3 rd floor (west side) Flooring | None Detected |
| FL-02B | Floor levelling compound Grey colour | 3 rd floor (west side) Flooring | None Detected |

Area-Specific Asbestos-Containing Materials Assessment3rd Floor (West) 125 East 10th Avenue, Vancouver, BC

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Appendix B: Summary Table – Suspected ACM Bulk Samples

| Sample Number | Material Description | Sample Location | Result (% Asbestos) |
|---------------|--|---|---------------------|
| FL-02C | Floor levelling compound Grey colour | 3 rd floor (west side) Flooring | None Detected |
| MAS-01A | Residual flooring mastic Black colour | 3 rd floor (west side) Flooring (on top of SF-01) | None Detected |
| MAS-01B | Residual flooring mastic Black colour | 3 rd floor (west side) Flooring (on top of SF-01) | None Detected |
| MAS-01C | Residual flooring mastic Black colour | 3 rd floor (west side) Flooring (on top of SF-01) | None Detected |
| CB-01A | Cove base mastic Light brown colour | 3 rd floor (west side) Wall base | None Detected |
| CB-01B | Cove base mastic Light brown colour | 3 rd floor (west side) Wall base | None Detected |
| CB-01C | Cove base mastic Light brown colour | 3 rd floor (west side) Wall base | None Detected |
| CB-02A | Cove base mastic Dark brown colour | 3 rd floor (west side) Wall base | None Detected |
| CB-02B | Cove base mastic Dark brown colour | 3 rd floor (west side) Wall base | None Detected |
| CB-02C | Cove base mastic Dark brown colour | 3 rd floor (west side) Wall base | None Detected |
| DJC-01A | Drywall joint compound | 3 rd floor (west side) Column (at north perimeter wall) | None Detected |
| DJC-01B | Drywall joint compound | 3 rd floor (west side) Column (at north perimeter wall) | None Detected |
| DJC-01C | Drywall joint compound | 3 rd floor (west side) East perimeter wall | None Detected |
| DJC-01D | Drywall joint compound | 3 rd floor (west side) East perimeter wall | None Detected |
| DJC-01E | Drywall joint compound | 3 rd floor (west side) Storage closet | None Detected |
| DJC-01F | Drywall joint compound | 3 rd floor (west side) Column (at east partition wall) | None Detected |
| DJC-01G | Drywall joint compound | 3 rd floor (west side) East perimeter wall | None Detected |
| OS-01A | Cementitious over-spray Grey colour | 3 rd floor (west side) Upper portion of wall (above suspended ceiling) | None Detected |

Area-Specific Asbestos-Containing Materials Assessment3rd Floor (West) 125 East 10th Avenue, Vancouver, BC

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Appendix B: Summary Table – Suspected ACM Bulk Samples

| Sample Number | Material Description | Sample Location | Result (% Asbestos) |
|----------------------|--|---|--------------------------------|
| OS-01B | Cementitious over-spray Grey colour | 3 rd floor (west side) Upper portion of wall (above suspended ceiling) | None Detected |
| OS-01C | Cementitious over-spray Grey colour | 3 rd floor (west side) Upper portion of wall (above suspended ceiling) | None Detected |
| PM-01A | Pipe insulation mastic Black colour | 3 rd floor (west side) Mechanical pipe | None Detected |
| PM-01B | Pipe insulation mastic Black colour | 3 rd floor (west side) Mechanical pipe | None Detected |
| PM-01C | Pipe insulation mastic Black colour | 3 rd floor (west side) Mechanical pipe | None Detected |
| DM-01A | Duct mastic Light grey colour | 3 rd floor (west side) Mechanical ductwork | None Detected |
| DM-01B | Duct mastic Light grey colour | 3 rd floor (west side) Mechanical ductwork | None Detected |
| DM-01C | Duct mastic Light grey colour | 3 rd floor (west side) Mechanical ductwork | None Detected |

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Shop Drawings, Data Products and Samples
- .2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .3 Section 07 62 00 – Sheet Metal Flashing and Trim

1.2 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM C726-05, Standard Specification for Mineral Fiber Roof Insulation Board.
 - .2 ASTM C728-05, Standard Specification for Perlite Thermal Insulation Board.
 - .3 ASTM C1177/C1177M-06, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .4 ASTM C1396/C1396M-06a, Standard Specification for Gypsum Board.
 - .5 ASTM D41-05, Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing. ASTM D312-00(2006), Standard Specification for Asphalt Used in Roofing.
 - .6 ASTM D2178-04, Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
 - .7 ASTM D6162-00a, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fibre Reinforcements.
 - .8 ASTM D6163-00e1, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fibre Reinforcements.
 - .9 ASTM D6164-05, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 37-GP-9Ma-83, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.
 - .2 CGSB 37-GP-56M-80b(A1985), Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.
 - .3 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction. Canada.
- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 CRCA Roofing Specifications Manual-1997.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA A123.21-04, Standard Test Method for the Dynamic Wind Uplift Resistance of Mechanically Attached Membrane-Roofing Systems
 - .2 CSA-A123.3-05, Asphalt Saturated Organic Roofing Felt.
 - .3 CSA-A123.4-04, Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems.
 - .4 CSA O121-08, Douglas Fir Plywood.
 - .5 CSA O151-04, Canadian Softwood Plywood.

- .5 Factory Mutual (FM Global)
 - .1 FM Approvals - Roofing Products.
- .6 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .7 Underwriters Laboratories' of Canada (ULC)CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .1 CAN/ULC-S702.2-03, Standard for Mineral Fibre Thermal Insulation for Buildings.
 - .2 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .3 CAN/ULC-S706-02, Standard for Wood Fibre Thermal Insulation for Buildings.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Convene pre-installation meeting one week prior to beginning waterproofing Work, with roofing contractor's representative and Departmental Representative in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM)] to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Shop Drawings, Data Products and Samples.
- .2 Product Data:
 - .1 Provide two copies of most recent technical roofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide two copies of WHMIS MSDS in accordance with Section 01 35 33 - Health and Safety Requirements, Section 01 35 43 - Environmental Procedures, and indicate VOC content for:
 - .1 Primers.
 - .2 Asphalt.
 - .3 Sealers.
 - .4 Filter fabric.
- .3 Provide shop drawings:
 - .1 Indicate flashing, control joints, tapered insulation details.
 - .2 Provide layout for tapered insulation.
- .4 Manufacturer's Certificate: certify that products meet or exceed specified requirements.
- .5 Test and Evaluation Reports: submit laboratory test reports certifying compliance of bitumens and membrane with specification requirements.
- .6 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane. SPEC NOTE: Use the following two paragraphs when a manufacturer's warranted roof system is specified.

- .7 Manufacturer's field report: in accordance with Section 01 45 00 - Quality Control.
- .8 Reports: indicate procedures followed, ambient temperatures and wind velocity during application.

1.5 QUALITY ASSURANCE

- .1 Installer qualifications: company or person specializing in application of modified bituminous roofing systems with 5 years documented experience approved by manufacturer.
- .2 Sustainability Standards Certification:
 - .1 Recycled Content: provide listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
 - .2 Regional Materials: provide evidence that project incorporates required percentage 10% of regional materials/products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.6 FIRE PROTECTION

- .1 Fire Extinguishers:
 - .1 Maintain one or stored pressure rechargeable type with hose and shut-off nozzle,
 - .2 ULC labelled for A, B and C class protection.
 - .3 Size 2.25 kg or as indicated on roof per torch applicator, within 6 m of torch applicator.
- .2 Maintain fire watch for 1 hour after each day's roofing operations cease.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
- .2 Storage and Handling Requirements:
 - .1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.
 - .2 Provide and maintain dry, off-ground weatherproof storage.
 - .3 Store rolls of felt and membrane in upright position. Store membrane rolls with salvage edge up.
 - .4 Remove only in quantities required for same day use.
 - .5 Place plywood runways over completed Work to enable movement of material and other traffic.
 - .6 Store sealants at +5 degrees C minimum.
 - .7 Store insulation protected from daylight and weather and deleterious materials.
- .3 Packaging Waste Management: remove for reuse of pallets crates padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
 - .2 Fold up metal banding, flatten and place in designated area for recycling.

1.8 SITE CONDITIONS

- .1 Ambient Conditions
 - .1 Do not install roofing when temperature remains below -18 degrees C for torch application, or -5 degrees C to manufacturers' recommendations for mop application.
 - .2 Minimum temperature for solvent-based adhesive is -5 degrees C.
- .2 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.9 WARRANTY

- .1 For Work of this Section 07 52 00 - Modified Bituminous Membrane Roofing, 12 months warranty period.
- .2 Provide Membrane Manufacturer's 10-year material warranty.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

- .1 Compatibility between components of roofing system is essential. Provide written declaration to Departmental Representative stating that materials and components, as assembled in system, meet this requirement.
- .2 Roofing System: to CSA A123.21 for wind uplift resistance.

2.2 DECK COVERING

- .1 Glass Mat, Gypsum Board: to ASTM C1177 13mm thick.

2.3 DECK PRIMER

- .1 Asphalt primer: to CGSB 37-GP-9Ma ASTM D41.

2.4 VAPOUR RETARDER

- .1 Self adhesive air/vapour barrier modified bitumen membrane compatible with the roofing membrane.

2.5 MEMBRANE

- .1 Base sheet: to CGSB 37-GP-56M glass fibres to ASTM D6163.
 - .1 Styrene-Butadiene-Styrene (SBS) elastomeric polymer prefabricated sheet, glass reinforcement, having nominal weight of 180 g/m².
 - .2 Type 1 fully adhered.
 - .3 Class C - plain surfaced.
 - .4 Grade 1 - standard service.
 - .5 Top and bottom surfaces:
 - .1 sanded/polyethylene.
 - .6 Base sheet membrane properties: to CGSB 37-GP-56M.
 - .1 Strain energy (longitudinal/transversal): 8.1/8.8 kN/m.
 - .2 Breaking strength (longitudinal/transversal): 17.0/18.0 N/5 cm.
 - .3 Ultimate elongation (longitudinal/transversal): 60/70%.
 - .4 Tear resistance: 85 N.
 - .5 Cold bending at -30 degrees C : no cracking.

- .6 Softening point: 110 degrees C.
- .7 Static puncture resistance: > 400.
- .8 Dimensional Stability: -0.3 / 0.3 %.
- .7 ULC certification: Class A.
- .2 Cap sheet membrane: to CGSB 37-GP-56M glass fibres to ASTM D6163.
 - .1 Styrene-Butadiene-Styrene(SBS) elastomeric polymer, prefabricated sheet, glass reinforcement, having nominal weight of 180 g/m².
 - .2 Type 1, fully adhered.
 - .3 Class A-granule surfaced.
 - .1 Colour for granular surface: black.
 - .4 Grade 1-standard service.
 - .5 Bottom surface sanded.
 - .6 Cap sheet membrane properties: to CGSB 37-GP-56M.
 - .1 Strain energy (longitudinal/transversal): 11.0/11.4 kN/m.
 - .2 Breaking strength (longitudinal/transversal): 25.0/16.0 kN/m.
 - .3 Ultimate elongation (longitudinal/transversal): 63/73 %.
 - .4 Tear resistance: 80 N.
 - .5 Cold bending at -30 degrees C: No cracking.
 - .6 Softening point: \geq 110 degrees C.
 - .7 Static puncture resistance: > 400.
 - .8 Dimensional Stability: -0.2 / 0.2 %.
 - .7 ULC certification: Class A.

2.6 ADHESIVE

- .1 Adhesive for securing overlay board and insulation: asphalt extended vulcanized adhesive, two component unit, consisting of two liquids mixed on site to produce pourable adhesive.

2.7 OVERLAY BOARD

- .1 Overlay Board: 6 mm thick asphalt based recovery board with non-woven glass facers, as recommended by the membrane manufacturer.
 - .1 Install over insulation to provide torch safe surface.

2.8 POLYSTYRENE INSULATION

- .1 Expanded polystyrene (EPS) insulation to CAN/ULC-S701, Type 2, thickness as indicated, square edges.

2.9 SEALERS

- .1 Sealants: Caulking - see Section 07 92 00 - Joint Sealants.

2.10 CARPENTRY

- .1 Refer to Section 06 10 00.01 - Rough Carpentry.

2.11 CANT STRIPS

- .1 Cut from material, to measure 140 mm on slope.

2.12 FASTENERS

- .1 Insulation to deck: coated insulation fasteners and galvanized plates must meet FM Approval for wind uplift and corrosion resistance, as recommended by insulation manufacturer.

PART 3 - EXECUTION

3.1 QUALITY OF WORK

- .1 Do examination, preparation and roofing Work in accordance with Roofing Manufacturer's Specification Manual and CRCA Roofing Specification Manual Provincial Roofing Association Manual.
- .2 Do priming in accordance with manufacturers written recommendations.
- .3 The interface of the upstand curb walls and roof assemblies will be fitted with durable rigid material plywood providing connection point for continuity of air barrier.
- .4 Assembly, component and material connections will be made in consideration of appropriate design loads, with reversible mechanical attachments.

3.2 EXAMINATION OF ROOF DECKS

- .1 Verification of Conditions:
 - .1 Inspect with Departmental Representative deck conditions including parapets, construction joints, roof drains, plumbing vents and ventilation outlets to determine readiness to proceed.
- .2 Evaluation and Assessment:
 - .1 Prior to beginning of work ensure:
 - .1 Decks are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris. Do not use calcium or salt for ice or snow removal.
 - .2 Curbs have been built.
- .3 Do not install roofing materials during rain or snowfall.

3.3 PROTECTION OF IN-PLACE CONDITIONS

- .1 Cover walls, walks, sloped roofs and adjacent work where materials hoisted or used.
- .2 Use warning signs and barriers. Maintain in good order until completion of Work.
- .3 Clean off drips and smears of bituminous material immediately.
- .4 Dispose of rain water off roof and away from face of building until roof drains or hoppers installed and connected.
- .5 Protect roof from traffic and damage. Comply with precautions deemed necessary by Departmental Representative.
- .6 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.
- .7 Metal connectors and decking will be treated with rust proofing or galvanization.

3.4 PRIMING DECK

- .1 Apply deck primer to concrete roofing substrate at the rate recommended by manufacturer.

3.5 VAPOUR RETARDER (CONCRETE/GYPSUM BOARD/PLYWOOD DECK)

- .1 Embed two-ply of felts glass in hot bitumen spread at rate of 1.2 kg/m⁵ for glass asphalt.
- .2 Modified bituminous vapour retarder sheet.

3.6 (EXPOSED) CONVENTIONAL MEMBRANE ROOFING (CMR) APPLICATION

- .1 Tapered insulation application:
 - .1 Mop insulation to vapour retarder and top layer of insulation to bottom layer with hot asphalt at rate of 1 kg/m⁵.
 - .2 Install tapered insulation as first second insulation layer, in accordance with shop drawings. Stagger joints between layers 150 mm minimum.
- .2 Overlay Board: adhesive application:
 - .1 Adhere overlay board to insulation with vulcanized adhesive at the rate of one litre per m².
 - .2 Place boards in parallel rows with end joints staggered. Cap joints approximately 25 mm.
 - .3 Cut ends to suit and apply adhesive in continuous ribbons at 300 mm on centre.
- .3 Base sheet application:
 - .1 Starting at low point of roof, perpendicular to slope, unroll base sheet, align and reroll from both ends.
 - .2 Unroll and embed base sheet in uniform coating of asphalt applied at rate of 1.2 kg/m⁵, at 230 degrees C.
 - .3 Unroll and torch base sheet onto substrate taking care not to burn membrane or its reinforcement or substrate.
 - .4 Lap sheets 75 mm minimum for side and 150 mm minimum for end laps.
 - .5 Application to be free of blisters, wrinkles and fishmouths.
- .4 Cap sheet application:
 - .1 Starting at low point on roof, perpendicular to slope, unroll cap sheet, align and reroll from both ends.
 - .2 Unroll and embed cap sheet in uniform coating of asphalt applied at rate of 1.2 kg/m⁵, EVT at point of contact.
 - .3 Unroll and torch cap sheet onto base sheet taking care not to burn membrane or its reinforcement.
 - .4 Lap sheets 75 mm minimum for side laps and 150 mm minimum for end laps. Offset joints in cap sheet 300 mm minimum from those in base sheet.
 - .5 Application to be free of blisters, fishmouths and wrinkles.
 - .6 Do membrane application in accordance with manufacturer's recommendations.
- .5 Flashings:
 - .1 Complete installation of flashing base sheet stripping prior to installing membrane cap sheet.
 - .2 Mop torch base and cap sheet onto substrate in 1 metre wide strips.

- .3 Lap flashing base sheet to membrane base sheet minimum 150 mm and seal by mopping or torch welding.
 - .4 Lap flashing cap sheet to membrane cap sheet 250 mm minimum and torch weld.
 - .5 Provide 75 mm minimum side lap and seal.
 - .6 Properly secure flashings to their support, without sags, blisters, fishmouths or wrinkles.
 - .7 Do work in accordance with manufacturer's recommendations Section 07 62 00 - Sheet Metal Flashing and Trim.
- .6 Roof penetrations:
- .1 Install roof penetrations and flashings and seal to membrane in accordance with manufacturer's recommendations and details.

3.7 CANTS

- .1 Install mineral wool fibre cants over rigid insulation.
- .2 Apply hot bitumen to receiving surface and embed cant firmly by hand.
- .3 Angle cut cants to fit tightly on back and bottom where roof to wall angle varies from 90 degrees.

3.8 FIELD QUALITY CONTROL

- .1 Inspections:
 - .1 Inspection and testing of roofing application will be carried out by testing laboratory designated by Departmental Representative.
 - .2 Costs of tests will be paid by Owner.

3.9 CLEANING

- .1 Remove bituminous markings from finished surfaces.
- .2 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their documented instructions.
- .3 Repair or replace defaced or disfigured finishes caused by work of this section.
- .4 Waste Management: separate waste materials for and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
 - .1 Place materials defined as hazardous or toxic in designated containers.
 - .2 Clearly label location of salvaged material's storage areas and provide barriers and security devices.
 - .3 Ensure emptied containers are sealed and stored safely.

- .4 Divert unused aggregate materials from landfill to local facility for reuse as reviewed by Departmental Representative.
- .5 Unused paint coating material must be disposed of at official hazardous material collections site as reviewed by Departmental Representative.
- .6 Unused adhesive, sealant and asphalt materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .7 Dispose of unused adhesive material at official hazardous material collections site approved by Departmental Representative.
- .8 Dispose of unused sealant material at official hazardous material collections site approved by Departmental Representative.
- .9 Dispose of unused asphalt material at official hazardous material collections site approved by Departmental Representative.
- .10 Divert unused gypsum materials from landfill to recycling facility as reviewed by Departmental Representative.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Shop Drawings, Product Data and Samples
- .2 Section 01 74 19 – Construction/Demolition Waste Management and Disposal
- .3 Section 07 52 00 – Modified Bituminous Membrane Roofing

1.2 REFERENCES

- .1 The Aluminum Association Inc. (AAI)
 - .1 AAI-Aluminum Sheet Metal Work in Building Construction-2002.
 - .2 AAI DAF45-03, Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A167-99(2004), Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM A240/A240M-07e1, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - .3 ASTM A606-04, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
 - .4 ASTM A653/A653M-07, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .5 ASTM A792/A792M-06a, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .6 ASTM B32-04, Standard Specification for Solder Metal.
 - .7 ASTM B370-03, Standard Specification for Copper Sheet and Strip for Building Construction.
 - .8 ASTM D523-89(1999), Standard Test Method for Specular Gloss.
 - .9 ASTM D822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual 1997.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
 - .2 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA A123.3-05, Asphalt Saturated Organic Roofing Felt.
 - .2 AAMA/WDMA/CSA 101/I.S.2/A440-2008, Standard/Specification for Windows, Doors, and Unit Skylights.
 - .3 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

- .6 Green Seal Environmental Standards
 - .1 Standard GS-03-93, Anti-Corrosive Paints.
 - .2 Standard GS-11-97, Architectural Paints.
 - .3 Standard GS-36-00, Commercial Adhesives.
- .7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .8 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule #1113-04, Architectural Coatings.
 - .2 SCAQMD Rule #1168-05, Adhesives and Sealants.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Shop Drawings, Product Data and Samples.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 33 - Health and Safety Requirements 01 35 43 - Environmental Procedures.
- .3 Shop Drawings:
 - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of BC, Canada.
- .4 Samples:
 - .1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes and colours.
- .5 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.
 - .2 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3, FIELD QUALITY CONTROL.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with contractor's representative and Departmental Representative in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM):
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Materials and Resources Credit MRc2.1 Construction Waste Management: Divert 50% From Landfill and MRc2.2 Construction Waste Management: Divert 75% From Landfill: prepare Construction Waste Management plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- .1 Zinc coated steel sheet: .55 mm thickness, commercial quality to ASTM A653/A653M, with Z275 designation zinc coating.
- .2 Aluminum-zinc alloy coated steel sheet: to ASTM A792/A792M, commercial quality, grade 33 with AZ 150 coating, regular spangle surface, not chemically treated for paint finish, .64mm base metal thickness.

2.2 PREFINISHED STEEL SHEET

- .1 Prefinished steel with factory applied polyvinyl chloride.
 - .1 Class F1S.
 - .2 Colour selected by Departmental Representative from manufacturer's standard range.
 - .3 Specular gloss: 30 units +/- 5 in accordance with ASTM D523.
 - .4 Coating thickness: not less than 200 micrometres.
 - .5 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20 % to ASTM D822 as follows:
 - .1 Outdoor exposure period 5000 hours.
 - .2 Humidity resistance exposure period 5000 hours.

2.3 PREFINISHED ALUMINUM SHEET

- .1 Finish: factory applied coating to CAN/CGSB-93.1 supplemented and amended as follows: Type 1
 - .1 Class F1S.
 - .2 Colour selected by Departmental Representative from manufacturer's standard range.
 - .3 Specular gloss: 30 units +/-5.
 - .4 Coating thickness: not less than 22 micrometres.
- .2 Thickness specified for prefinished aluminum sheet applies to base metal.

2.4 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CAN/CGSB 37.5.
 - .1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.
- .3 Underlay for metal flashing: dry sheathing to CAN/CGSB-51.32 asphalt laminated 3.6 to 4.5 kg kraft paper No. 15 perforated asphalt felt to CSA A123.3.
- .4 Sealants: in accordance with Section 07 92 00 – Joint Sealants.
 - .1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168.
- .5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.
- .6 Fasteners: of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.
- .7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .8 Solder: to ASTM B32.
- .9 Flux: rosin, cut hydrochloric acid, or commercial preparation suitable for materials to be soldered.
- .10 Touch-up paint: as recommended by prefinished material manufacturer.

2.5 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details.
- .2 Fabricate aluminum flashings and other sheet aluminum work in accordance with AAI-Aluminum Sheet Metal Work in Building Construction.
- .3 Form pieces in 2400 mm maximum lengths.
 - .1 Make allowance for expansion at joints.
- .4 Hem exposed edges on underside 12 mm.
 - .1 Mitre and seal corners with sealant.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.6 METAL FLASHINGS

- .1 Form flashings, copings and fascias to profiles indicated of .81mm thick galvanized prefinished steel.

2.7 PANS

- .1 Form pans to receive roofing plastic from 1.27 mm thick galvanized, prefinished steel sheet metal with minimum 75 mm upstand above finished roof and 100 mm continuous flanges with no open corners. Solder joints.
 - .1 Make pans minimum 50 mm wider than member passing through roof membrane.

2.8 REGLETS AND CAP FLASHINGS

- .1 Form surface mounted reglets metal cap flashing of .81 mm thick sheet metal in accordance with CRCA FL series details.
 - .1 Provide slotted fixing holes and steel/plastic washer fasteners.
 - .2 Cover face and ends with plastic tape.

PART 3- EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Install sheet metal work in accordance with CRCA FL series details. AAI-Aluminum Sheet Metal Work in Building Construction as detailed.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal.
 - .1 Secure in place and lap joints 100 mm.
- .4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs.
 - .1 Flash joints using standing seams forming tight fit over hook strips, as detailed.
- .5 Lock end joints and caulk with sealant.
- .6 Install surface mounted reglets true and level, and caulk top of reglet with sealant.
- .7 Insert metal flashing into under cap flashing to form weather tight junction.
- .8 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.
- .9 Caulk flashing at cap flashing with sealant.
- .10 Install pans, where shown around items projecting through roof membrane.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 11 55 – General Instructions.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Shop Drawings, Data Products and Samples
- .2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .3 Section 06 10 00 – Rough Carpentry
- .4 Section 07 92 00 – Joint Sealants
- .5 Section 08 14 16 – Flush Wood Doors
- .6 Section 08 71 00 – Door Hardware
- .7 Section 08 80 50 – Glazing
- .8 Section 09 91 23 – Interior Painting

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-06a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM B29-03, Standard Specification for Refined Lead.
 - .3 ASTM B749-03, Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .3 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
- .4 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-04, Architectural Coatings.
 - .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

1.3 SYSTEM DESCRIPTION

- .1 Design Requirements:
 - .1 Ensure product is manufactured by a firm experienced in design and production of standard and custom commercial steel door frame assemblies, integration of builders' and electronic hardware and glazing assemblies and other items affecting the work

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide product data and shop drawing submittals: in accordance with Section 01 33 00 – Shop Drawings, Data Products and Samples.
 - .1 Indicate each type of frame material, core thickness, reinforcement, glazing stops, location of anchors and exposed fastenings and finishes.
 - .2 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
 - .3 Submit test and engineering data, and installation instructions.

- .2 Provide samples in accordance with Section 01 33 00 – Shop Drawings, Data Products and Samples.
- .3 Submit one 300 x 300 mm corner sample of frame.
 - .1 Show butt cut-out glazing stop.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Hot dipped galvanized steel sheet: to ASTM A653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.

2.2 PRIMER

- .1 Touch-up prime CAN/CGSB-1.181.
 - .1 Maximum VOC limit 50 g/L to GC-03.

2.3 PAINT

- .1 Field paint steel frames in accordance with Sections 09 91 23 - Interior Painting. Protect acoustic seals from paint. Provide final finish free of scratches or other blemishes.
 - .1 Maximum VOC emission level 50 g/L to GS-11 to SCAQMD Rule 1113.

2.4 ACCESSORIES

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.
- .3 Metallic paste filler: to manufacturer's standard.
- .4 Sealant: Refer to Section 07 92 00 – Joint Sealants.
- .5 Glazing: Refer to Section 08 80 50 - Glazing
- .6 Make provisions for glazing as indicated and provide necessary glazing stops.
 - .1 Provide removable steel glazing beads for use with glazing tapes and compounds and secured with countersunk oval-head sheet metal screws.

2.5 FRAMES FABRICATION GENERAL

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Interior frames: 1.6 mm welded type construction.
- .4 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.

- .5 Protect mortised cutouts with steel guard boxes.
- .6 Prepare frame for door silencers, 3 for single door.
- .7 Manufacturer's nameplates on frames and screens are not permitted.
- .8 Conceal fastenings except where exposed fastenings are indicated.
- .9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

2.6 FRAME ANCHORAGE

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.
- .4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum. FRAMES: WELDED TYPE ONLY.
- .5 Weld in accordance with CSA W59.
- .6 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .7 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .8 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .9 Securely attach floor anchors to inside of each jamb profile.
- .10 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.
- .11 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

PART 3- EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION GENERAL

- .1 Install doors and frames to CSDMA Installation Guide.

3.3 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Remove temporary spreaders after frames are built-in.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .5 Fill void space between door frame and wall opening with acoustic foam insulation. Seal frame perimeter at drywall with acoustic sealant.

3.4 WOOD DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates, manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .2 Install specified acoustic perimeter door seals.
- .3 Provide even margins between doors and jambs and doors and finished floor as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latch side and head: 1.5 mm.
 - .3 Finished floor: 13 mm maximum.
- .4 Adjust operable parts for correct function.

3.5 FINISH REPAIRS

- .1 Touch up with primer finishes damaged during installation.
- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.6 GLAZING

- .1 Install glazing for doors and frames in accordance with Section 08 80 50 - Glazing.

END OF SECTION

PART 1- GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Shop Drawings, Product Data and Samples
- .2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .3 Section 01 61 10 – Product Requirements
- .4 Section 01 78 30 – Closeout Submittals
- .5 Section 08 11 00 – Metal Doors and Frames
- .6 Section 08 14 16 – Flush Wood Doors
- .7 Section 08 70 05 – Cabinet and Miscellaneous Hardware

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-69.18-M90/ANSI/BHMA A156.1-2000, Butts and Hinges.
 - .2 CAN/CGSB-69.20-M90/ANSI/BHMA A156.4-2000, Door Controls (Closers).
 - .3 CAN/CGSB-69.22-M90/ANSI/BHMA A156.6-2005, Architectural Door Trim.
 - .4 CAN/CGSB-69.24-M90/ANSI/BHMA A156.8-2005, Door Controls - Overhead Holders.
 - .5 CAN/CGSB-69.29-93/ANSI/BHMA A156.13-2002, Mortise Locks and Latches.
 - .6 CAN/CGSB-69.31-M89/ANSI/BHMA A156.15-2006, Closer/Holder Release Device.
 - .7 CAN/CGSB-69.32-M90/ANSI/BHMA A156.16-2002, Auxiliary Hardware.
 - .8 CAN/CGSB-69.34-93/ANSI/BHMA A156.18-2006, Materials and Finishes.
- .2 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
 - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 -Shop Drawings, Product Data and Samples.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
 - .4 After approval samples will be returned for incorporation in Work.
- .4 Hardware List:
 - .1 Submit contract hardware list.
 - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

- .5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .6 Manufacturer's Instructions: submit manufacturer's installation instructions.
- .7 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
 - .3 Regional Materials: submit evidence that project incorporates required percentage 10% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

1.5 MAINTENANCE MATERIALS SUBMITTALS

- .1 Extra Stock Materials:
 - .1 Supply maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Tools:
 - .1 Supply 2 sets of wrenches for door closers locksets and fire exit hardware.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements:
 - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled with manufacturer's name and address.
- .3 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

- .4 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect door hardware from nicks, scratches, and blemishes.
 - .3 Protect prefinished surfaces with wrapping.
 - .4 Replace defective or damaged materials with new.
- .5 Develop Construction Waste Management Plan related to Work of this Section.
- .6 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 HARDWARE ITEMS

- .1 Use one manufacturer's products only for similar items.

2.2 DOOR HARDWARE

- .1 Locks and latches:
 - .1 Mortise locks and latches: to CAN/CGSB-69.29-93/ANSI/BHMA A156.13, series 1000 mortise lock, grade 1, designed for function and keyed as stated in Hardware Schedule.
 - .2 Lever handles: plain design
 - .3 Escutcheons : round
 - .4 Normal strikes: box type, lip projection not beyond jamb.
 - .5 Cylinders: key into keying system as directed.
- .2 Butts and hinges:
 - .1 Butts and hinges: to CAN/CGSB-69.18-M90/ANSI/BHMA A156.1, designated by letter A and numeral identifiers, followed by size and finish, listed in Hardware Schedule.

Door Closers and Accessories:

- .2 Door controls (closers): to ANSI/BHMA A156.4, designated by letter C and numeral identifiers listed in Hardware Schedule, in accordance with ANSI/BHMA A156.4, table A1.
- .3 Door controls - overhead holders: to ANSI/BHMA A156.8, designated by letter C and numeral identifiers listed in Hardware Schedule.
- .4 Closer/holder release devices: to ANSI/BHMA A156.15, designated by letter C and numeral identifiers listed in hardware schedule.
- .3 Door Trim:
- .4 Auxiliary locks and associated products: to ANSI/BHMA A156.5, designated by letter E and numeral identifiers listed in Hardware Schedule.
- .5 Architectural door trim: to ANSI/BHMA A156.6, designated by letter J and numeral identifiers listed in Hardware Schedule.
- .6 Sliding and folding door hardware: to ANSI/BHMA A156.14, designated by letter D and numeral identifiers listed in Hardware Schedule.
- .7 Auxiliary hardware: to ANSI/BHMA A156.16, designated by letter L and numeral identifiers listed in Hardware Schedule.

- .8 Door bottom seal: heavy duty, door seal of extruded aluminum frame and solid closed cell neoprene weather seal, closed ends, automatic retract mechanism when door is open, clear anodized finish.
- .9 Thresholds: 100 mm wide x full width of door opening, extruded aluminum mill finish, plain surface, with thermal break of rigid PVC, with lip and vinyl door seal insert.
- .10 Weatherstripping:
 - .1 Head and jamb seal:
 - .1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.
 - .2 Adhesive backed neoprene material.

2.3 MISCELLANEOUS HARDWARE

- .1 Indexed key control system: to ANSI/BHMA A156.5, designated by letter E and numeral identifiers, wall mounted enamel paint finish.

2.4 FASTENINGS

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.
- .4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.

2.5 KEYING

- .1 Doors to be keyed differently, master keyed as directed. Prepare detailed keying schedule in conjunction with Departmental Representative.
- .2 Supply keys in duplicate for every lock in this Contract.
- .3 Supply 3 master keys for each master key or grand master key group.
- .4 Stamp keying code numbers on keys and cylinders.
- .5 Hand over permanent cores and keys to Departmental Representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Supply manufacturers' instructions for proper installation of each hardware component.
- .4 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).
- .5 Where door stop contacts door pulls, mount stop to strike bottom of pull.

- .6 Install key control cabinet.
- .7 Use only manufacturer's supplied fasteners.
 - .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .8 Remove construction cores when directed by Departmental Representative.
 - .1 Install permanent cores and ensure locks operate correctly.

3.2 ADJUSTING

- .1 Adjust door hardware, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.
- .2 Lubricate hardware, operating equipment and other moving parts.
- .3 Adjust door hardware to ensure tight fit at contact points with frames.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
 - .3 Remove protective material from hardware items where present.
 - .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 DEMONSTRATION

- .1 Keying System Setup and Cabinet:
 - .1 Set up key control system with file key tags, duplicate key tags, numerical index, alphabetical index and key change index, label shields, control book and key receipt cards.
 - .2 Place file keys and duplicate keys in key cabinet on their respective hooks.
 - .3 Lock key cabinet and turn over key to Departmental Representative.
- .2 Maintenance Staff Briefing:
 - .1 Brief maintenance staff regarding:
 - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
 - .2 Description, use, handling, and storage of keys.
 - .3 Use, application and storage of wrenches for door closers locksets and fire exit hardware.
- .3 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by door hardware installation.

DOOR INDEX

| Dr. # | Set # |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 308 | 02 | 310b | 03 | 340 | 02 | 355 | 02 | 358 | 05 |
| 309 | 02 | 321 | 02 | 342 | 01 | 356 | 04 | | |
| 310a | 02 | 323 | 02 | 354 | 01 | 357A | 05 | | |

Hardware List

2.2.2 Hinges:

A1 – Hinge 5 Knuckle-.134 gauge- 114mm x 101mm x Non Removable Pin x 652

2.2.1 Locks, Dead Bolts and Privacy's:

| | | |
|----------------|-----------------------------|-----|
| B1 - Cylinder | Type x length x cam to suit | 626 |
| B2 - Lock set | ANSI F04 (office) | 626 |
| B3 - Latch set | ANSI F01 (latch) | 626 |
| B4 - Lock set | ANSI F09 (exit) | 626 |
| B5 - Lock set | ANSI F25 (double) | 626 |

2.2.4 Closers:

C1 - Institutional, non sized, regular arm x delayed action x 689

2.2.8 AUXILIARY HARDWARE:

- F1 - Floor stop Low dome 28.57mm high x 50mm Dia solid cast x 626
- F2 - Wall stop Cast concealed mount, concave bumper with back plate x 626
- F3 - Electric Strike Fire rated, 12 VDC, 1500Lbs holding, 19mm keeper depth, Fail secure x 630
- F4- Coat Hooks 1 3/16"w x 1 1/2"h x 3" projection x 626

Sliding and folding door hardware::

- D1 - Bifold door track & hardware nylon wheels max weight 55 kg
Acceptable products or equal: KrisTrack KT15-width with 2 wire pulls 12,7mm dia x 101mm x 630 Fascia, and the balance of hardware by door supplier c/w hinges.

2.2.6 Architectural door trim:

J1 -Kick Plate 1.27mm thickness x 254mm height x width less 38mm x 630

2.2.9, 2.2.10, 2.2.11, 2.2.12 Threshold, seals, door bottoms, astragal::

| | |
|-----------------|--|
| M1 -Threshold | Barrier free Saddle 76.2mm x 6.4mm x width |
| M2 - Seals | Adjustable sponge neoprene sound rated 34.9mm x 22.2mm x 2/height x 1 width |
| M3 –Door Bottom | Surface type sponge neoprene sound rated-width |

Hardware Schedule

Hardware Set 01

3-A1, 2-B1, B4, F3, C1, F2, J1, M1, M2, M3, F4

Hardware Set 02

3-A1, 1-B1, B2, F2, M1, M2, M3, F4

Hardware Set 03

3-A1, 2-B1, B5, F2, M1, M2, M3, F4

Hardware Set 04

3-A1, B3, F2, M1, M2, M3, F4

Hardware Set 05
D1

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Shop Drawings, Product Data and Samples
- .2 Section 01 61 00 – Common Product Requirements
- .3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .4 Section 01 78 30 – Closeout Submittals
- .5 Section 08 11 00 – Door Metal Frames
- .6 Section 08 14 16 – Flush Wood Doors

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM C542-05, Standard Specification for Lock-Strip Gaskets.
 - .2 ASTM D2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
 - .3 ASTM E84-10, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - .4 ASTM F1233-08, Standard Test Method for Security Glazing Materials and Systems.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
 - .2 CAN/CGSB-12.8-97, Insulating Glass Units.
 - .3 CAN/CGSB-12.8-97 (Amendment), Insulating Glass Units.
- .3 Environmental Choice Program (ECP)
 - .1 CCD-045-95(R2005), Sealants and Caulking Compounds.
- .4 Glass Association of North American (GANA)
 - .1 GANA Glazing Manual - 2008.
 - .2 GANA Laminated Glazing Reference Manual - 2009.
- .5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section, with Contractor's Representative and Departmental Representative in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions, and coordinate with other building subtrades.
 - .3 Review manufacturer's written installation instructions and warranty requirements.
 - .2 Arrange for site visit with Departmental Representative prior to start of Work to examine existing site conditions.
 - .3 Hold project meetings every week.

- .4 Ensure key personnel attend.
- .5 Departmental Representative will submit written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Shop Drawings, Product Data and Samples.
- .2 Product Data and Shop Drawings:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for glass, sealants, and glazing accessories and include product characteristics, performance criteria, physical size, finish and limitations; submit shop drawings.
- .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Submit duplicate 150 mm size samples of double glazing sealed unit and sealant material.
- .4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
 - .1 Submit testing and analysis of glass under provisions of Section 01 11 55 – General Instructions.

1.5 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for glazing for incorporation into manual.

1.6 QUALITY ASSURANCE

- .1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .2 Mock-ups:
 - .1 Construct mock-ups in accordance with Section 01 11 55 – General Instructions.
 - .2 Construct mock-up to include glass, glazing seals.
 - .3 Locate where directed.
 - .4 Allow 24 hours for mock-up review before proceeding with work.
 - .5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect glazing from nicks, scratches and blemishes.

- .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.8 AMBIENT CONDITIONS

- .1 Ambient Requirements:
 - .1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.
 - .2 Maintain minimum ambient temperature before, during and for 24 hours after installation of glazing compounds.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Flat Glass:
 - .1 Safety glass: to CAN/CGSB-12.1, transparent, 6 mm thick.
 - .1 Type 2-tempered.
 - .2 Class B-float.
 - .3 Category 1.
- .2 Insulating Glass Units:
 - .1 Insulating glass units: to CAN/CGSB-12.8, double unit, 19 mm overall thickness.
 - .1 Glass: to CAN/CGSB-12.3.
 - .2 Glass thickness: 6 mm each light, safety glass.
 - .3 Inter-cavity space thickness: 6 mm.
- .3 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.
 - .1 VOC limit: 5% maximum by weight to CCD-045.
 - .2 Ensure sealant does not contain chemical restrictions to CCD-045.

2.2 ACCESSORIES

- .1 Setting blocks: neoprene or EPDM, 80-90 Shore A durometer hardness to ASTM D2240, to suit glazing method, glass light weight and area.
- .2 Spacer shims: neoprene, 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.
- .3 Glazing tape:
 - .1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; black colour.
- .4 Glazing splines: resilient polyvinyl chloride, extruded shape to suit glazing channel retaining slot.
- .5 Glazing clips: manufacturer's standard type.
- .6 Lock-strip gaskets: to ASTM C542.

PART 3- EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.
 - .1 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, openings for glazing are correctly sized, within tolerance and ready to receive glazing.
 - .2 Visually inspect substrate in presence of Departmental Representative.
 - .3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Clean contact surfaces with solvent and wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION: PLASTIC FILM

- .1 Install plastic film with adhesive, applied in accordance with film manufacturer's instructions.
- .2 Place without air bubbles, creases or visible distortion.
- .3 Fit tight to glass perimeter with razor cut edge.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 55 – General Instructions.
 - .1 Leave Work area clean at end of each day.
 - .1 Remove traces of primer, caulking.
 - .2 Remove glazing materials from finish surfaces.
 - .3 Remove labels.
 - .4 Clean glass using approved non-abrasive cleaner in accordance with manufacturer's instructions.
 - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 55 – General Instructions.
- .2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 After installation, mark each light with an "X" by using removable plastic tape or paste.
- .3 Repair damage to adjacent materials caused by glazing installation.

END OF SECTION

Harry Steven's Building

DDC Tune-up 2009

Job# 1.08.8478

HVAC Control System Asbuilts



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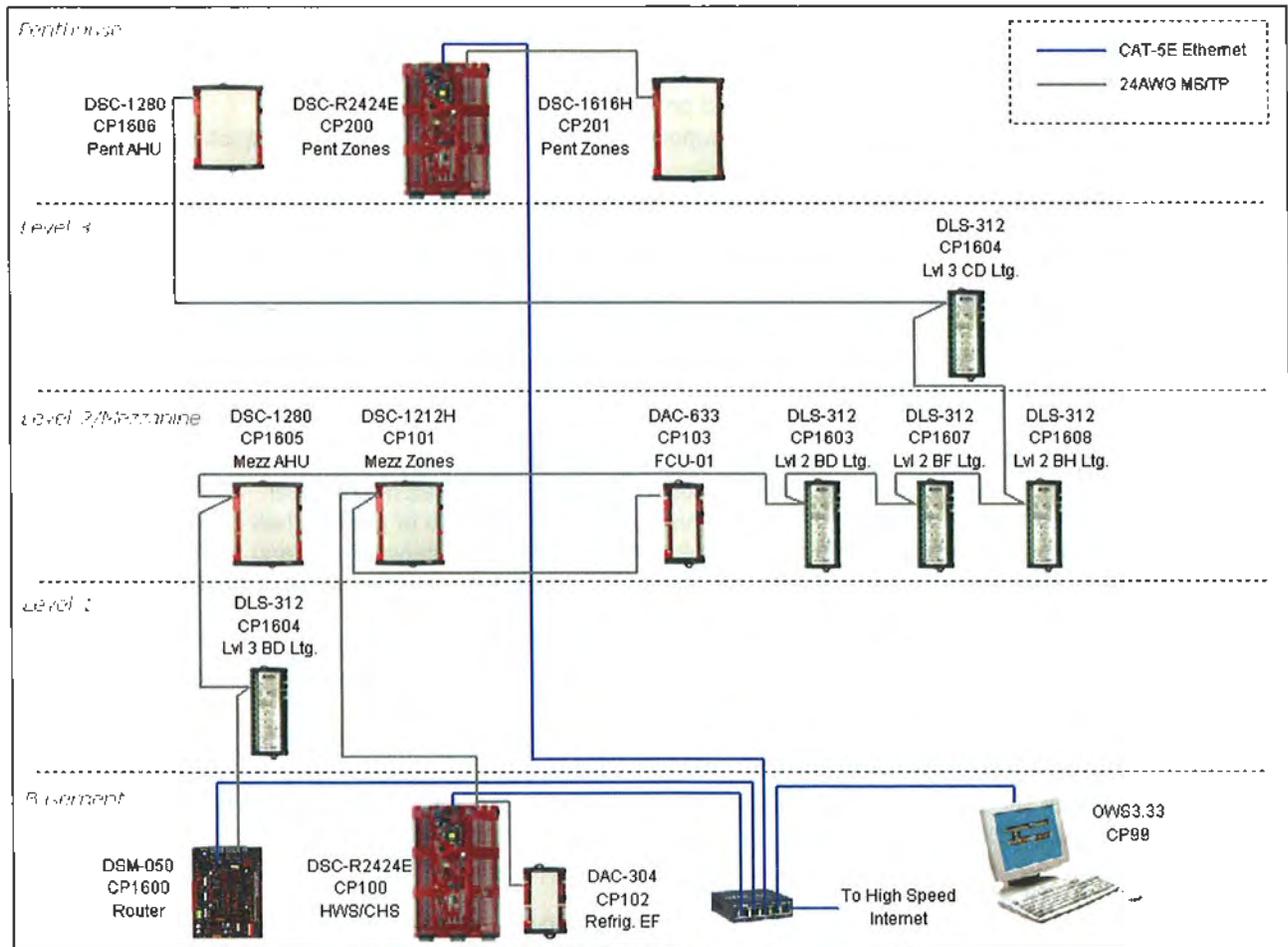
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Sequence of Operation

1. **DDC control is used for all aspects of the building mechanical system but not used for the fire/smoke safety operation**
- 2.
3. **Air Handling Units, Penthouse unit and Mezzanine Unit (Constant Volume Unit)**
- 4.
5. Start-up Mode
6. The return fan starts by weekly schedule, purge mode or by the heating optimum start algorithm:

| | | | | | | |
|------|------|------|------|-------|------|------|
| Sun. | Mon. | Tue. | Wed. | Thur. | Fri. | Sat. |
| on | | | | | | |
| off | | | | | | |
7. Return fans (RF) starts.
8. Return fan speed is ramped to its controlled position (penthouse unit only).
9. After return fan(RF) has been proven on, supply fans (SF) starts after a software adjustable time delay of 30 seconds.
10. Supply fan speed is ramped to its controlled position (penthouse unit only). Fan speed is modulated to maintain the supply static pressure setpoint.
- 11.
12. Morning Warm-up Mode
13. The unit starts according to the optimal (heating) start algorithm.
14. The unit runs with 100% return air until the return air temperature rises above 20°C at which time the unit goes to normal mode of control.
- 15.
16. Normal Mode (once SF status is proven)
17. Mixed Air Dampers are controlled from the cold deck supply temperature controller. At 0% of controller MAD will be at min position and when controller is equal to or greater then 50% MAD will be at maximum position. MAD will modulate from 0% to 100% between 0% and 50% of controller value. If OAT is greater than 18°C then MAD goes to minimum position regardless of controller value.
18. Mixed Air Dampers are limited between the minimum position and a maximum of 100 %. The minimum position setpoint shall be reset based on the CO2 levels in the space to provide demand control ventilation.
- 19.
20. Deck Control
21. The hot deck supply air temperature setpoint (HD_SAT_SP) is reset from the average damper position(DMP_POS).

****CALCULATE AVERAGE DAMPER POSTION****
DMP_POS=AVG(ZONE1_DMP, ZONE2_DMP, ZONE3_DMP,)

HD_SAT_SP = ((-0.2 *(DMP_POS) + 30)
HD_SAT_SP = LIMIT(HD_SAT_SP, 20 , 30)
22. Heating Coil Valve (HCV) modulates to maintain hot deck setpoint (HD_SP).
- 23.
24. The cold deck supply air temperature setpoint (CD_SAT_SP) is reset from the average damper position(DMP_POS).

CD_SAT_SP = ((-7/50 * (MEZZ_DMP_POS)) + 26)
CD_SAT_SP = LIMIT (CD_SAT_SP, 12, 19)
25. Cooling Coil Valve (CCV) modulates to maintain cold deck setpoint(CD_SAT_SP) when CD_SAT~CO is greater than 50% (ie free cooling has been used first). Cooling coil valve will modulate from 0% to 100% when between controller value of 50% and 100%.

Harry Stevens Building

- 26.
- 27. Hot Deck Coil Pumps
- 28. The Hot Deck Coil pump shall be started when the heating coil valve opens more than 5%.
- 29. The Hot Deck Coil pump shall run continuously when the outdoor air temperature is below 13°C
- 30.
- 31. Zone Dampers
- 32. Individual zone dampers modulate to maintain individual zone temperature setpoints.
- 33.
- 34. Shutdown Mode
- 35. Supply Fans (SF) stop.
- 36. Return Fans (RF) stop.
- 37. Mixed Air Dampers close.
- 38. Cooling coil valve is closed.
- 39. Heating coil valve modulates to maintain minimum plenum temperature of 10°C.
- 40.

Hot Water Boilers (B1-B2)

- 41.
- 42.
- 43. Start-up Mode
- 44. When OAT is below setpoint 16 °C the heating plant shall be enabled. P1 through P6 status will be checked to ensure there is circulation through the heating system before enabling the boilers.
- 45.
- 46. Normal Mode
- 47. Boilers shall alternate lead and lag position every week.
- 48. The DDC system resets the boiler supply water temperature setpoint (HWS_SP) according to the outdoor air temperature.

$$HWS_SP = 60 + ((18 - OAT) * 1.3)$$

OAT -12 °C. HWS_SP 90 °C.
 OAT 15 °C. HWS_SP 65 °C.
 (HWS_SP has operating range of 65 to 90 °C)
 Hot water supply is further reset by the building low variance (LO_VAR) through the boiler offset controller (BLR_OFFSET_CO).

$$LO_VAR = LSEL(RT1 - SP1, RT2 - SP2, \dots)$$
 The boiler offset controller operates to maintain the lowest space temperature no less than 1°C below setpoint. The boiler setpoint is ramped up if the controller is less than 35%, and is ramped down if the controller is above 65%. The boiler setpoint bias is limited between 15 and -10°C.

$$HWS_SP = HWS_SP + HWS_BIAS$$
- 49. Boiler firing rate is modulated to maintain HWS_SP with lead boiler.
- 50.
- 51. Shutdown Mode
- 52. Boiler is hard-wired to a low water cut-off, a high limit, a water flow switch to prevent the firing if any alarm condition is detected.
- 53. When OAT is above setpoint of 16 °C the boilers are disabled.
- 54.

Radiation Loops

- 55.
- 56.
- 57. When OAT is below setpoint of 15 °C radiation zone pumps NW_RAD_PUMP_C and SE_RAD_PUMP_C are enabled.

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58. The DDC system resets the radiation loop supply water temperature setpoint (RAD_SP) according to the outdoor air temperature.
 $RAD_SP = 50 + ((18 - OAT) * 1.3)$
- OAT -12 °C HWS_SP 80 °C
 OAT 15 °C HWS_SP 40 °C
 (HWS_SP has operating range of 50 to 85 °C)
59. When OAT is above setpoint of 16 °C radiation zone pumps MEZZ_COIL_PUMP and PENT_COIL_PUMP are disabled.
60. The DDC system modulates the heating valve(RAD_VLV_C) to maintain the temperature setpoint.

Chiller

- 63.
64. Chiller pump is enabled when OAT > 15 deg. C and with any air handling unit cooling coil valve more than 30% open.
65. When there is a call for cooling the Condensing Water and Chilled Water Pumps will run for 3 min. before the chiller will be enabled.
66. Both flow switches, one on the Condensing Water, and one on the Chilled Water, must make, before the chiller will come on.
67. The leaving Chilled Water temperature is reset based on the return Chilled Water temperature.

Cooling Tower

- 70.
71. Startup mode:
72. Cooling tower system is enabled by COND_PUMP_S.
73. Cooling tower will be prevented from operating if the basin heater is enabled or basin level is low.
- 74.
75. Cooling mode: (cooling tower)
76. Cooling tower fan is controlled via Variable Speed Drive.
77. Fan Speed is set by basin water temperature according to the following equation:
 $Fan_S = 20 * (BWT - 21) + 21$
 $Fan_S = Limit (0 , 100)$
 At 21°C Fan_S = 0% (runs at minimum of 20%)
 At 26°C Fan_S = 100%
 BWT < 21°C Fan is OFF
78. Cooling tower fan has minimum runtime of 10 Minutes.

Refrigerant Exhaust System:

- 81.
82. Exhaust Fan 1, EF-1, will start whenever the chiller is running, after its corresponding dampers open fully.
83. Exhaust Fan 2, EF-2, will start as soon as a refrigerant leak is detected, after its corresponding dampers open fully.
84. if a refrigerant leak is detected a warning beacon (strobe light) on the outside of the room, will indicate there is a leak inside.
85. A switch located outside the room can be used to manually turn EF-2 on only.
86. The refrigerant monitor, MSA TGM-4-DR, has a capability of up to 4 sensors measuring a minimum of 50PPM (Parts Per Million) each. One sensor is installed on the east side of the room and the other on the west side of the room.
87. There are 2 alarm levels that can be set on the detector. The low alarm is set to 150PPM and the high alarm is set to 950PPM.

Conference Room Fancoil FC1

1.08.8478.0

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| | | |
|------|---|--|
| 90. | | |
| 91. | Supply fan is started and runs continuously during occupied periods. | |
| 92. | Once fan status has been proven, mixed air dampers, heating coil valve, and cooling coil valve shall operate in sequence to maintain the supply air temperature setpoint. | |
| 93. | The supply air temperature setpoint is reset based on the room temperature controller. | |
| 94. | Mixed Air Dampers are limited between a minimum position of <u>20</u> % and a maximum of 100 %. | |
| 95. | Exhaust fan EF1 shall run whenever FC1 supply fan is running. | |
| 96. | | |
| 97. | Exhaust Fans | |
| 98. | | |
| 99. | Washroom Exhaust fan is enabled by weekly schedule. | |
| 100. | When Parkade Propane(HAZ_GAS) level attains <u>25</u> %LEL the parkade exhaust fan shall be started. | |
| 101. | | |
| 102. | Lighting | |
| 103. | | |
| 104. | Interior lighting zones are enabled based on the master lighting schedule. | |
| 105. | Parkade lighting is enabled based on the parkade lighting schedule. | |
| 106. | | |
| 107. | Miscellaneous | |
| 108. | | |
| 109. | <u>Control Air Pressure</u> | |
| 110. | When control air pressure(CONTROL_AIR_PRESS) is greater than ___ PSI an alarm is provided at the B.A.S. | |
| 111. | | |
| 112. | <u>Sump Alarm</u> | |
| 113. | Sump alarm contact shall be monitored. | |

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Control Panel Report

CP Panel: CP100 **LP Panel:** LP **Power Panel #:** **CP Model No** DSC-2424E
Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**EXP120
CP Panel Location: Boiler Room **Exp. Slot #2:** **Exp. Slot #3:**EXP161

| Point # | Descriptor | Field Part | Wiring Detail | Point # | Descriptor | Field Part | Wiring Detail |
|----------|------------------|-------------|------------------|----------|------------------|------------|-----------------|
| 100.IP1 | ENTRANCE_PUMP_S | S100-1L | MAG M15_FB | 100.OP1 | ENTRANCE_PUMP_C | M15MAH12DC | MAG M15_FB |
| 100.IP2 | WORKAREA_PUMP_S | S100-1L | MAG M15_FB | 100.OP2 | WORKAREA_PUMP_C | M15MAH12DC | MAG M15_FB |
| 100.IP3 | MEZZ_HCP4_S | S100-1L | MAG M15_FB | 100.OP3 | MEZZ_HCP4_C | M15MAH12DC | MAG M15_FB |
| 100.IP4 | PENT_HCP3_S | S100-1L | MAG M15_FB | 100.OP4 | PENT_HCP3_C | M15MAH12DC | MAG M15_FB |
| 100.IP5 | SE_RAD_P5_S | S100-1L | MAG M15_FB | 100.OP5 | SE_RAD_P5_C | M15MAH12DC | MAG M15_FB |
| 100.IP6 | NW_RAD_P6_S | S100-1L | MAG M15_FB | 100.OP6 | NW_RAD_P6_C | M15MAH12DC | MAG M15_FB |
| 100.IP7 | CLGTWR_FAN_S_old | S100-1L | MAG M15_FB | 100.OP7 | CLGTWR_FAN_C_old | M15MAH12DC | MAG M15_FB |
| 100.IP8 | CHILLER_S | S200-2 | FBK CT | 100.OP8 | CHIL_C | M15MAH12DC | CTL Dry Output |
| 100.IP9 | CHIL_CHW_P1S | S100-1L | MAG M15_FB | 100.OP9 | CHIL_CHW_P1C | M15MAH12DC | MAG M15_FB |
| 100.IP10 | CHIL_COND_P2S | S100-1L | MAG M15_FB | 100.OP10 | CHIL_COND_P2C | M15MAH12DC | MAG M15_FB |
| 100.IP11 | MEZZ_SFS | S100-1L | MAG M15_FB | 100.OP11 | MEZZ_SFC | M15MAH12DC | MAG M15_FB_FZ |
| 100.IP12 | MEZZ_RFS | S100-1L | MAG M15_FB | 100.OP12 | MEZZ_RFC | M15MAH12DC | MAG M15_FB |
| 100.IP13 | PENT_SFS | S100-1L | MAG M15_FB | 100.OP13 | PENT_SF_VSD~PWR | M15MAH12DC | MAG M15_FB |
| 100.IP14 | PENT_RFS | S100-1L | MAG M15_FB | 100.OP14 | PENT_RF_VSD~PWR | M15MAH12DC | MAG M15_FB |
| 100.IP15 | HWS_BLR1_SWT | WTS420-1 | TMP 10K Device | 100.OP15 | HWS_BLR1_C | M15MAH12DC | CTL Boiler |
| 100.IP16 | HWS_BLR2_SWT | WTS420-1 | TMP 10K Device | 100.OP16 | HWS_BLR2_C | M15MAH12DC | CTL Boiler |
| 100.IP17 | HWS_SWT | WTS420-1 | TMP 10K Device | 100.OP17 | HWS_BLR1_FIRE | 0-10VDC | CTL Analog Outp |
| 100.IP18 | SE_RAD_SWT | WTS420-1 | TMP 10K Device | 100.OP18 | SE_RAD_VLV_C | EPT750 | CTL EPT |
| 100.IP19 | NW_RAD_SWT | WTS420-1 | TMP 10K Device | 100.OP19 | NW_RAD_VLV_C | EPT750 | CTL EPT |
| 100.IP20 | PARKADE_HAZ_GAS | 0-10VDC | FBK Analog Input | 100.OP20 | WASHROOM_EF_C | M15MAH12DC | MTR M15_FB |
| 100.IP21 | CHIL_COND_IN_T | WTS420-1 | TMP 10K Device | 100.OP21 | PARKADE_EF_C | M15MAH12DC | MAG M15_FB |
| 100.IP22 | CONTROL_AIR_PRES | 0-5VDC | FBK Analog Input | 100.OP22 | PARKADE_LIGHTS | M15MAH12DC | CTL Dry Output |
| 100.IP23 | SUMP_ALARM | DRY CONTACT | FBK Dry Contact | 100.OP23 | CHIL_RESET | 0-10VDC | CTL Analog Outp |
| 100.IP24 | PARKADE_CO | 0-10VDC | FBK Analog Input | 100.OP24 | HWS_BLR2_FIRE | 0-10VDC | CTL Analog Outp |
| 100.IP25 | CLGTWR_BWT | WTS420-1 | TMP 10K Device | 100.OP25 | SPARE100_OP25 | | |
| 100.IP26 | CLGTWR_LVL | DRY CONTACT | FBK Dry Contact | 100.OP26 | SPARE100_OP26 | | |
| 100.IP27 | CLGTWR_HTR | S100-1L | FBK CT | 100.OP27 | MEZZ_ZONE1_RAD | 0-10VDC | VLV Bel_MOD |
| 100.IP28 | CLGTWR_SPD_FB | 0-10VDC | FBK Analog Input | 100.OP28 | MEZZ_ZONE3_RAD | 0-10VDC | VLV Bel_MOD |
| 100.IP29 | CLGTWR_FAN_S | S100-1L | MAG M15_FB | 100.OP29 | MEZZ_ZONE2_RAD | 0-10VDC | VLV Bel_MOD |
| 100.IP30 | CHIL_CWST | WTS420-1 | TMP 10K Device | 100.OP30 | CLGTWR_SPD_C | 0-10VDC | CTL Analog Outp |
| 100.IP31 | CHIL_CWRT | WTS420-1 | TMP 10K Device | 100.OP31 | CLGTWR_FAN_C | M15MAH12DC | MAG M15_FB |
| 100.IP32 | CHIL_COND_OUT_T | WTS420-1 | TMP 10K Device | 100.OP32 | DHW_RECIRC_PC | M15MAH12DC | MAG M15_FB |



Project: 1088478
 Engineer: Wwa

Date 23-Mar-09

B1-1



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Control Panel Report

CP Panel: CP102 LP Panel: LP Power Panel #: CP Model No DAC-304
Mechanical Dwg: Enclosure Model #: Power Circuit #: Exp. Slot #1:
CP Panel Location: Boiler Room Exp. Slot #2:
Exp. Slot #3:

| Point # | Descriptor | Field Part | Wiring Detail | Point # | Descriptor | Field Part | Wiring Detail |
|---------|------------|-------------|-----------------|---------|--------------|------------|---------------|
| 102.IP1 | EF1_EFS | DRY CONTACT | FBK Dry Contact | 102.OP1 | EF1_EAD | LF24-S | MAG_MZP_FB_F |
| 102.IP2 | EF2_EFS | DRY CONTACT | FBK Dry Contact | 102.OP2 | EF2_EAD | LF24-S | MAG_MZP_FB_F |
| 102.IP3 | REFRIG_DET | DRY CONTACT | FBK Dry Contact | 102.OP3 | EF_BEACON | TERM PT | CTL LED |
| | | | | 102.OP4 | SPARE102_OP4 | | |

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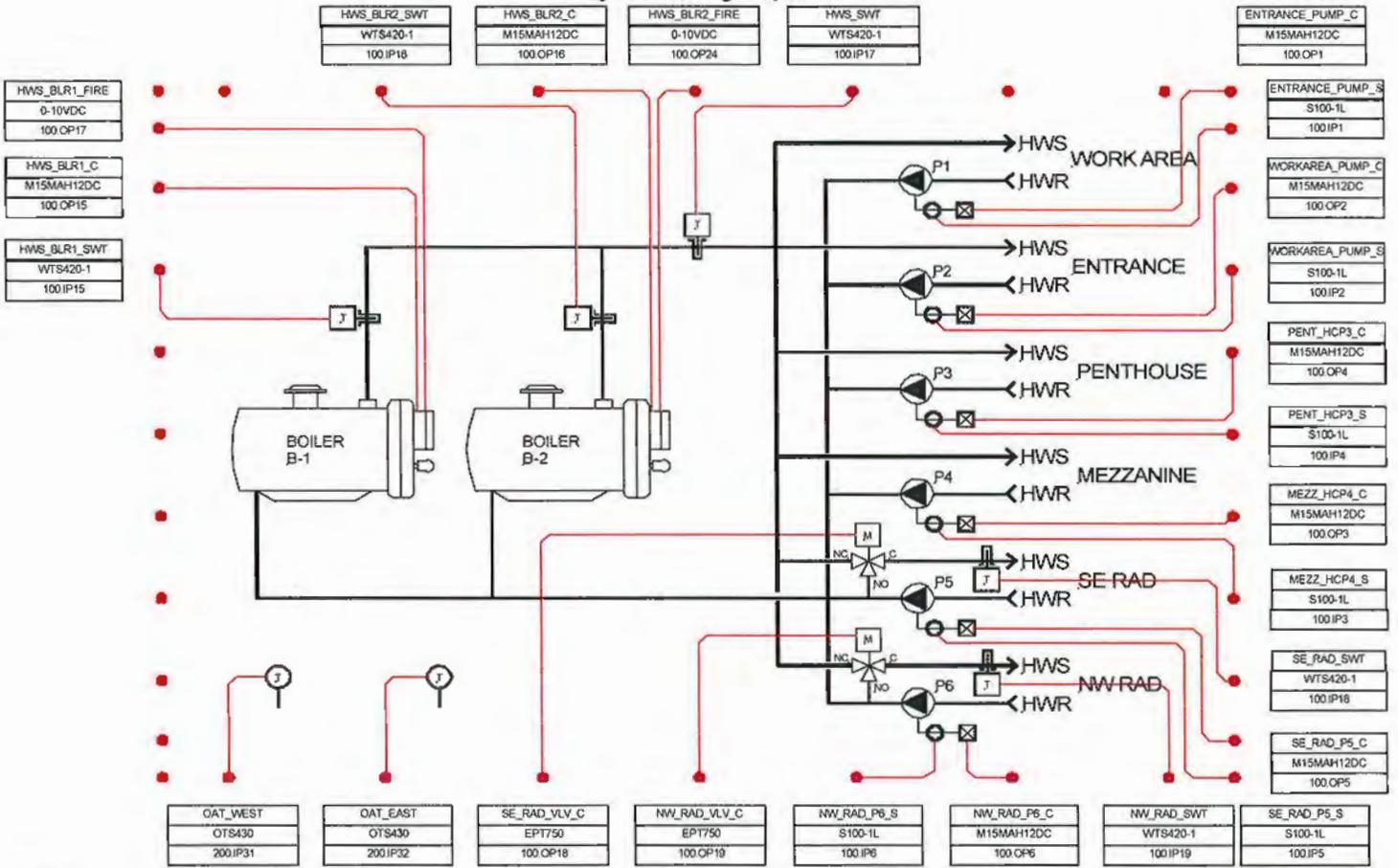
Control Panel Report

CP Panel: CP1605 **LP Panel:** LP **Power Panel #:** **CP Model No** DSC-1280
Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**
CP Panel Location: Mezzanine Mechanical Room **Exp. Slot #2:**
Exp. Slot #3:

| Point # | Descriptor | Field Part | Wiring Detail | Point # | Descriptor | Field Part | Wiring Detail |
|-----------|----------------|-------------|-----------------|----------|---------------|------------|---------------|
| 1605.IP1 | MEZZ_RAT | DTS410 | TMP 10K Device | 1605.OP1 | MEZZ_MAD | EPT750 | CTL EPT |
| 1605.IP2 | MEZZ_MAT | TSFC204T10 | TMP 10K Device | 1605.OP2 | SPARE1605_OP2 | | |
| 1605.IP3 | MEZZ_MAD_FB | 0-10VDC | ACT Bel_MOD_F | 1605.OP3 | SPARE1605_OP3 | | |
| 1605.IP4 | MEZZ_SA~CO2 | 90-DM3A-D-T | GAS Vulcain | 1605.OP4 | SPARE1605_OP4 | | |
| 1605.IP5 | MEZZ_RA~CO2 | 90-DM3A-D-T | GAS Vulcain | 1605.OP5 | SPARE1605_OP5 | | |
| 1605.IP6 | MEZZ_NSB_OVR | DRY CONTACT | FBK Dry Contact | 1605.OP6 | SPARE1605_OP6 | | |
| 1605.IP7 | SPARE1605_IP7 | | | 1605.OP7 | SPARE1605_OP7 | | |
| 1605.IP8 | SPARE1605_IP8 | | | 1605.OP8 | SPARE1605_OP8 | | |
| 1605.IP9 | SPARE1605_IP9 | | | | | | |
| 1605.IP10 | SPARE1605_IP10 | | | | | | |
| 1605.IP11 | SPARE1605_IP11 | | | | | | |
| 1605.IP12 | SPARE1605_IP12 | | | | | | |

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System Drawings Report



System: **HWS** System Description: Main Heating Plant Control Panel: 100
 System Location: Boiler Room Local Panel: 100



Project: 1088478
 Engineer: Wa

Date 19-Mar-09
 Revision:

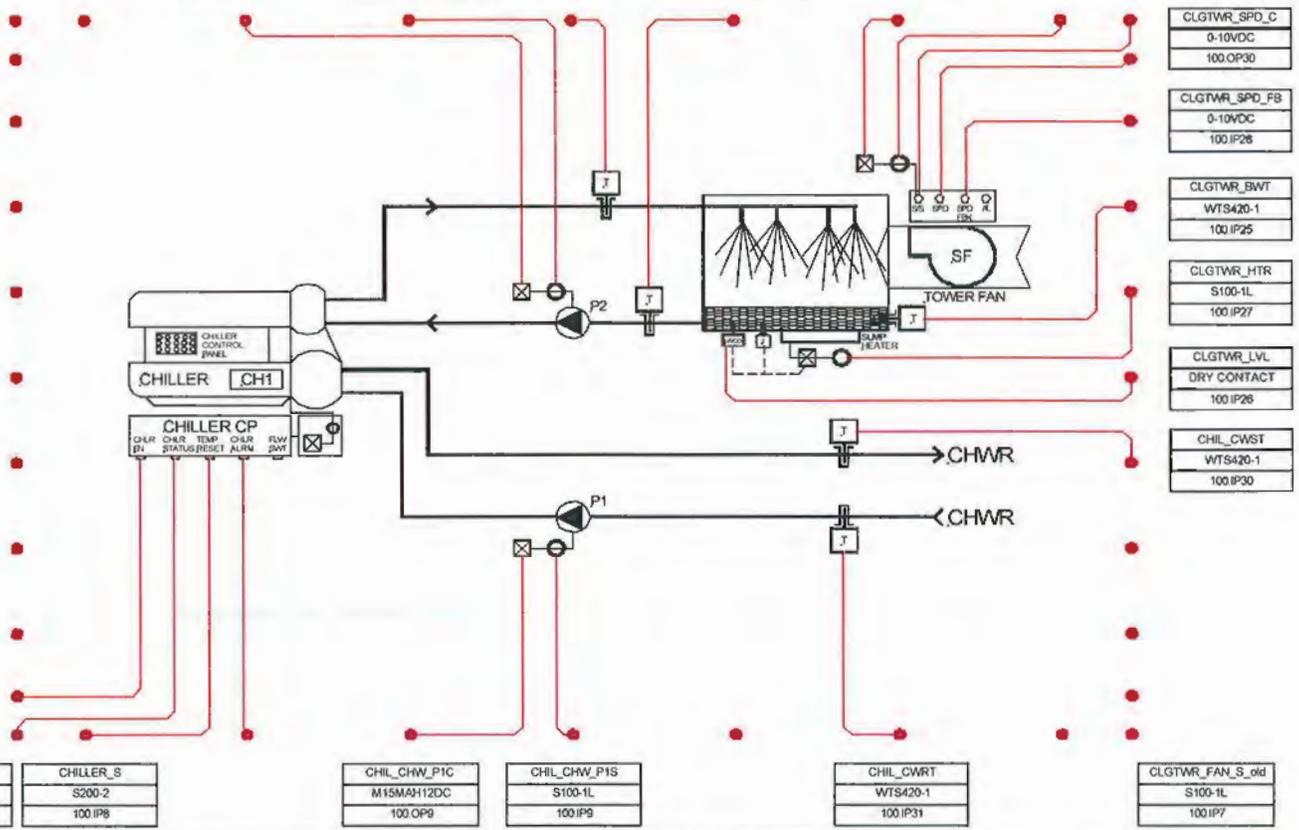
B2-1



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System Drawings Report

| | | | | | | |
|---|--------------------------------------|--|---|---|-------------------------------------|--|
| CHIL_COND_P2C M15MAH12DC 100.OP10 | CHIL_COND_P2S S100-1L 100.IP10 | CHIL_COND_IN_T WTS420-1 100.IP21 | CHIL_COND_OUT_T WTS420-1 100.IP32 | CLGTWR_FAN_C_old M15MAH12DC 100.OP7 | CLGTWR_FAN_S S100-1L 100.IP29 | CLGTWR_FAN_C M15MAH12DC 100.OP31 |
|---|--------------------------------------|--|---|---|-------------------------------------|--|



| |
|---------------------------------|
| CHIL_C M15MAH12DC 100.OP8 |
|---------------------------------|

| |
|-----------------------------------|
| CHIL_RESET 0-10VDC 100.OP23 |
|-----------------------------------|

| |
|--------------------------------|
| CHILLER_S S200-2 100.IP8 |
|--------------------------------|

| |
|---------------------------------------|
| CHIL_CHW_P1C M15MAH12DC 100.OP9 |
|---------------------------------------|

| |
|------------------------------------|
| CHIL_CHW_P1S S100-1L 100.IP9 |
|------------------------------------|

| |
|-----------------------------------|
| CHIL_CWRT WTS420-1 100.IP31 |
|-----------------------------------|

| |
|--|
| CLGTWR_FAN_S_old S100-1L 100.IP7 |
|--|

System: **CHS** System Description: **Main Cooling Plant** Control Panel: **100**
 System Location: **Boiler Room** Local Panel:



Project: 1088478
 Engineer: Wwa

Date 19-Mar-09
 Revision:

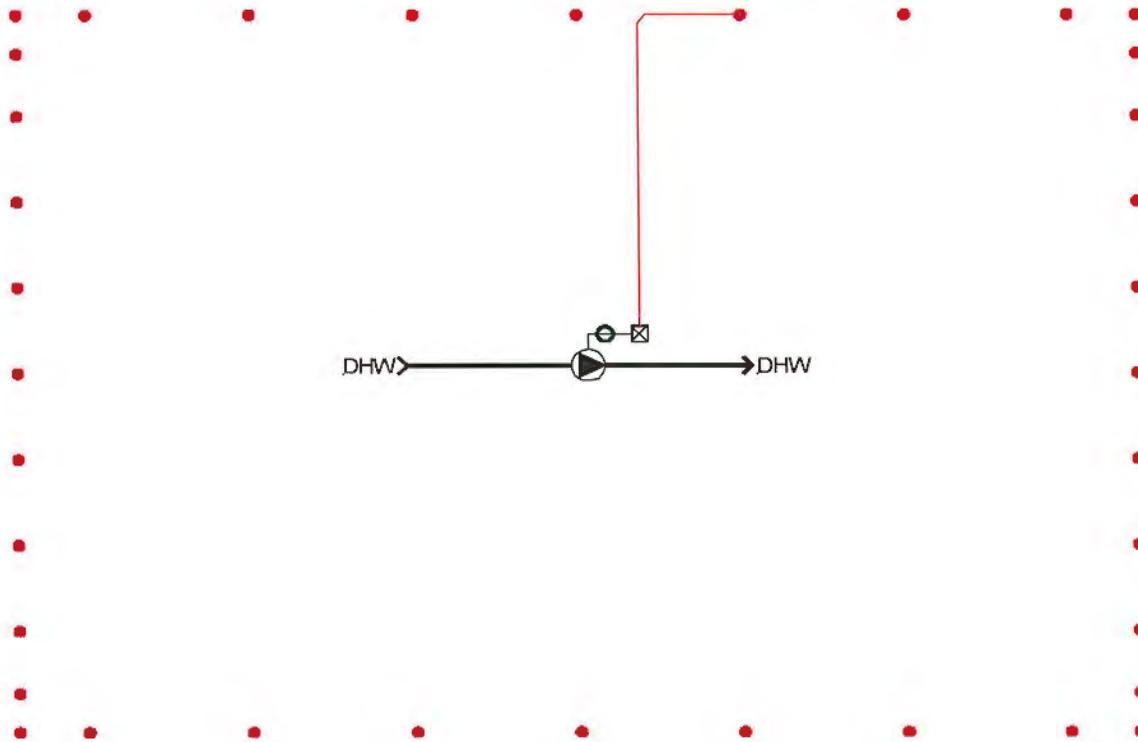
B2-2



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System Drawings Report

| |
|---------------|
| DHW_RECIRC_PC |
| M15MAH12DC |
| 100 OP22 |



System:

DHW

System Description:

Domestic Hot Water System

Control Panel:

100

System Location:

Boiler Room

Local Panel:



Project: 1088478
Engineer: Wa

Date: 19-Mar-09
Revision:

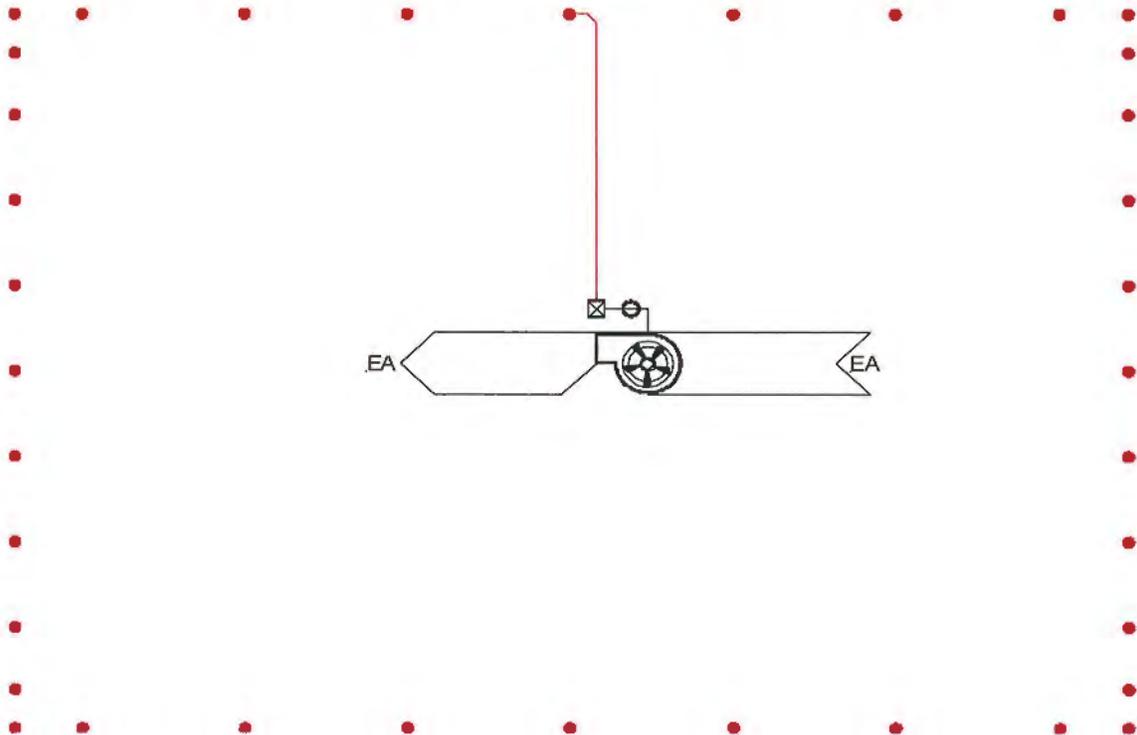
B2-3



Harry Stevens Building

System Drawings Report

| |
|---------------|
| WASHROOM_EF_C |
| M15MAH12DC |
| 100 OP20 |



| | | | | | |
|--------------------------|------------------|---------------------|-------------|----------------|--------------------------|
| System: | WASHROOM_EF | System Description: | Exhaust Fan | Control Panel: | 100 |
| System Location: | Washrooms | | | Local Panel: | |
| ESC AUTOMATION | Project: 1088478 | Date: 19-Mar-09 | | B2-4 | Delta CONTROLS |
| | Engineer: Wwa | Revision: | | | |

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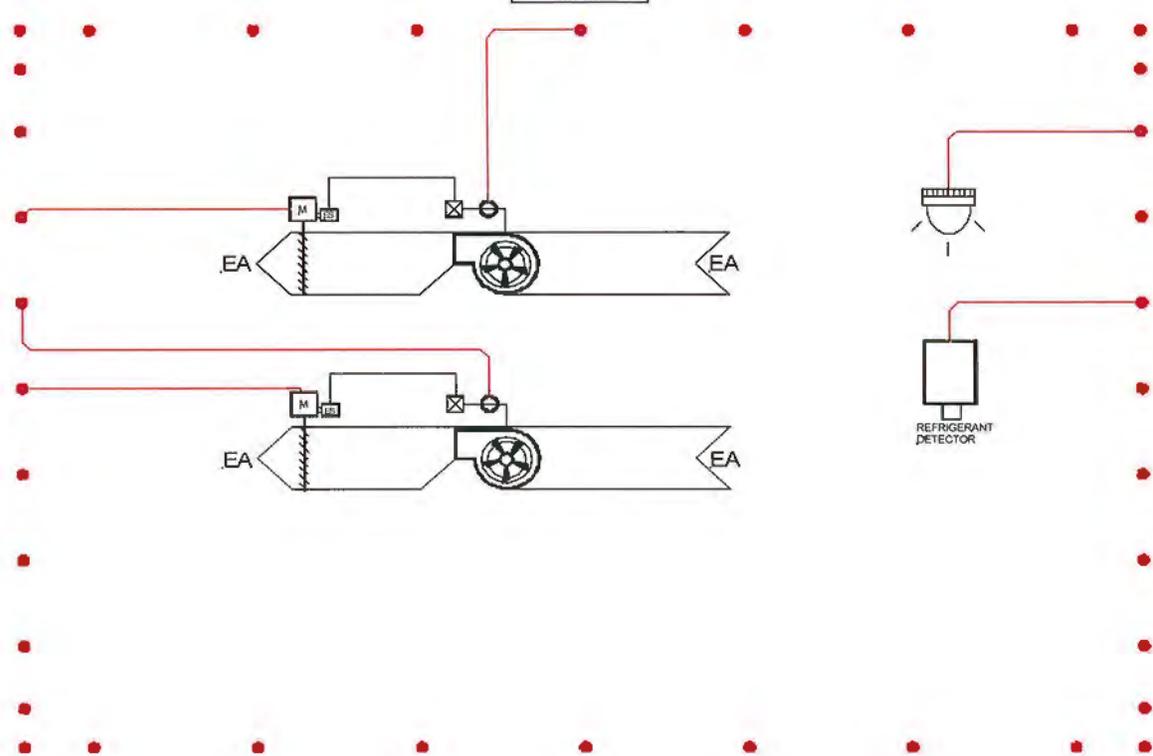
System Drawings Report

| |
|-------------|
| EF1_EFS |
| DRY CONTACT |
| 102 IP1 |

| |
|---------|
| EF1_EAD |
| LF24-S |
| 102 OP1 |

| |
|-------------|
| EF2_EFS |
| DRY CONTACT |
| 102 IP2 |

| |
|---------|
| EF2_EAD |
| LF24-S |
| 102 OP2 |



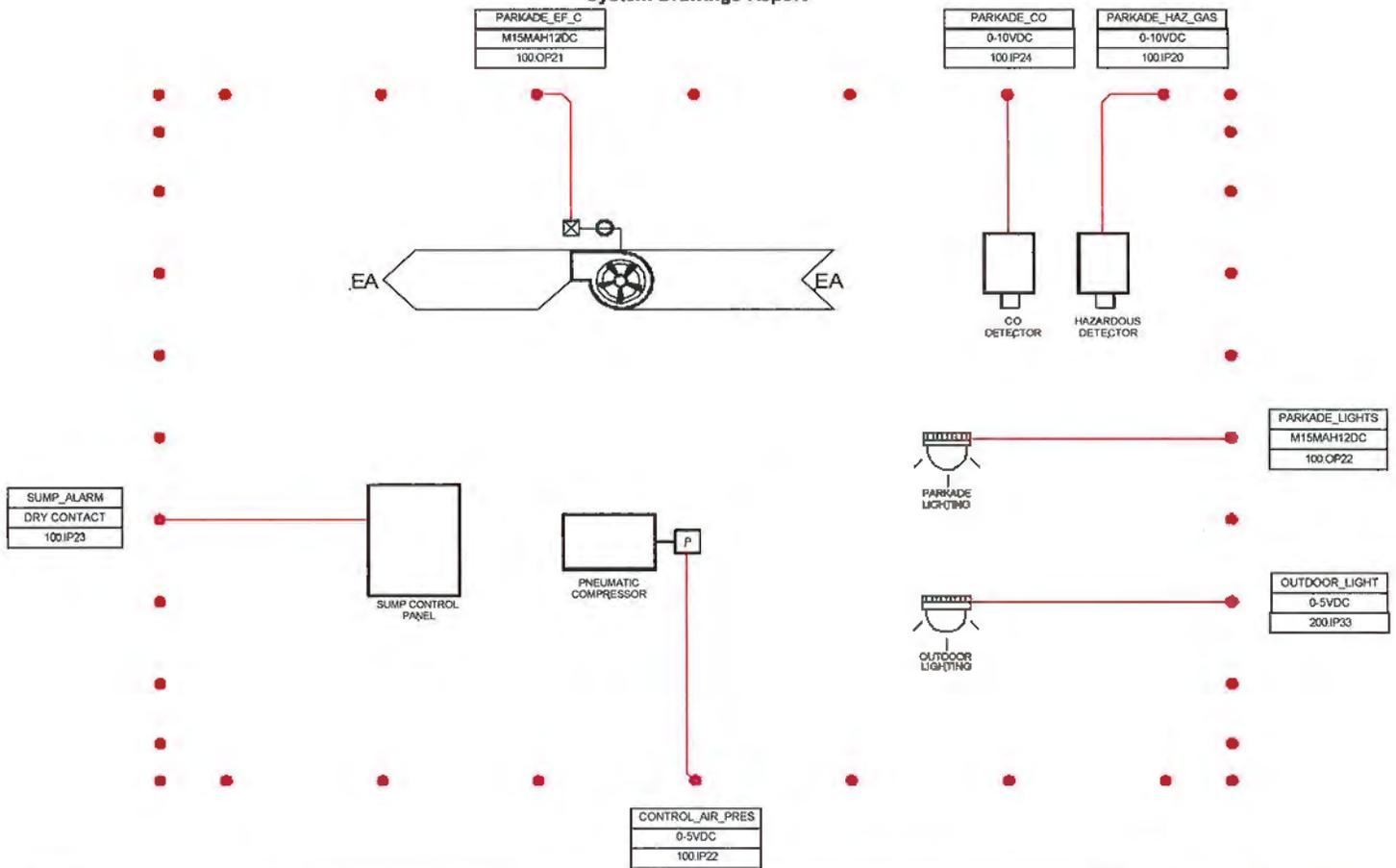
| |
|-----------|
| EF_BEACON |
| TERM PT |
| 102 OP3 |

| |
|-------------|
| REFRIG_DET |
| DRY CONTACT |
| 102 IP3 |

| | | | | | |
|-------------------------|------------------|----------------------------|-----------------------------------|-----------------------|-----------------------|
| System: | REF_EF | System Description: | Refrigerant Detection and Exhaust | Control Panel: | 102 |
| System Location: | Chiller Room | | | Local Panel: | |
| ESC AUTOMATION | Project: 1088478 | Date: 19-Mar-09 | | B2-5 | Delta CONTROLS |
| | Engineer: Wwa | Revision: | | | |

Harry Stevens Building

System Drawings Report



System:

PARKADE_EF

System Description:

Exhaust Fan and Gas Detection

Control Panel:

100

System Location:

Parkade

Local Panel:



Project: 1088478
Engineer: Wjs

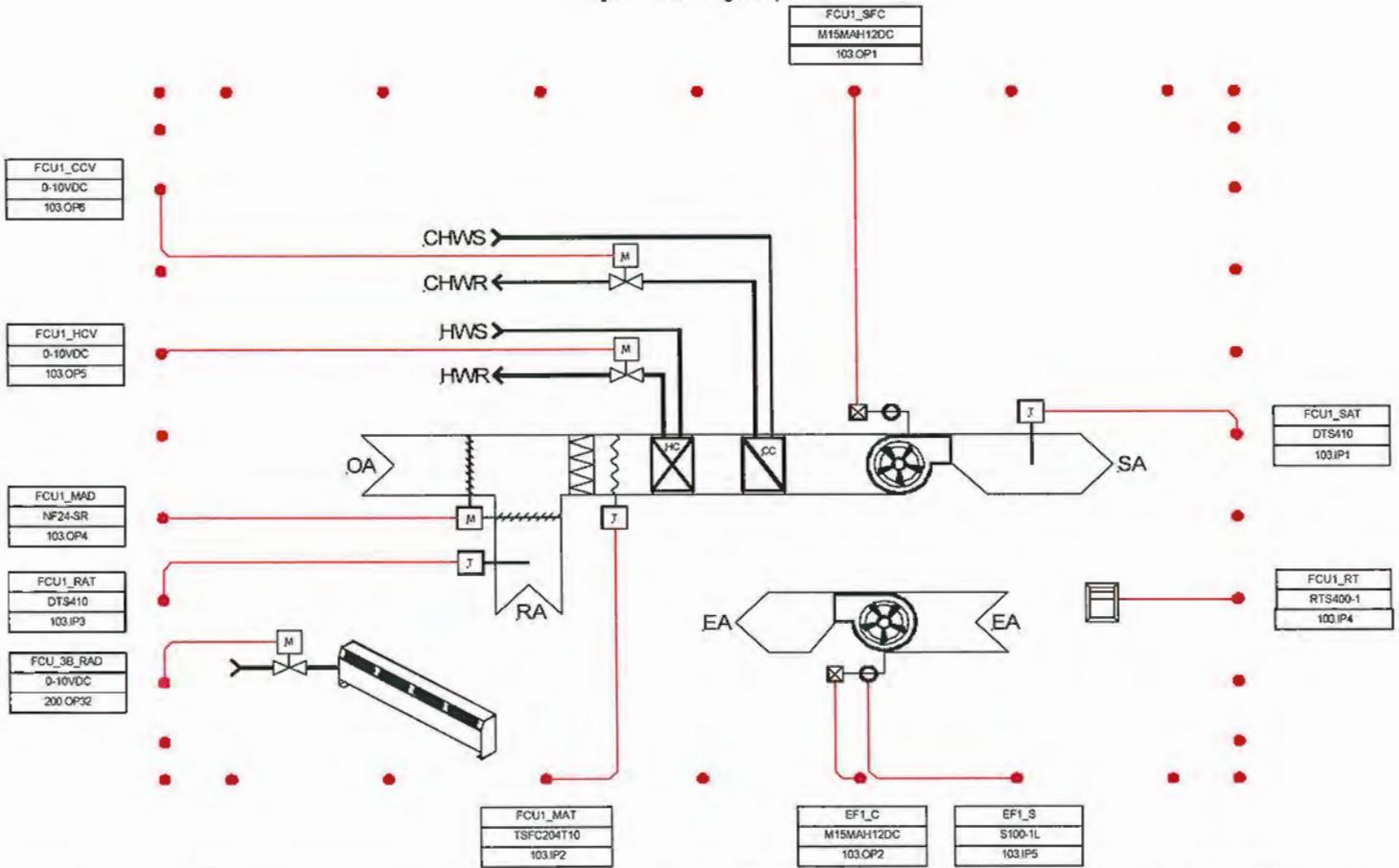
Date: 19-Mar-09
Revision:

B2-6



Harry Stevens Building

System Drawings Report



System: **FC** System Description: Fancoil Unit and Exhaust Fan Control Panel: **103**
 System Location: Level 2 Conference Room Local Panel:



Project: 1088478
 Engineer: Wwa

Date: 19-Mar-09
 Revision:

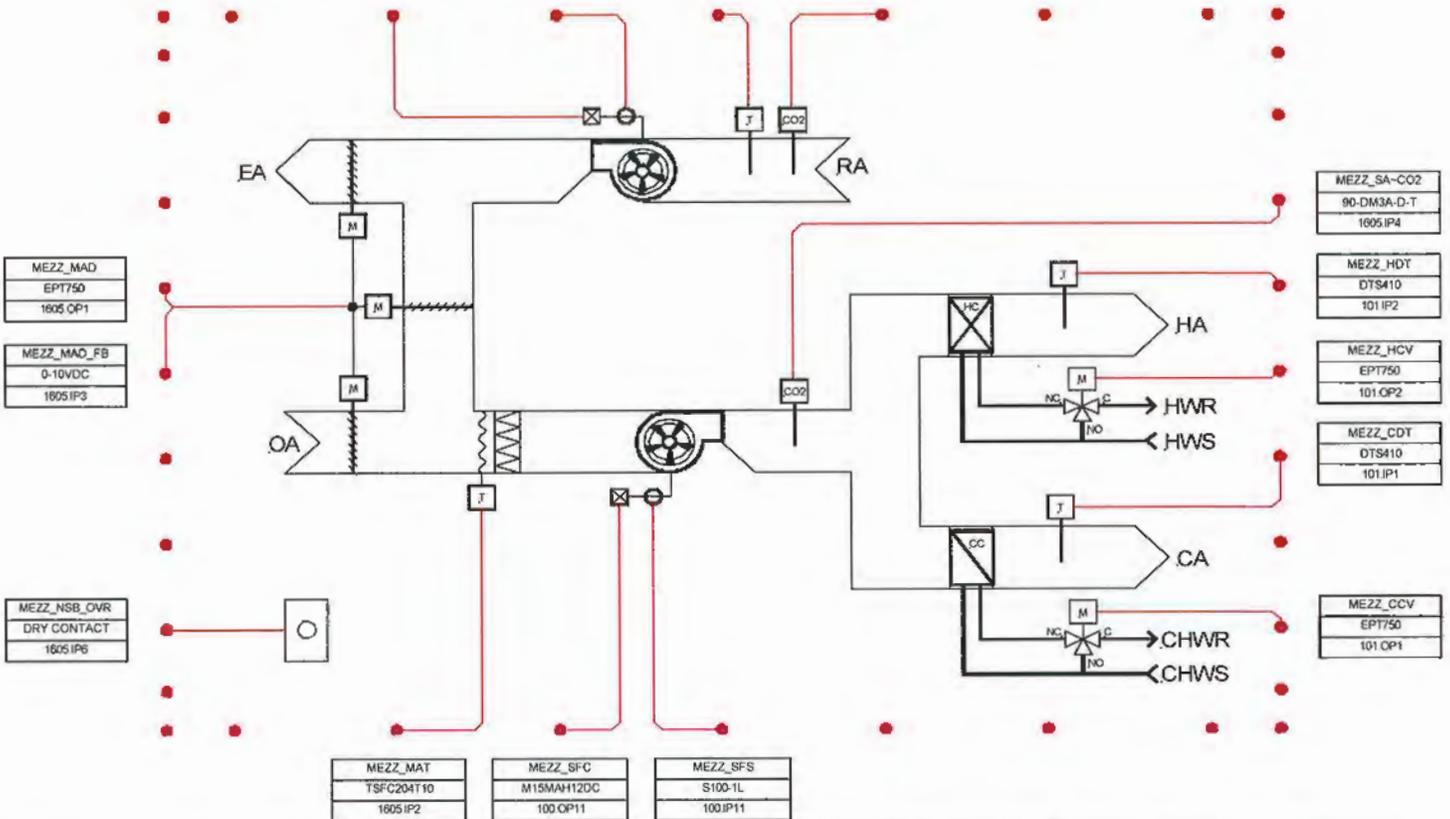
B2-7



Harry Stevens Building

System Drawings Report

| | | | |
|------------------------------------|---------------------------------|--------------------------------|--|
| MEZZ_RFC M15MAH12DC 100.OP12 | MEZZ_RFS S100-1L 100.IP12 | MEZZ_RAT DTS410 1605.IP1 | MEZZ_RA-CO2 90-DM3A-D-T 1605.IP5 |
|------------------------------------|---------------------------------|--------------------------------|--|



| | | | | | | | | | | |
|--------------------------------|------------------------------------|---|------------------------------------|------------------------------------|---------------------------------|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| MEZZ_MAD EPT750 1605.OP1 | MEZZ_MAD_FB 0-10VDC 1605.IP3 | MEZZ_NSB_OVR DRY CONTACT 1605.IP6 | MEZZ_MAT TSFC204T10 1605.IP2 | MEZZ_SFC M15MAH12DC 100.OP11 | MEZZ_SFS S100-1L 100.IP11 | MEZZ_SA-CO2 90-DM3A-D-T 1605.IP4 | MEZZ_HDT DTS410 101.IP2 | MEZZ_HCV EPT750 101.OP2 | MEZZ_CDT DTS410 101.IP1 | MEZZ_CCV EPT750 101.OP1 |
|--------------------------------|------------------------------------|---|------------------------------------|------------------------------------|---------------------------------|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|

System: **MEZZ_AHU** System Description: Mezzanine Dual Deck Air Handling Unit Control Panel: 100
 System Location: Mezzanine Mechanical Room Local Panel:



Project: 1088478
 Engineer: Wwa

Date 19-Mar-09
 Revision:

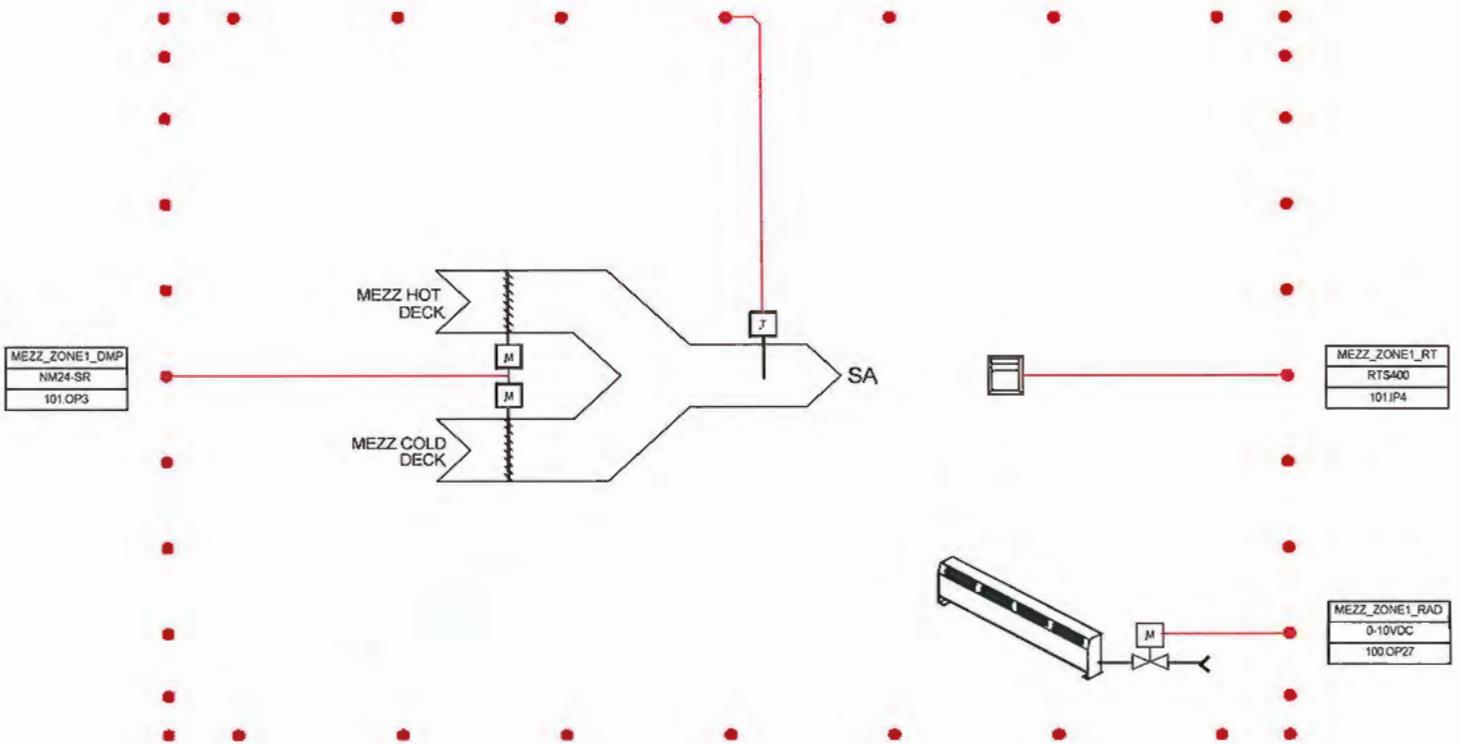
B2-8



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System Drawings Report

| |
|----------------|
| MEZZ_ZONE1_SAT |
| DTS410 |
| 101.IP3 |



System: **MEZZ_ZONE1** System Description: Mezzanine Zone 1 Dampers Control Panel: 101
 System Location: Mezzanine Mechanical Room Local Panel:



Project: 1088478
 Engineer: Wwa

Date 19-Mar-09
 Revision:

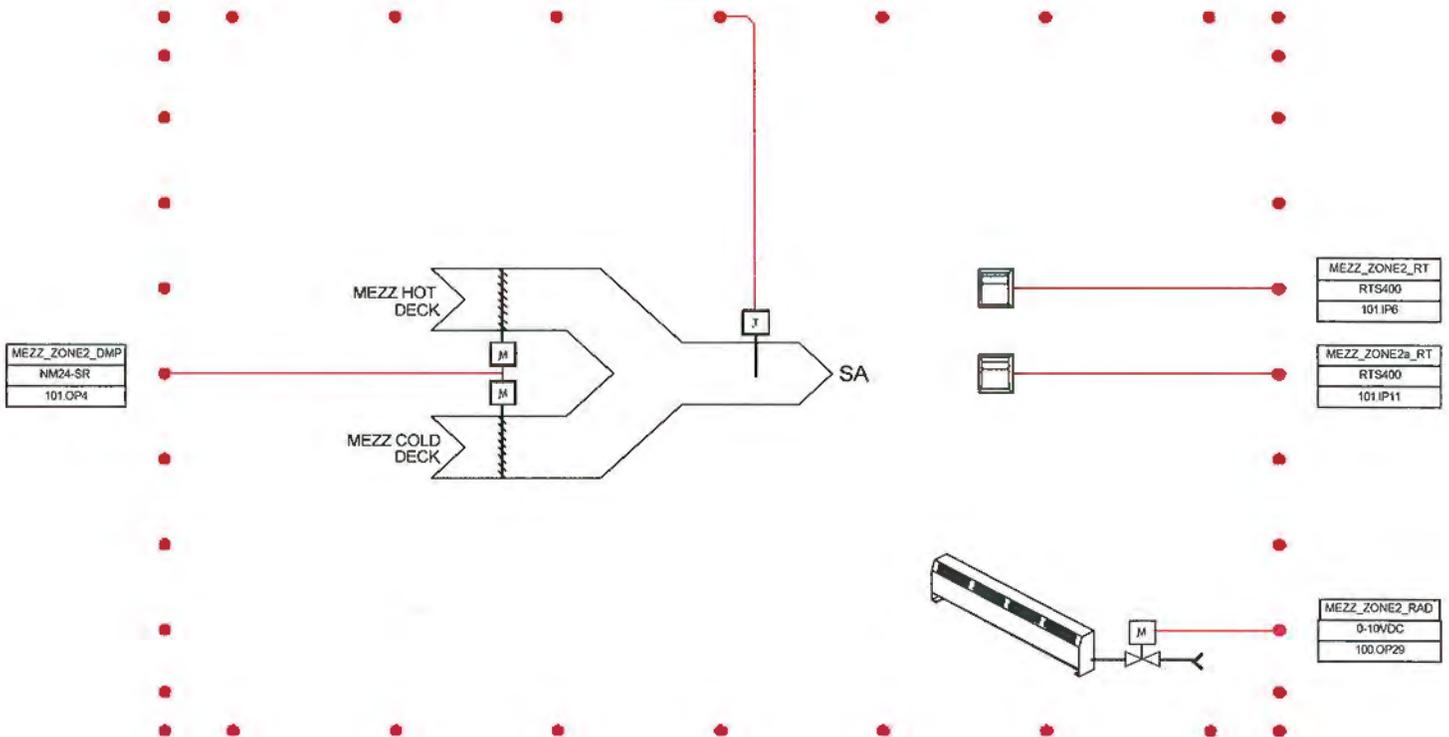
B2-9



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System Drawings Report

| |
|----------------|
| MEZZ_ZONE2_SAT |
| DTS410 |
| 101.IP5 |



System: MEZZ_ZONE2 System Description: Mezzanine Zone 1 Dampers Control Panel: 101
 System Location: Mezzanine Mechanical Room Local Panel:



Project: 1088478
 Engineer: Wva

Date 19-Mar-09
 Revision:

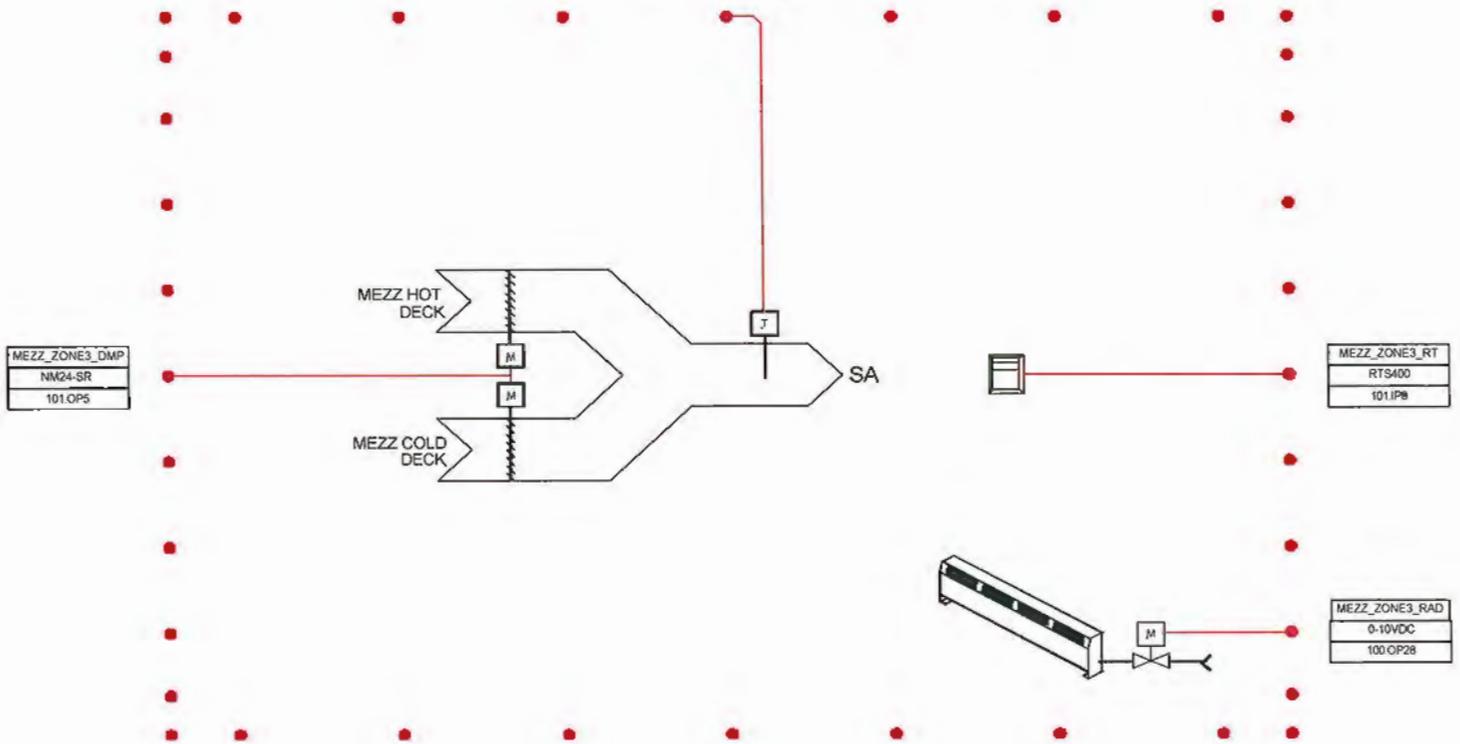
B2-10



Harry Stevens Building

System Drawings Report

| |
|----------------|
| MEZZ_ZONE3_SAT |
| DTS410 |
| 101.IP7 |



System:

MEZZ_ZONE3

System Description:

Mezzanine Zone 1 Dampers

Control Panel:

101

System Location:

Mezzanine Mechanical Room

Local Panel:



Project: 1088478
 Engineer: Wwa

Date: 19-Mar-09
 Revision:

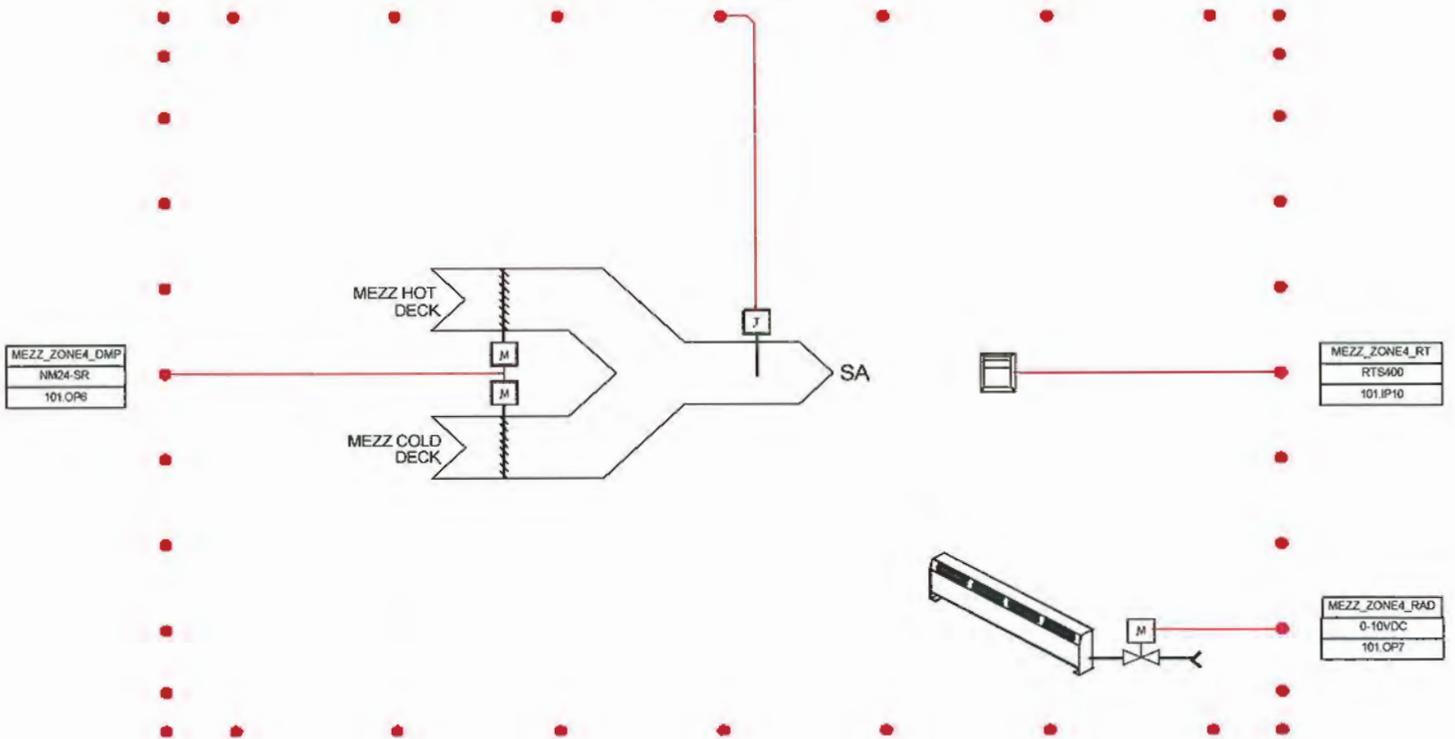
B2- 11



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System Drawings Report

| |
|----------------|
| MEZZ_ZONE4_SAT |
| DTS410 |
| 101.IP9 |



System: MEZZ_ZONE4 System Description: Mazzanine Zone 1 Dampers Control Panel: 101
 System Location: Mezzanine Mechanical Room Local Panel:



Project: 1088478
 Engineer: Wa

Date 19-Mar-09
 Revision:

B2-12



Harry Stevens Building

Control Panel Report

CP Panel: CP200 LP Panel: LP Power Panel #: CP Model No DSC-2424E
Mechanical Dwg: Enclosure Model #: Power Circuit #: Exp. Slot #1:EXP130
CP Panel Location: Penthouse Mechanical Room Exp. Slot #2:EXP161
Exp. Slot #3:EXP161

| | | | | | | | |
|----------|-----------------|--------|----------------|----------|-----------------|------------|----------------|
| 200.IP37 | PENT_ZONE6B_RTS | RTS400 | TMP 10K Device | 200.OP37 | RAOA_SA_CO2_SEL | M15MAH12DC | CTL Dry Output |
| 200.IP38 | PENT_ZONE3A_RT | RTS400 | TMP 10K Device | 200.OP38 | SPARE200_OP38 | | |
| 200.IP39 | PENT_CDT | DTS410 | TMP 10K Device | 200.OP39 | SPARE200_OP39 | | |
| 200.IP40 | PENT_ZONE7_RTS | RTS400 | TMP 10K Device | 200.OP40 | SPARE200_OP40 | | |

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Control Panel Report

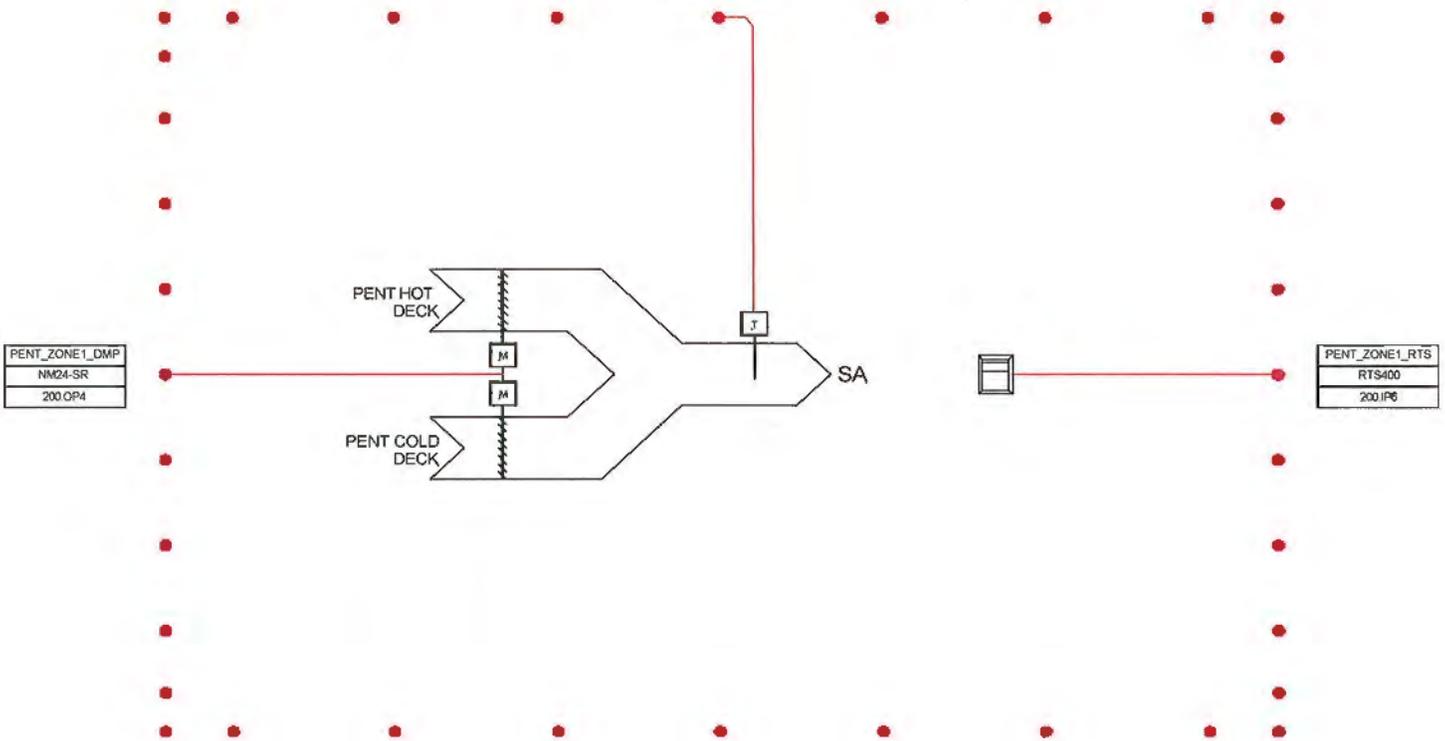
CP Panel: CP1606 **LP Panel:** LP **Power Panel #:** **CP Model No** DSC-1280
Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**
CP Panel Location: Penthouse Mechanical Room **Exp. Slot #2:**
Exp. Slot #3:

| Point # | Descriptor | Field Part | Wiring Detail | Point # | Descriptor | Field Part | Wiring Detail |
|-----------|---------------|-------------|-----------------|----------|---------------|------------|---------------|
| 1606.IP1 | PENT_SF~SpdFB | 0-10VDC | CTL VSD | 1606.OP1 | PENT_SF_EN | M15MAH12DC | CTL VSD |
| 1606.IP2 | PENT_SF_AL | DRY CONTACT | CTL VSD | 1606.OP2 | PENT_SF_SPD | 0-10VDC | CTL VSD |
| 1606.IP3 | PENT_SSP | 600D212D4 | PRE Auto600 | 1606.OP3 | PENT_RF_EN | M15MAH12DC | CTL VSD |
| 1606.IP4 | PENT_RF~SpdFB | 0-10VDC | CTL VSD | 1606.OP4 | PENT_RF_SPD | 0-10VDC | CTL VSD |
| 1606.IP5 | PENT_RF_AL | DRY CONTACT | CTL VSD | 1606.OP5 | PENT_MAD | EPT750 | CTL EPT |
| 1606.IP6 | PENT_OadFB | 0-10VDC | ACT Bel_MOD_F | 1606.OP6 | SPARE1606_OP6 | | |
| 1606.IP7 | PENT_RAT | DTS410 | TMP 10K Device | 1606.OP7 | SPARE1606_OP7 | | |
| 1606.IP8 | PENT_MAT | TSFC204T10 | TMP 10K Device | 1606.OP8 | SPARE1606_OP8 | | |
| 1606.IP9 | PENT_SA~CO2 | 90-DM3A-D-T | GAS Vulcain | | | | |
| 1606.IP10 | PENT_RA~CO2 | 90-DM3A-D-T | GAS Vulcain | | | | |
| 1606.IP11 | PENT_NSB_OVR | DRY CONTACT | FBK Dry Contact | | | | |
| 1606.IP12 | PENT_RadFB | 0-10VDC | ACT Bel_MOD_F | | | | |

Harry Stevens Building

System Drawings Report

| |
|----------------|
| PENT_ZONE1_SAT |
| DTS410 |
| 200 IPS |



System: PENT_ZONE1 System Description: Penthouse Zone 1 Dampers Control Panel: 200
 System Location: Penthouse Mechanical Room Local Panel:



Project: 1088478
 Engineer: Waa

Date 19-Mar-09
 Revision:

C2-2

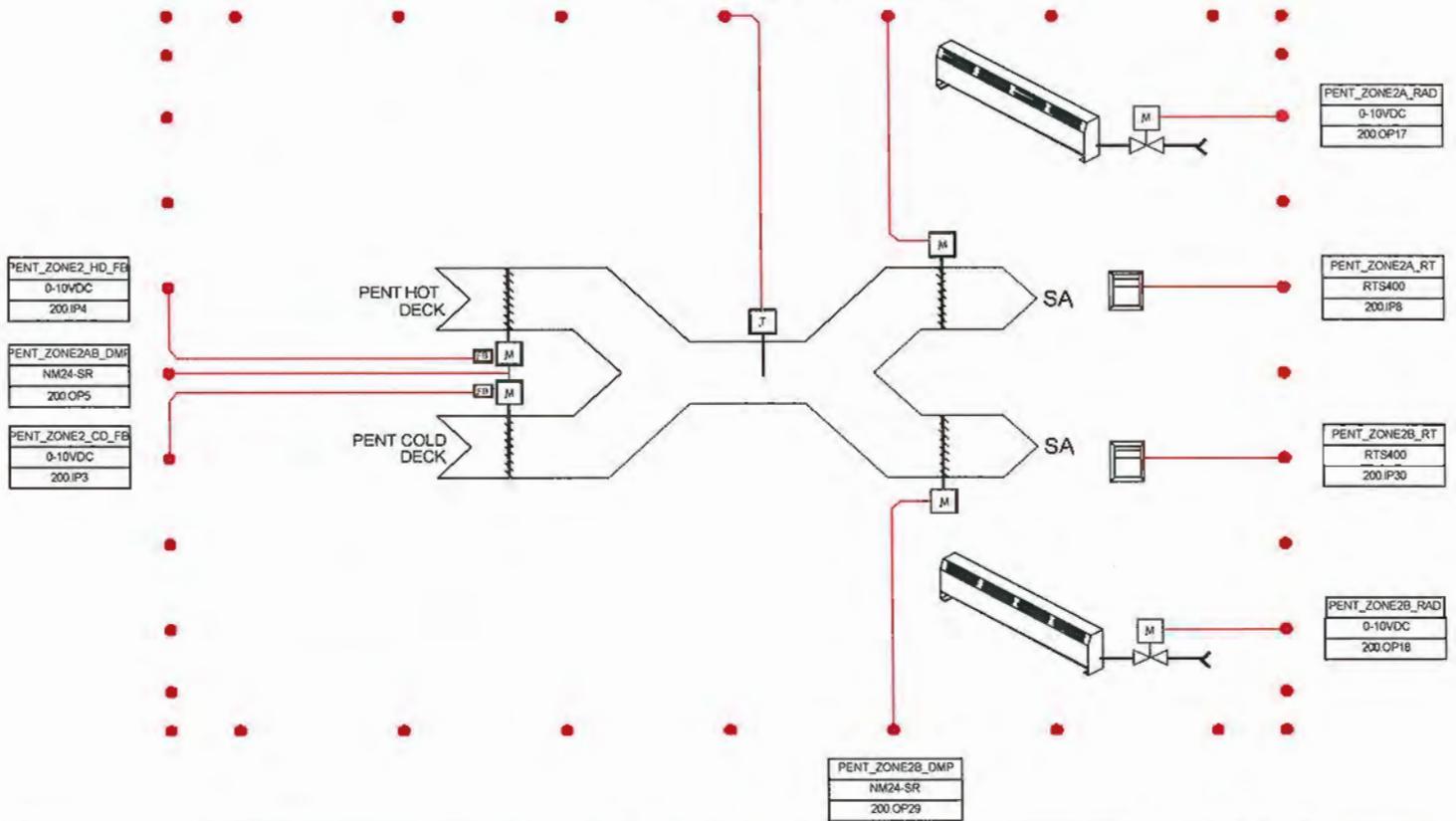


Harry Stevens Building

System Drawings Report

| |
|------------------|
| PENT_ZONE2AB_SAT |
| DTS410 |
| 200 IP7 |

| |
|-----------------|
| PENT_ZONE2A_DMP |
| NM24-SR |
| 200 OP28 |



| |
|------------------|
| PENT_ZONE2_HD_FB |
| 0-10VDC |
| 200 IP4 |

| |
|------------------|
| PENT_ZONE2AB_DMP |
| NM24-SR |
| 200 OP5 |

| |
|------------------|
| PENT_ZONE2_CD_FB |
| 0-10VDC |
| 200 IP3 |

| |
|-----------------|
| PENT_ZONE2A_RAD |
| 0-10VDC |
| 200 OP17 |

| |
|----------------|
| PENT_ZONE2A_RT |
| RTS400 |
| 200 IP8 |

| |
|----------------|
| PENT_ZONE2B_RT |
| RTS400 |
| 200 IP30 |

| |
|-----------------|
| PENT_ZONE2B_RAD |
| 0-10VDC |
| 200 OP18 |

| |
|-----------------|
| PENT_ZONE2B_DMP |
| NM24-SR |
| 200 OP29 |

System: PENT_ZONE2 System Description: Penthouse Zone 2 Dampers Control Panel: 200
 System Location: Penthouse Mechanical Room Local Panel:



Project: 1088478
 Engineer: Wwa

Date: 19-Mar-09
 Revision:

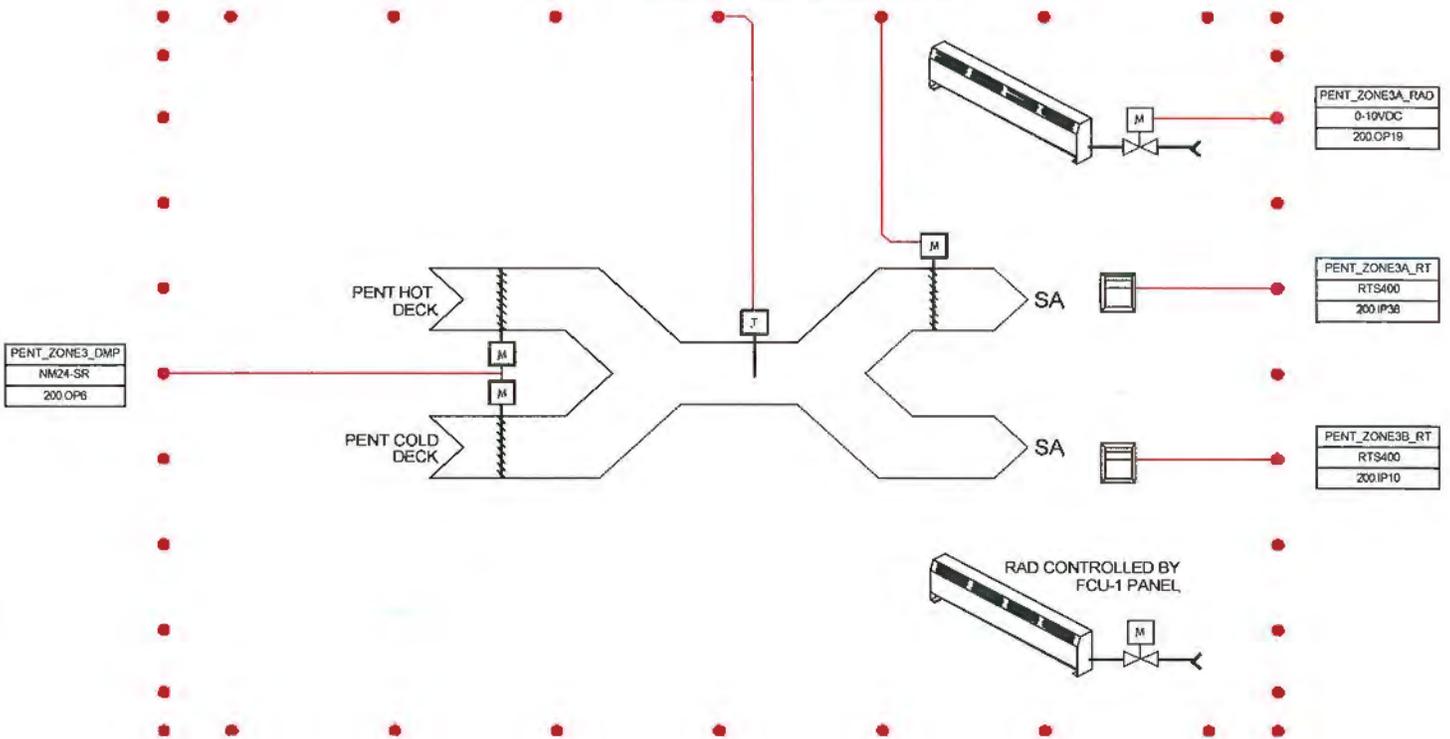
C2-3



Harry Stevens Building

System Drawings Report

| | |
|----------------|-----------------|
| PENT_ZONE3_SAT | PENT_ZONE3A_DMP |
| DYS410 | NM24-SR |
| 200 IP9 | 200 OP31 |



System: PENT_ZONE3 System Description: Penthouse Zone 3 Dampers Control Panel: 200
 System Location: Penthouse Mechanical Room Local Panel:



Project: 1088478
 Engineer: Wwa

Date: 19-Mar-09
 Revision:

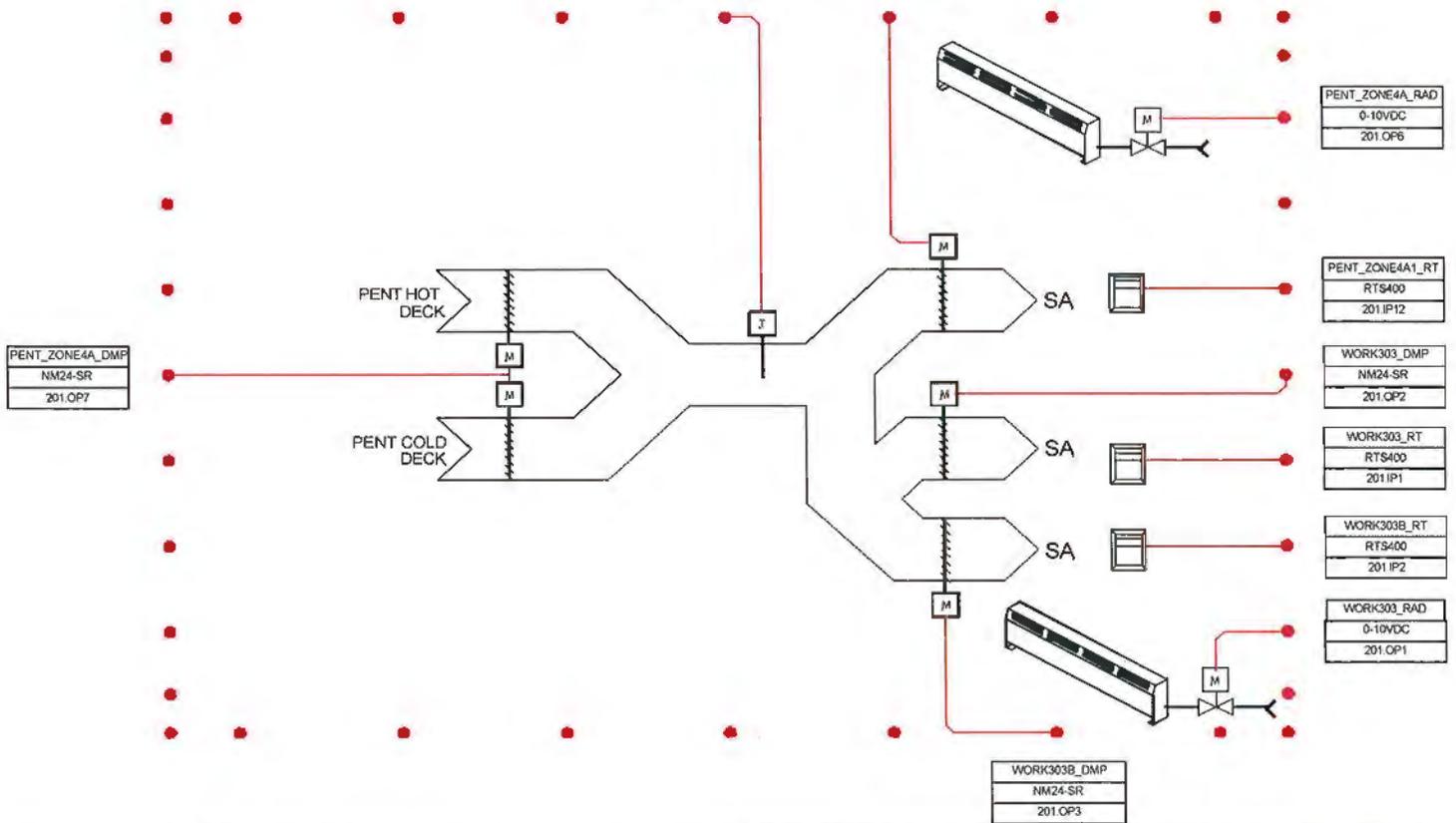
C2-4



Harry Stevens Building

System Drawings Report

| | |
|-----------------|------------------|
| PENT_ZONE4A_SAT | PENT_ZONE4A1_DMP |
| DTS410 | NM24-SR |
| 201.IP11 | 201.OP8 |



System:

PENT_ZONE4A

System Description:

Penthouse Zone 4A Dampers

Control Panel:

201

System Location:

Penthouse Mechanical Room

Local Panel:



Project: 1088478
 Engineer: Wwa

Date 19-Mar-09
 Revision:

C2- 5



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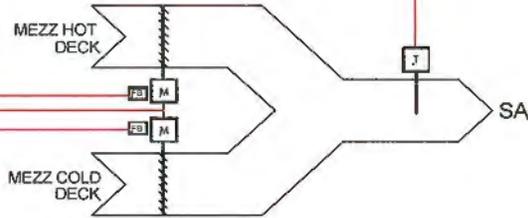
System Drawings Report

| |
|-----------------|
| PENT_ZONE4B_SAT |
| DTS410 |
| 200.IP27 |

| |
|------------------|
| PENT_ZONE4B_HDFE |
| 0-10VDC |
| 200.IP12 |

| |
|-----------------|
| PENT_ZONE4B_DMP |
| NM24-SR |
| 200.OP15 |

| |
|------------------|
| PENT_ZONE4B_CDFE |
| 0-10VDC |
| 200.IP11 |



| |
|-----------------|
| PENT_ZONE4B_RTS |
| RTS400 |
| 200.IP28 |

System: PENT_ZONE4B System Description: Penthouse Zone 4B Dampers Control Panel: 200
 System Location: Penthouse Mechanical Room Local Panel:



Project: 1088478
 Engineer: Wae

Date 19-Mar-09
 Revision:

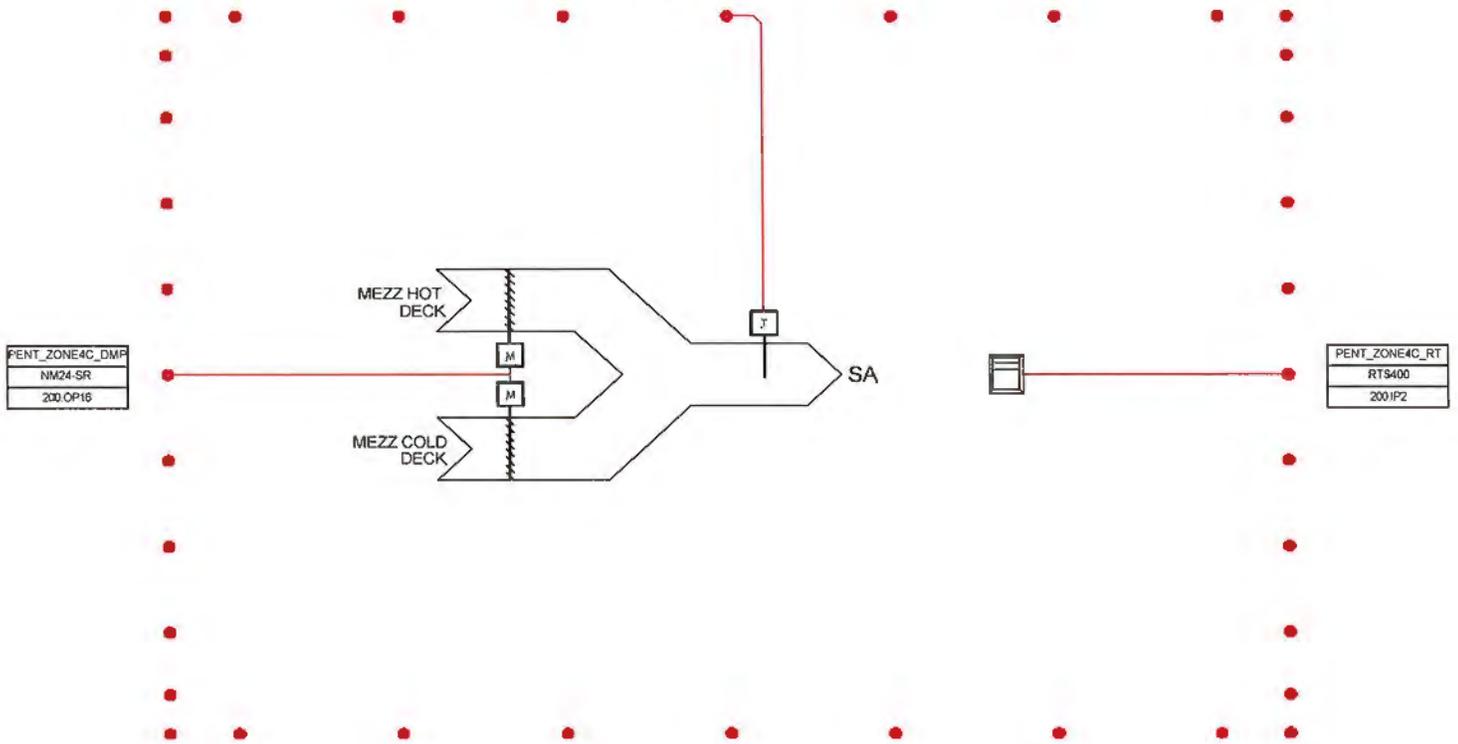
C2-6



Harry Stevens Building

System Drawings Report

| |
|-----------------|
| PENT_ZONE4C_SAT |
| DTS410 |
| 200IP34 |



System: PENT_ZONE4C System Description: Penthouse Zone 4C Dampers Control Panel: 200
 System Location: Penthouse Mechanical Room Local Panel:



Project: 1088478
 Engineer: Wwa

Date 19-Mar-09
 Revision:

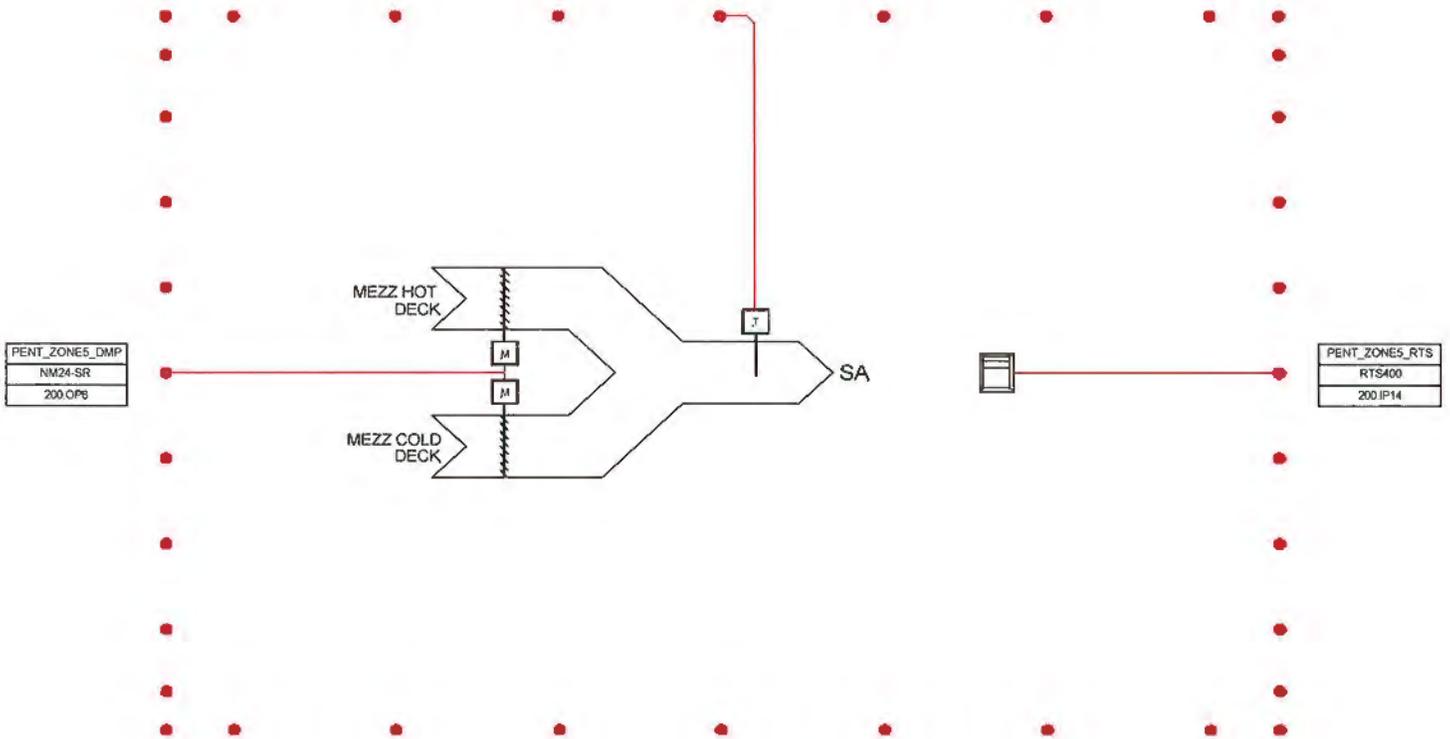
C2-7



Harry Stevens Building

System Drawings Report

| |
|----------------|
| PENT_ZONES_SAT |
| DTS410 |
| 200IP13 |

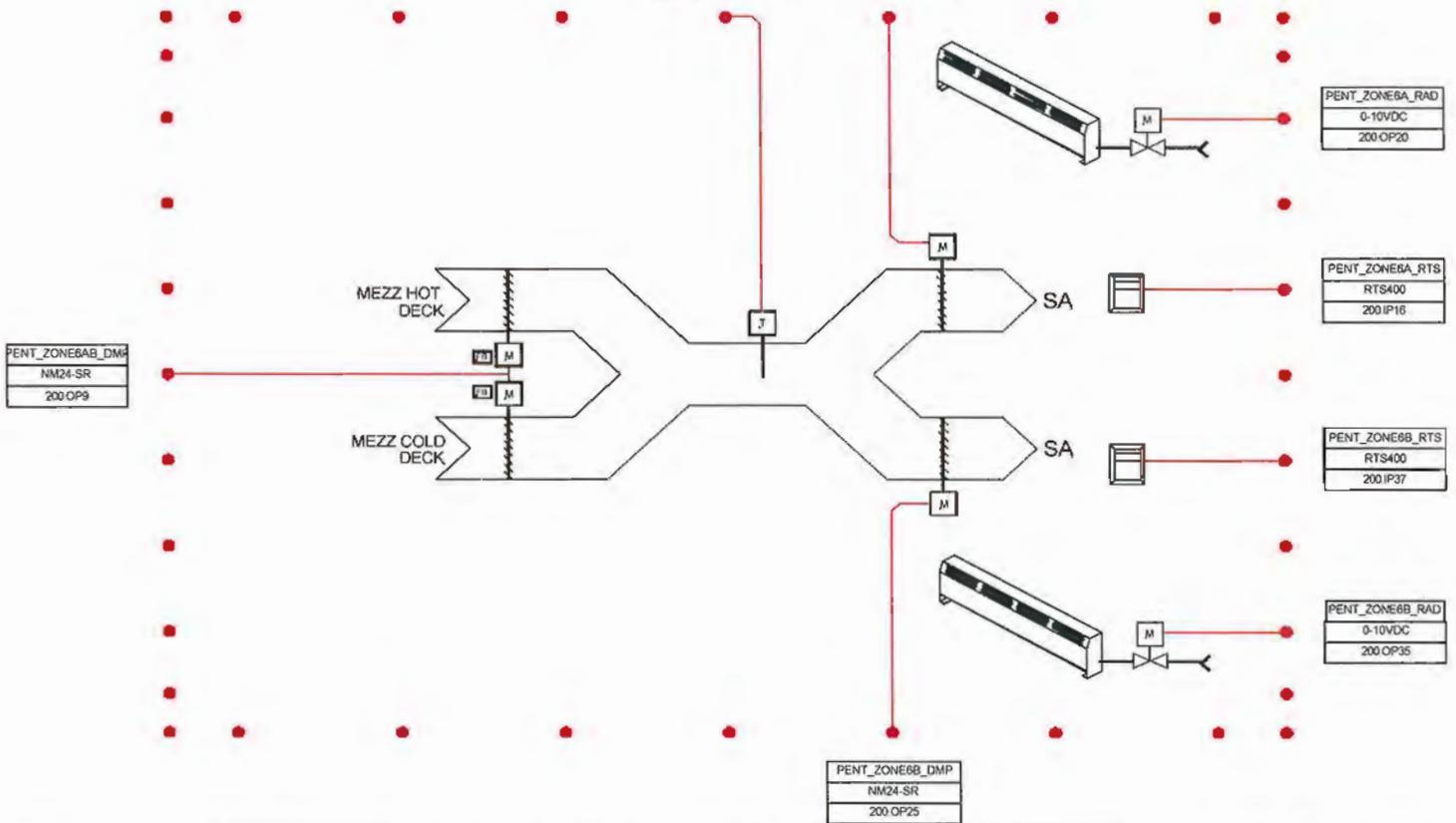


| | | | | | |
|-------------------|---------------------------|---------------------|--------------------------|----------------|----------------------|
| System: | PENT_ZONES5 | System Description: | Penthouse Zone 5 Dampers | Control Panel: | 200 |
| System Location: | Penthouse Mechanical Room | Date: | 19-Mar-09 | Local Panel: | |
| ESC AUTOMATION | Project: 1088478 | Engineer: WJa | Revision: | C2-8 | Delta CORPORATION |

Harry Stevens Building

System Drawings Report

| | |
|------------------|-----------------|
| PENT_ZONE6AB_SAT | PENT_ZONE6A_DMP |
| DTS410 | NM24-SR |
| 200.IP15 | 200.OP24 |



System: PENT_ZONE6 System Description: Penthouse Zone 6 Dampers Control Panel: 200
 System Location: Penthouse Mechanical Room Local Panel:



Project: 1088478
 Engineer: Wa

Date: 19-Mar-09
 Revision:

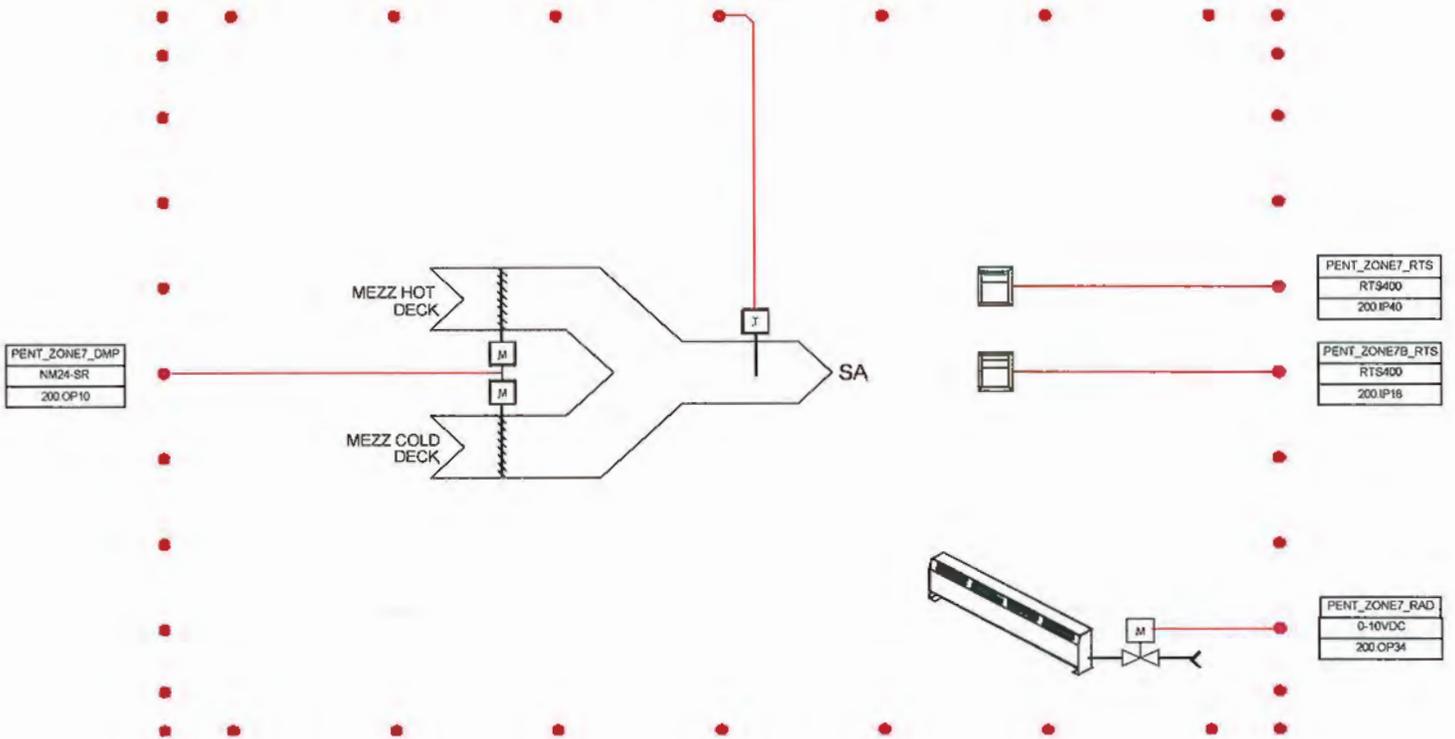
C2-9



Harry Stevens Building

System Drawings Report

| |
|----------------|
| PENT_ZONE7_SAT |
| DTS410 |
| 200.IP17 |



System: PENT_ZONE7 System Description: Penthouse Zone 7 Dampers Control Panel: 200
 System Location: Penthouse Mechanical Room Local Panel:



Project: 1088478
 Engineer: Wwa

Date: 19-Mar-09
 Revision:

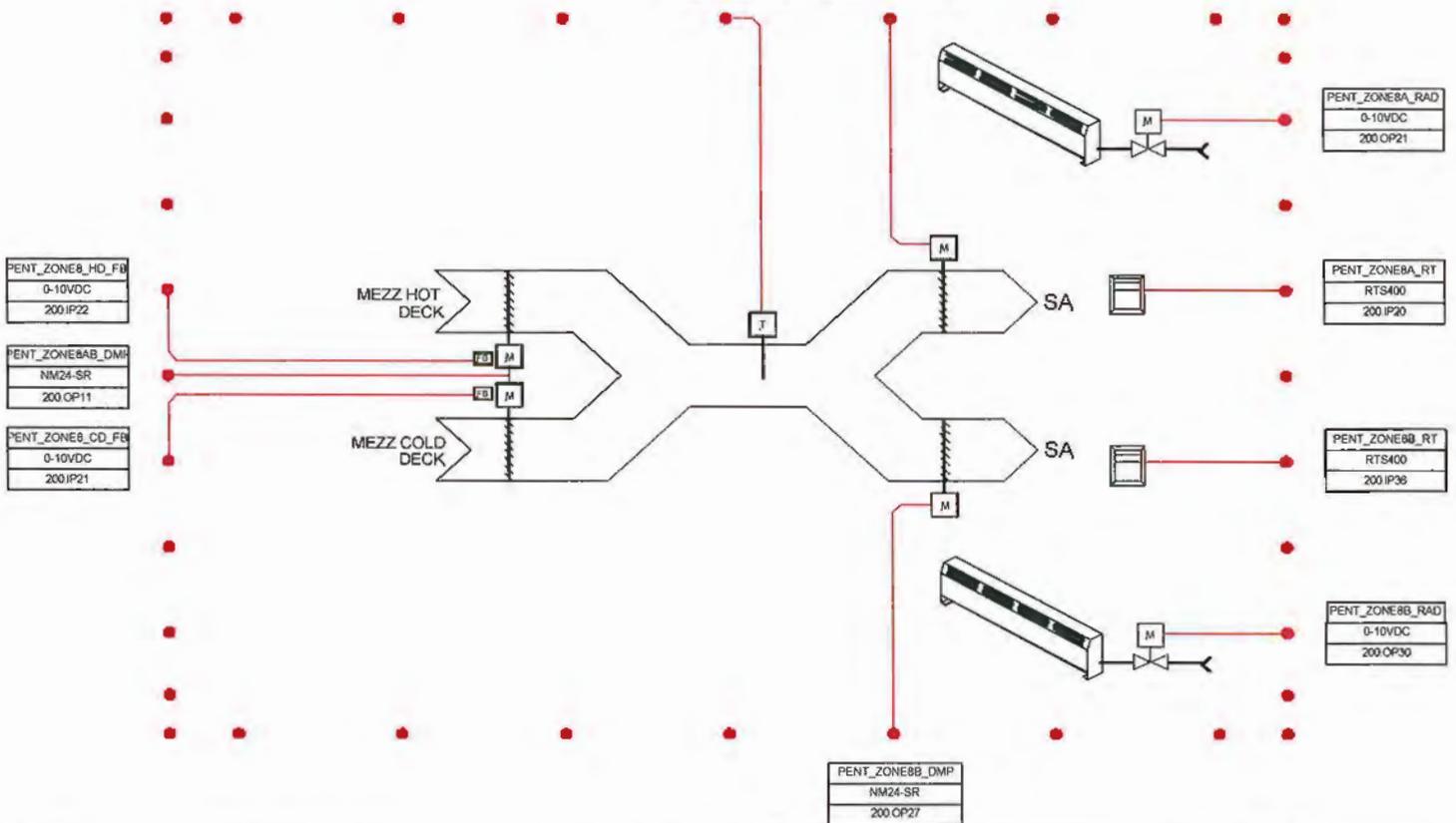
C2-10



Harry Stevens Building

System Drawings Report

| | |
|------------------|-----------------|
| PENT_ZONE8AB_SAT | PENT_ZONE8A_DMP |
| DTS410 | NM24-SR |
| 200.IP19 | 200.OP26 |



System: PENT_ZONE8 System Description: Penthouse Zone 8 Dampers Control Panel: 200
 System Location: Penthouse Mechanical Room Local Panel:



Project: 1088478
 Engineer: Waa

Date 19-Mar-09
 Revision:

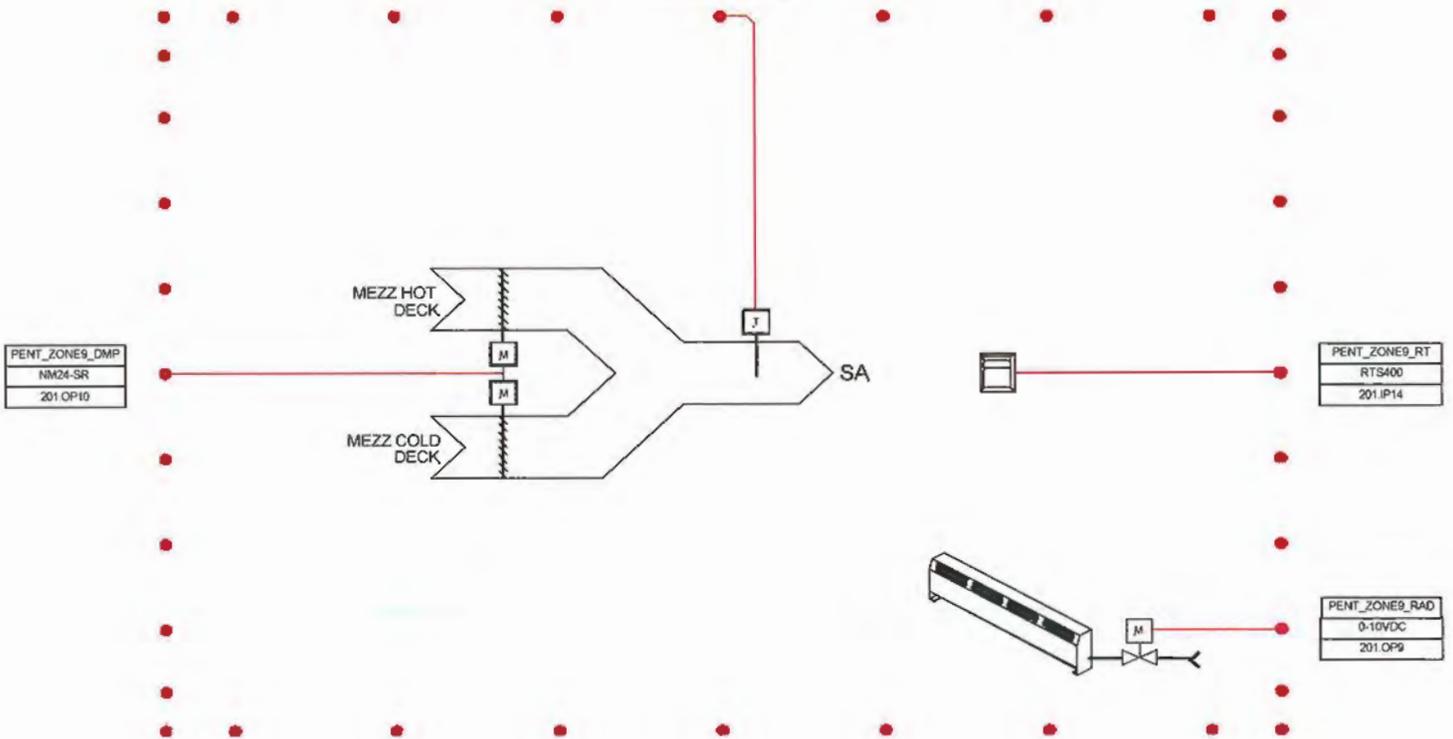
C2-11



Harry Stevens Building

System Drawings Report

| |
|----------------|
| PENT_ZONE9_SAT |
| DTS410 |
| 201.IP13 |



System: PENT_ZONE9 System Description: Penthouse Zone 9 Dampers Control Panel: 201
 System Location: Penthouse Mechanical Room Local Panel:



Project: 1088478
 Engineer: Wwa

Date: 19-Mar-09
 Revision:

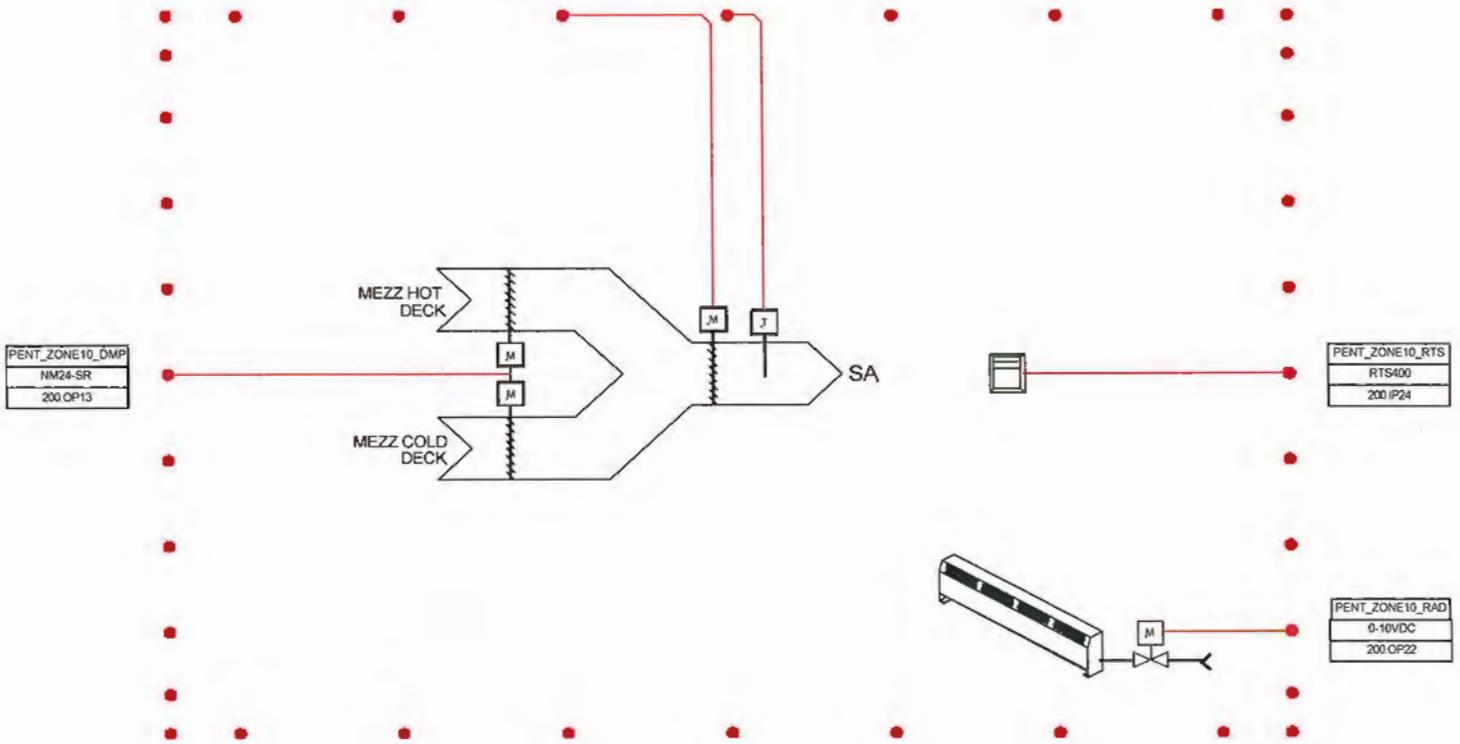
C2-12



Harry Stevens Building

System Drawings Report

| | |
|------------------|-----------------|
| PENT_ZONE10A_DMP | PENT_ZONE10_SAT |
| NM24-SR | DTS410 |
| 200 OP33 | 200 IP23 |



System: PENT_ZONE10 System Description: Penthouse Zone 10 Dampers Control Panel: 200
 System Location: Penthouse Mechanical Room Local Panel:



Project: 1088478
 Engineer: Wwa

Date 19-Mar-09
 Revision:

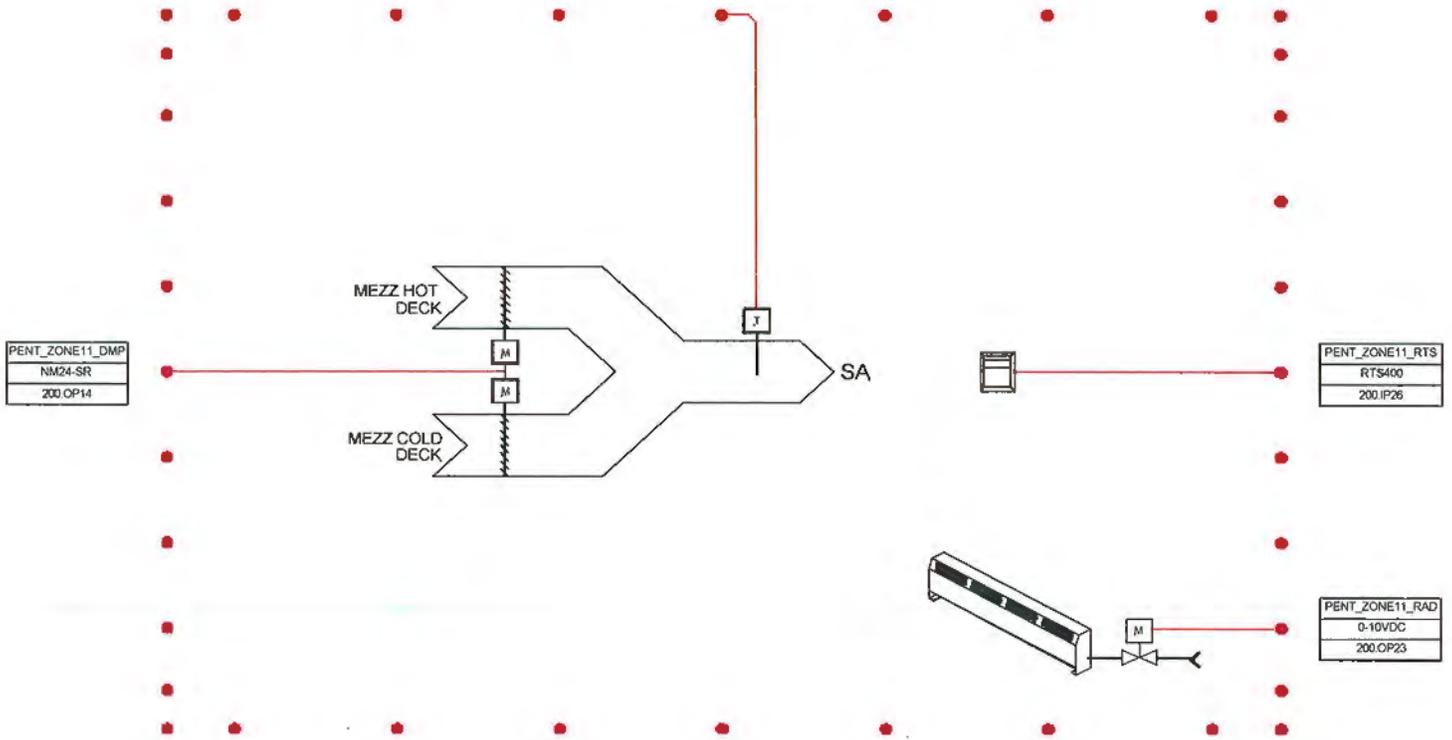
C2-13



Harry Stevens Building

System Drawings Report

| |
|-----------------|
| PENT_ZONE11_SAT |
| DTS410 |
| 200.IP25 |



| | | | | | |
|------------------|---------------------------|---------------------|---------------------------|----------------|-----|
| System: | PENT_ZONE11 | System Description: | Penthouse Zone 11 Dampers | Control Panel: | 200 |
| System Location: | Penthouse Mechanical Room | | | Local Panel: | |



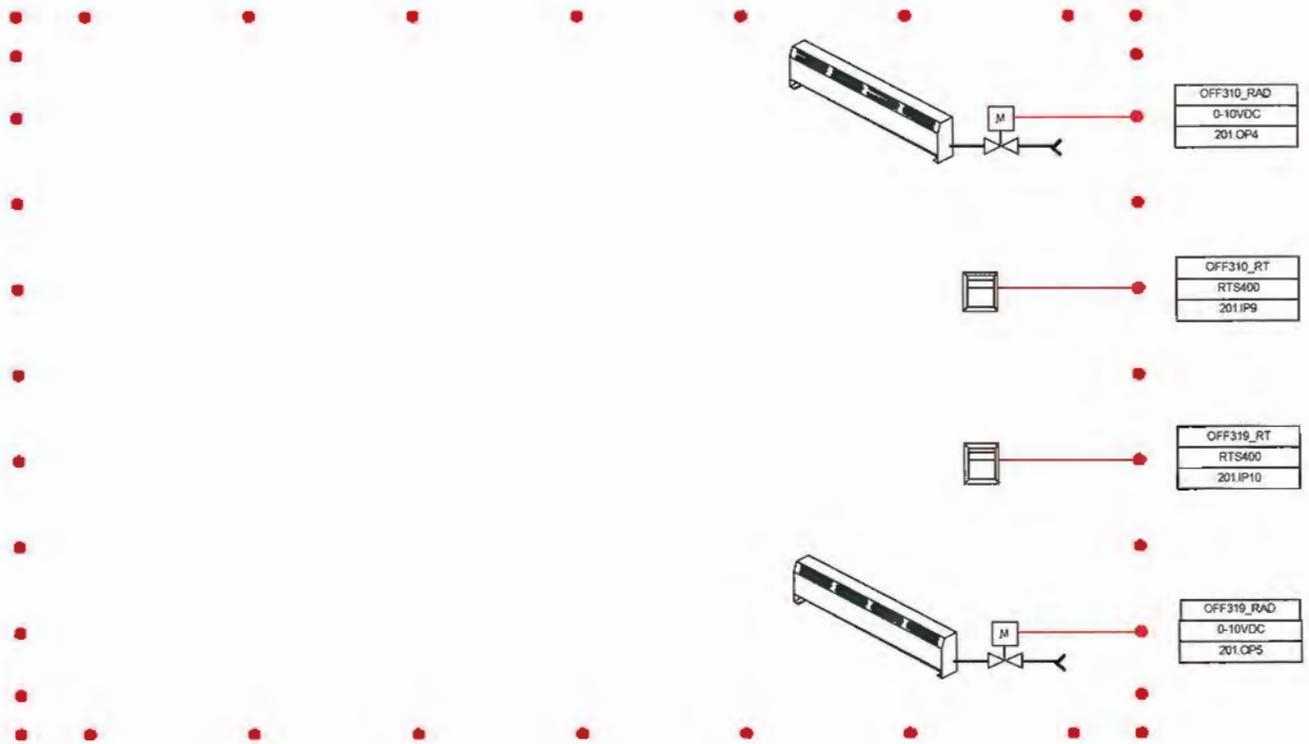
Project: 1088478
 Date: 19-Mar-09
 Engineer: Wg
 Revision:

C2- 14



Harry Stevens Building

System Drawings Report



| | | | | | |
|---|---------------------|---------------------|---------------------------|----------------|---|
| System: | OFF_RAD | System Description: | Penitence Zone 4A Dampers | Control Panel: | 201 |
| System Location: | Offices 310 and 319 | | | Local Panel: | |
|  | Project: | 1088478 | Date | 19-Mar-09 |  |
| | Engineer: | Wwa | Revision: | | |

C2-15

Harry Stevens Building

System Drawings Report

| | | | | |
|------------|-------------|------------|----------|----------|
| EAST_SOLAR | SOUTH_SOLAR | WEST_SOLAR | SE_SOLAR | SW_SOLAR |
| 0-SVDC | 0-SVDC | 0-SVDC | 0-SVDC | 0-SVDC |
| 201.IP3 | 201.IP4 | 201.IP5 | 201.IP6 | 201.IP7 |



| | | | | | |
|-------------------------|---------------------------|----------------------------|---------------------|-----------------------|-----|
| System: | SOLAR | System Description: | Solar Points | Control Panel: | 201 |
| System Location: | Penthouse Mechanical Room | | Local Panel: | | |
| Project: | 1088478 | Date: | 19-Mar-09 | C2- 16 | |
| Engineer: | Wg | Revision: | | | |



Harry Stevens Building

Control Panel Report

CP Panel: CP1603 **LP Panel:** LP **Power Panel #:** **CP Model No** DLC-312
Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**
CP Panel Location: Level 2 Panel BD Lighting **Exp. Slot #2:**
Exp. Slot #3:

| Point # | Descriptor | Field Part | Wiring Detail | Point # | Descriptor | Field Part | Wiring Detail |
|----------|---------------|------------|---------------|-----------|------------------|------------|---------------|
| 1603.IP1 | SPARE1603_AI1 | | | 1603.OP1 | Floor 2 BD_A Ltg | TERM PT | LTG_DLC_OP |
| 1603.IP2 | SPARE1603_BI2 | | | 1603.OP2 | Floor 2 BD_B Ltg | TERM PT | LTG_DLC_OP |
| 1603.IP3 | SPARE1603_BI3 | | | 1603.OP3 | SPARE1603_OP3 | | |
| 1603.IP4 | SPARE1603_BI4 | | | 1603.OP4 | SPARE1603_OP4 | | |
| | | | | 1603.OP5 | SPARE1603_OP5 | | |
| | | | | 1603.OP6 | SPARE1603_OP6 | | |
| | | | | 1603.OP7 | SPARE1603_OP7 | | |
| | | | | 1603.OP8 | SPARE1603_OP8 | | |
| | | | | 1603.OP9 | SPARE1603_OP9 | | |
| | | | | 1603.OP10 | SPARE1603_OP10 | | |
| | | | | 1603.OP11 | SPARE1603_OP11 | | |
| | | | | 1603.OP12 | SPARE1603_OP12 | | |

Harry Stevens Building

Control Panel Report

CP Panel: CP1604 **LP Panel:** LP **Power Panel #:** **CP Model No** DLC-312
Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**
CP Panel Location: Level 3 Panel CD Lighting **Exp. Slot #2:**
Exp. Slot #3:

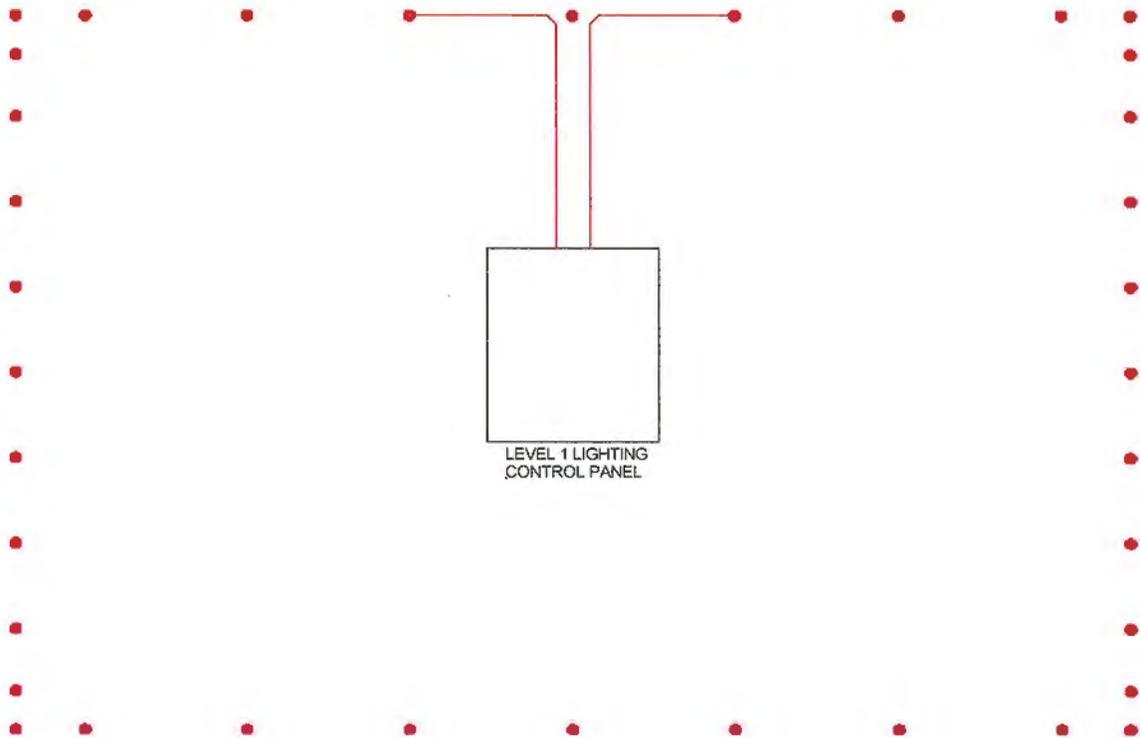
| Point # | Descriptor | Field Part | Wiring Detail | Point # | Descriptor | Field Part | Wiring Detail |
|----------|---------------|------------|---------------|-----------|------------------|------------|---------------|
| 1604.IP1 | SPARE1604_AI1 | | | 1604.OP1 | Floor 3 CD_A Ltg | TERM PT | LTG_DLC_OP |
| 1604.IP2 | SPARE1604_BI2 | | | 1604.OP2 | Floor 3 CD_B Ltg | TERM PT | LTG_DLC_OP |
| 1604.IP3 | SPARE1604_BI3 | | | 1604.OP3 | Floor 3 CF_A Ltg | TERM PT | LTG_DLC_OP |
| 1604.IP4 | SPARE1604_BI4 | | | 1604.OP4 | Floor 3 CF_B Ltg | TERM PT | LTG_DLC_OP |
| | | | | 1604.OP5 | Floor 3 CB_A Ltg | TERM PT | LTG_DLC_OP |
| | | | | 1604.OP6 | Floor 3 CB_B Ltg | TERM PT | LTG_DLC_OP |
| | | | | 1604.OP7 | SPARE_1604_OP7 | | |
| | | | | 1604.OP8 | SPARE_1604_OP8 | | |
| | | | | 1604.OP9 | SPARE_1604_OP9 | | |
| | | | | 1604.OP10 | SPARE_1604_OP10 | | |
| | | | | 1604.OP11 | SPARE_1604_OP11 | | |
| | | | | 1604.OP12 | SPARE_1604_OP12 | | |

Harry Stevens Building

System Drawings Report

| |
|-------------|
| Floor 1ALTG |
| TERM PT |
| 1602 OP1 |

| |
|-------------|
| Floor 1BLTG |
| TERM PT |
| 1602 OP2 |

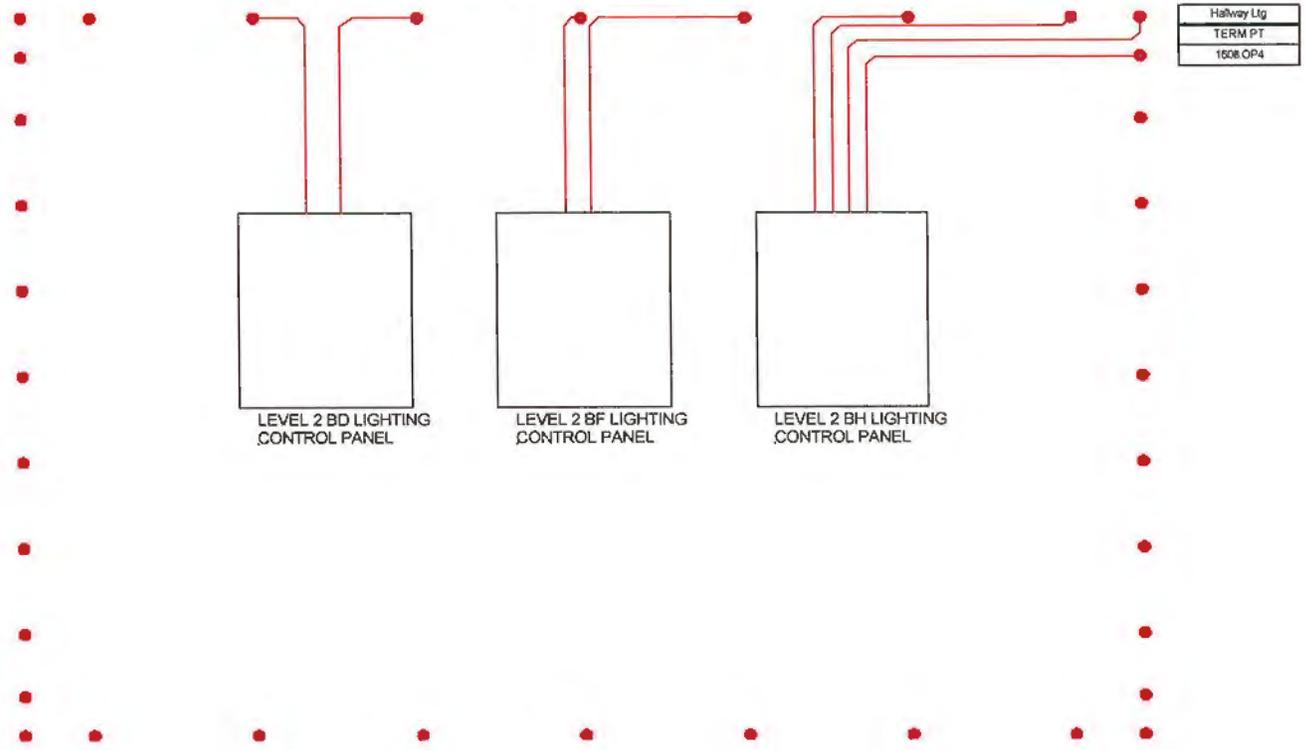


| | | | | | |
|--------------------------|-------------------------|----------------------------|--------------------------|-----------------------|------|
| System: | L1_LTG | System Description: | Level 1 Lighting Control | Control Panel: | 1602 |
| System Location: | Level 1 | | | Local Panel: | |
| ESC AUTOMATION | Project: 1088478 | Date: 19-Mar-09 | | D2- 1 | |
| | Engineer: Wwa | Revision: | | | |

Harry Stevens Building

System Drawings Report

| | | | | | | |
|------------------|------------------|------------------|------------------|------------------|----------------|-----------------|
| Floor 2 BD_A Ltg | Floor 2 BD_B Ltg | Floor 2 BF_A Ltg | Floor 2 BF_B Ltg | Floor 2 BH_B Ltg | Lunch Room Ltg | Locker Room Ltg |
| TERM PT | TERM PT | TERM PT |
| 1603.OP1 | 1603.OP2 | 1607.OP1 | 1607.OP2 | 1608.OP2 | 1606.OP1 | 1606.OP3 |

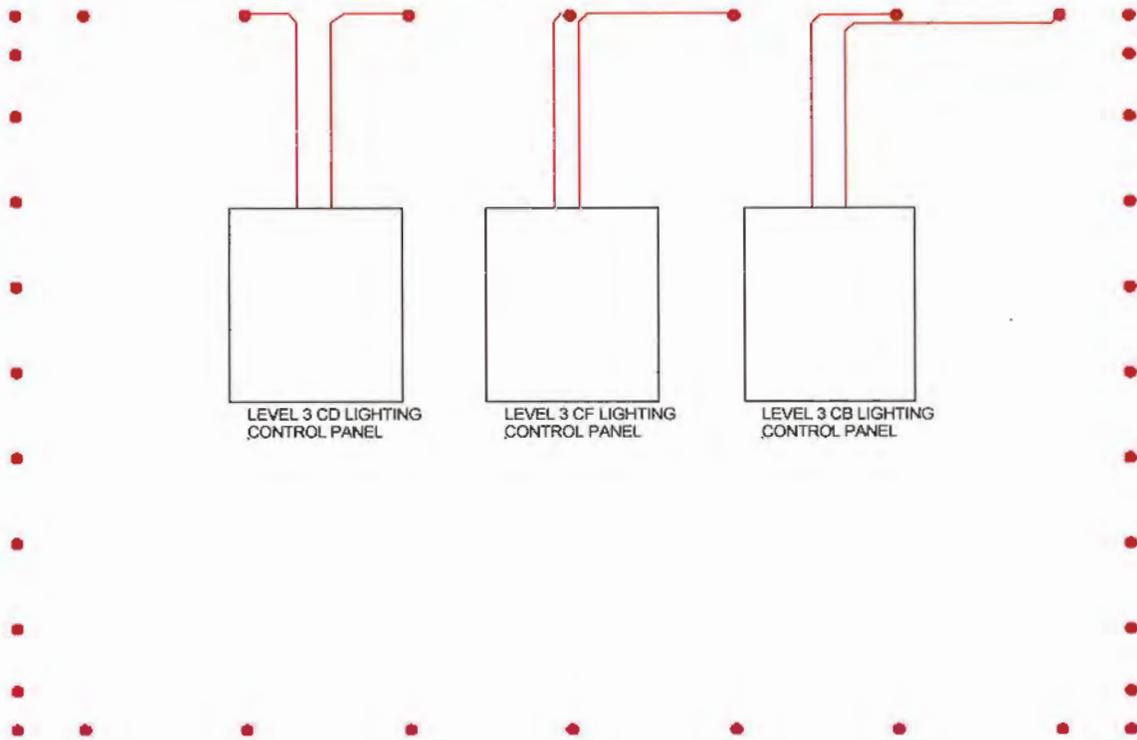


| | | | | | |
|--------------------------|------------------|---------------------|--------------------------|----------------|--------------------------|
| System: | L2_LTG | System Description: | Level 2 Lighting Control | Control Panel: | 1603 |
| System Location: | Level 2 | | | Local Panel: | |
| ESC AUTOMATION | Project: 1088478 | Date: 19-Mar-09 | | D2-2 | Delta CONTROLS |
| | Engineer: Wwa | Revision: | | | |

Harry Stevens Building

System Drawings Report

| | | | | | |
|------------------|------------------|------------------|------------------|------------------|------------------|
| Floor 3 CD_A Lig | Floor 3 CD_B Lig | Floor 3 CF_A Lig | Floor 3 CF_B Lig | Floor 3 CB_A Lig | Floor 3 CB_B Lig |
| TERM PT |
| 1604.OP1 | 1604.OP2 | 1604.OP3 | 1604.OP4 | 1604.OP5 | 1604.OP6 |



| | | | | | |
|-------------------|------------------|---------------------|--------------------------|----------------|------|
| System: | L3_LTG | System Description: | Level 3 Lighting Control | Control Panel: | 1604 |
| System Location: | Level 3 | | | Local Panel: | |
| ESC AUTOMATION | Project: 1088478 | Date: 19-Mar-09 | | D2-3 | |
| | Engineer: Wwa | Revision: | | | |

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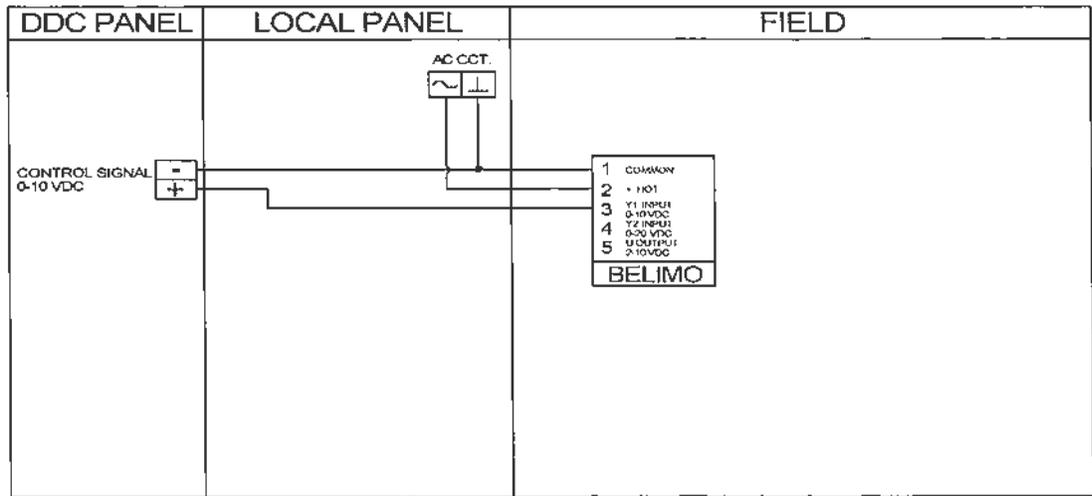
Wiring Details (Single) Report

Wiring Detail:

ACT Bel_MOD

Wiring Detail Description:

Wiring Detail
Belimo Actuator
Modulating.

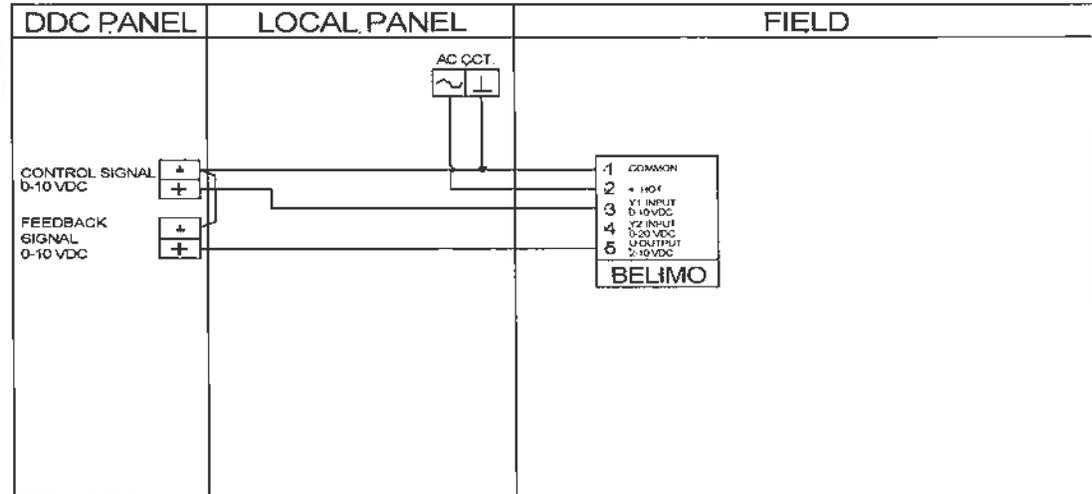


Wiring Detail:

ACT Bel_MOD_FB

Wiring Detail Description:

Wiring Detail
Belimo Actuator
Modulating with
Feedback.

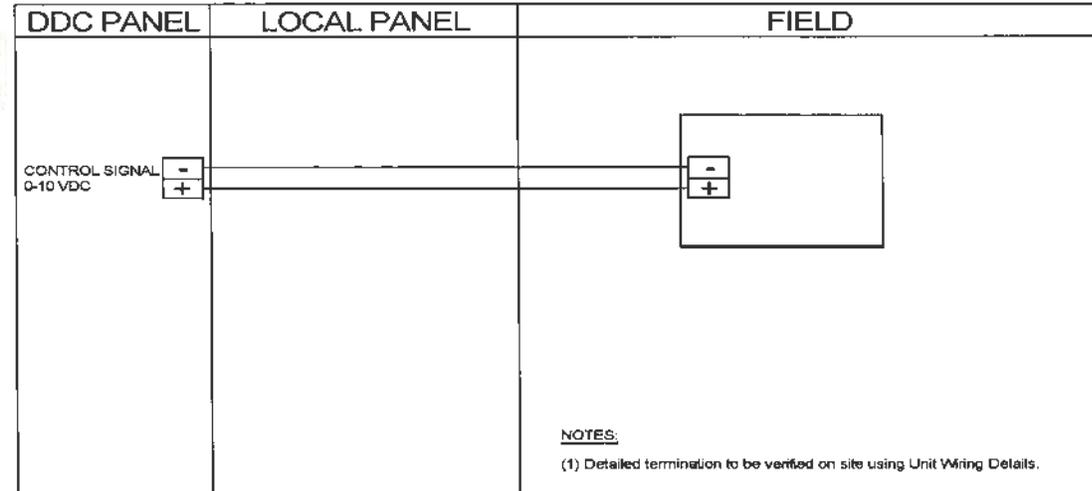


Wiring Detail:

CTL Analog
Output

Wiring Detail Description:

Wiring Detail
Analog Output.



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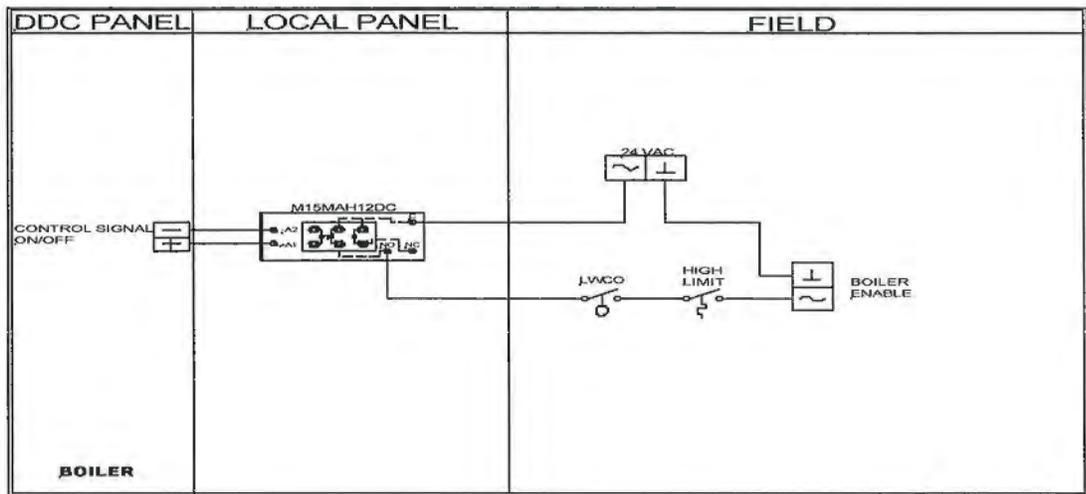
Wiring Details (Single) Report

Wiring Detail:

CTL Boiler

Wiring Detail Description:

Wiring Detail Boiler Enable Controlled by 0-10VDC Output.

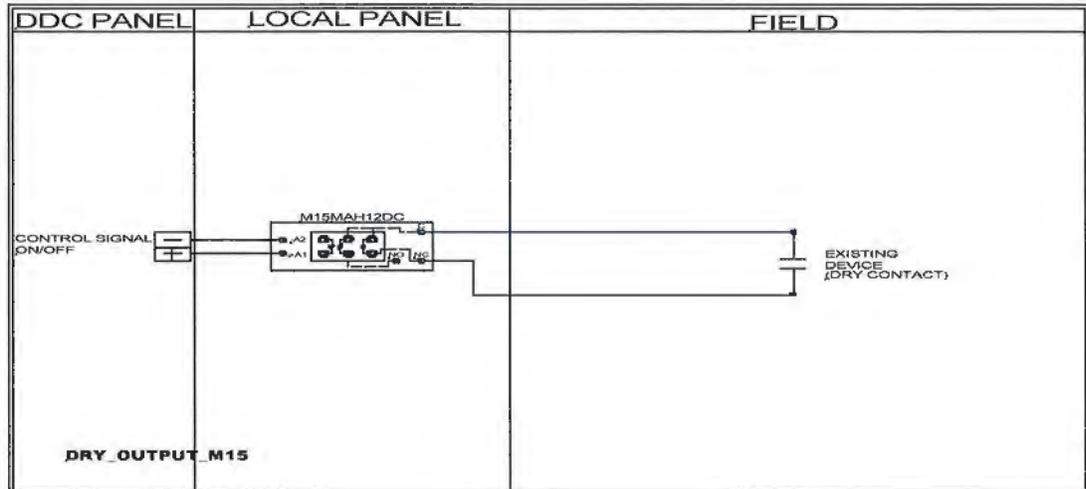


Wiring Detail:

CTL Dry Output

Wiring Detail Description:

Wiring Detail Existing Dry Contact Device controlled by 0-10VDC Output.

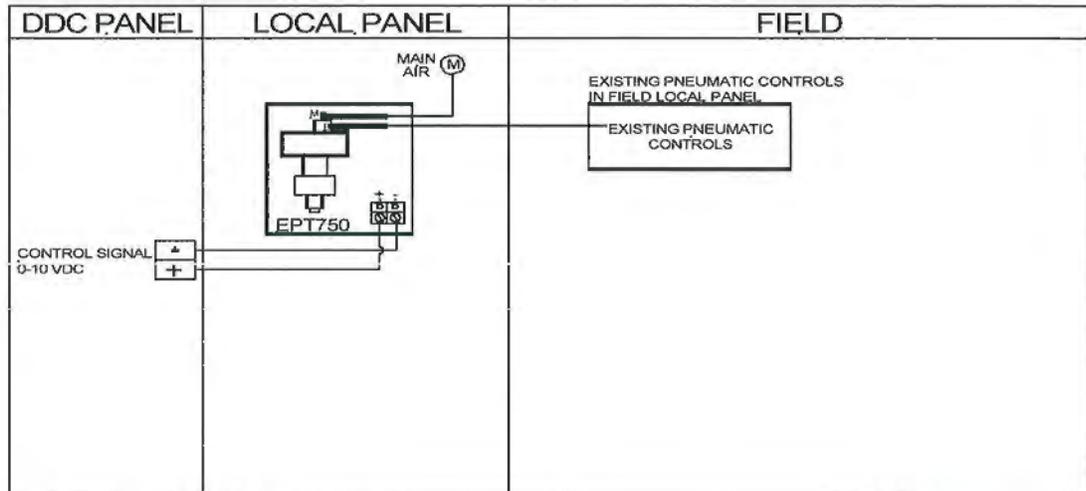


Wiring Detail:

CTL EPT

Wiring Detail Description:

Wiring Detail Electro-Pneumatic Transducer controlled by 0-10VDC Outputs.



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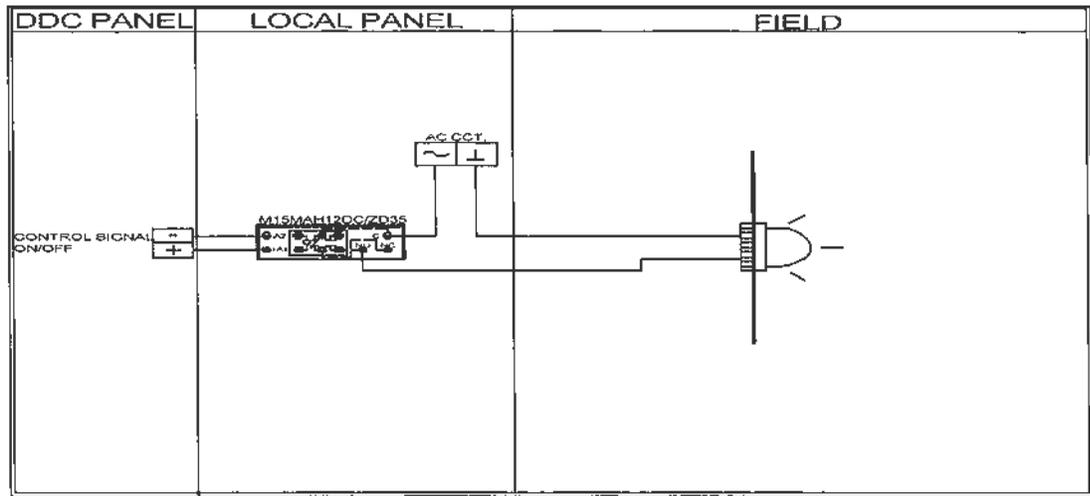
Wiring Details (Single) Report

Wiring Detail:

CTL LED

Wiring Detail Description:

Wiring Detail LED controlled by 0-10VDC output.

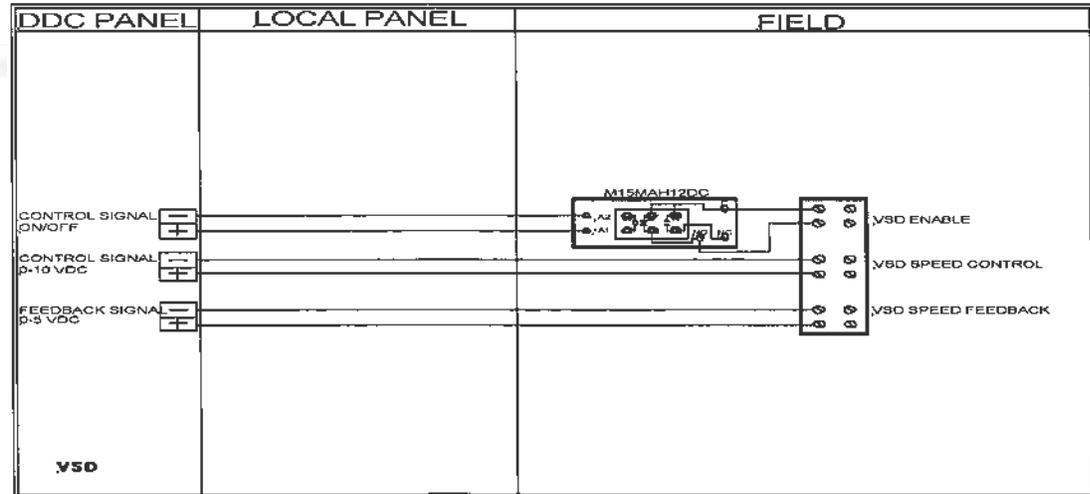


Wiring Detail:

CTL VSD

Wiring Detail Description:

Wiring Detail Variable Sped Drive Interface.

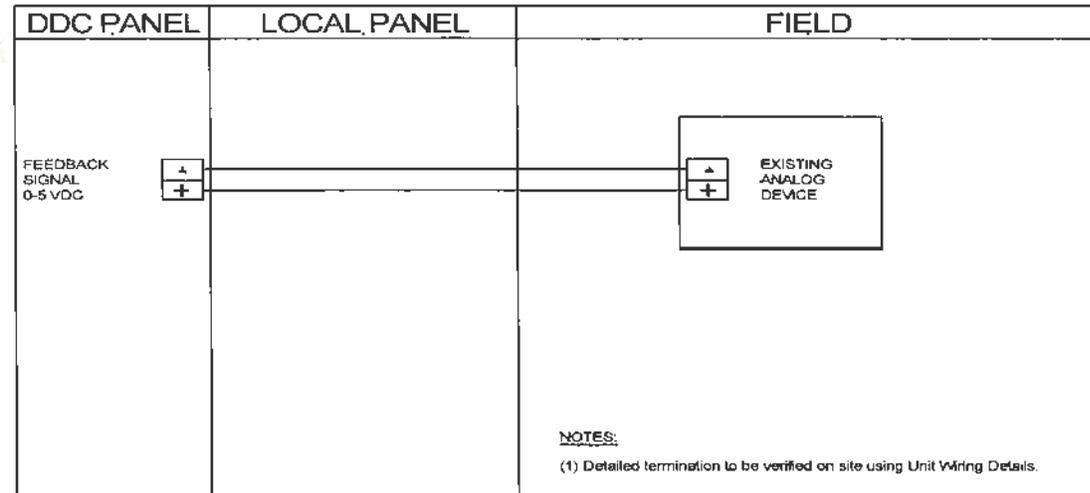


Wiring Detail:

FBK Analog Input

Wiring Detail Description:

Wiring Detail Existing Analog Device.



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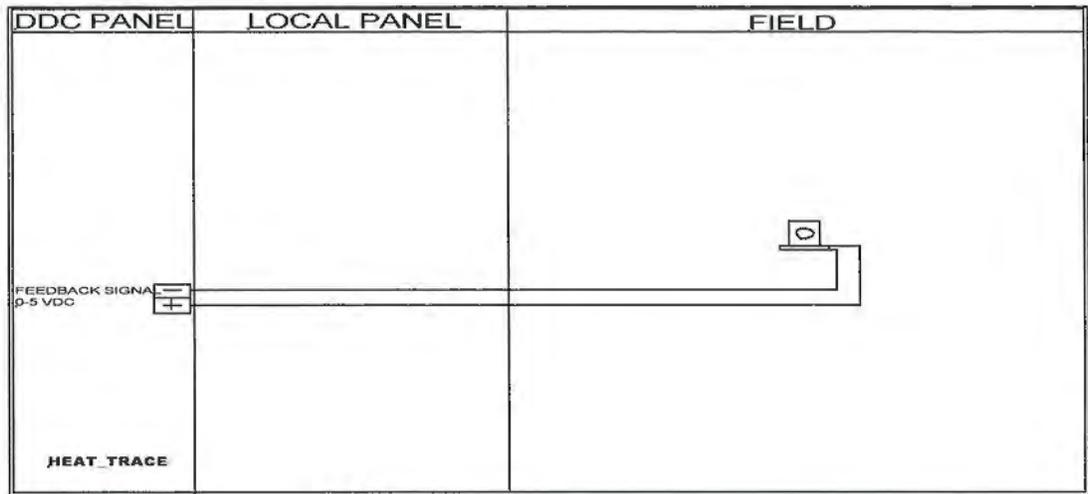
Wiring Details (Single) Report

Wiring Detail:

FBK CT

Wiring Detail Description:

Wiring Detail Current Sensor.

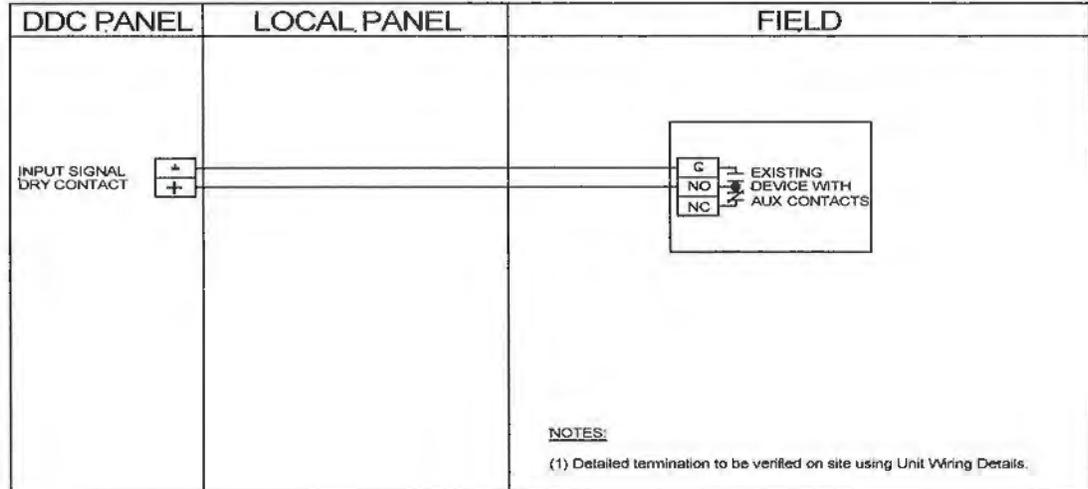


Wiring Detail:

FBK Dry Contact

Wiring Detail Description:

Wiring Detail Dry Contact Input.

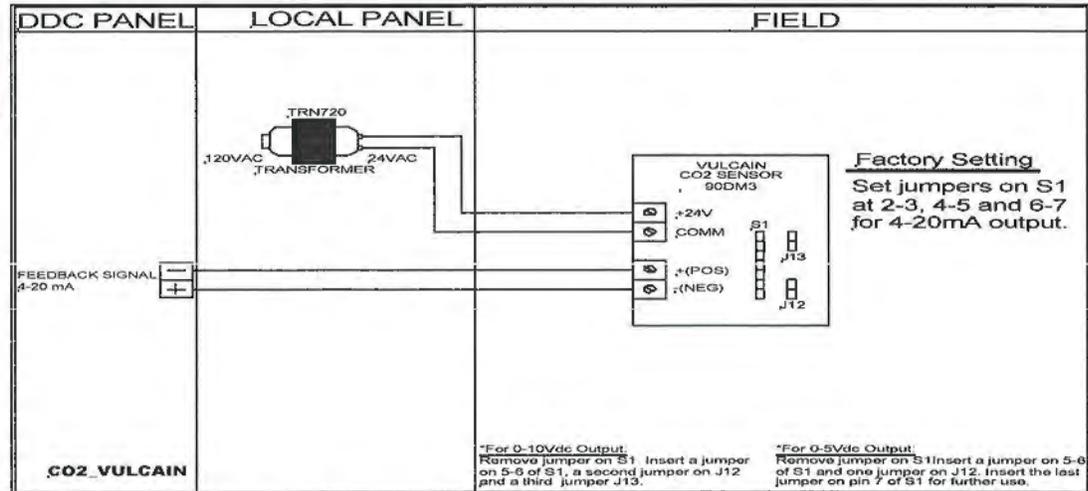


Wiring Detail:

GAS Vulcain

Wiring Detail Description:

Wiring Detail Vulcain 90DM3 Gas Monitoring Sensor.



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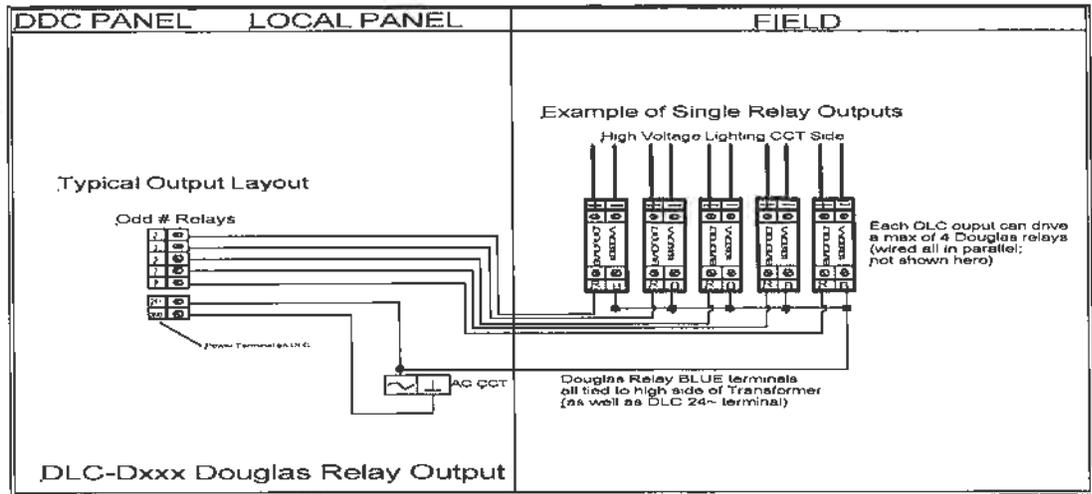
Wiring Details (Single) Report

Wiring Detail:

LTG_DLC_OP

Wiring Detail Description:

Douglas lighting Relay on DLC-Dxxx Output.

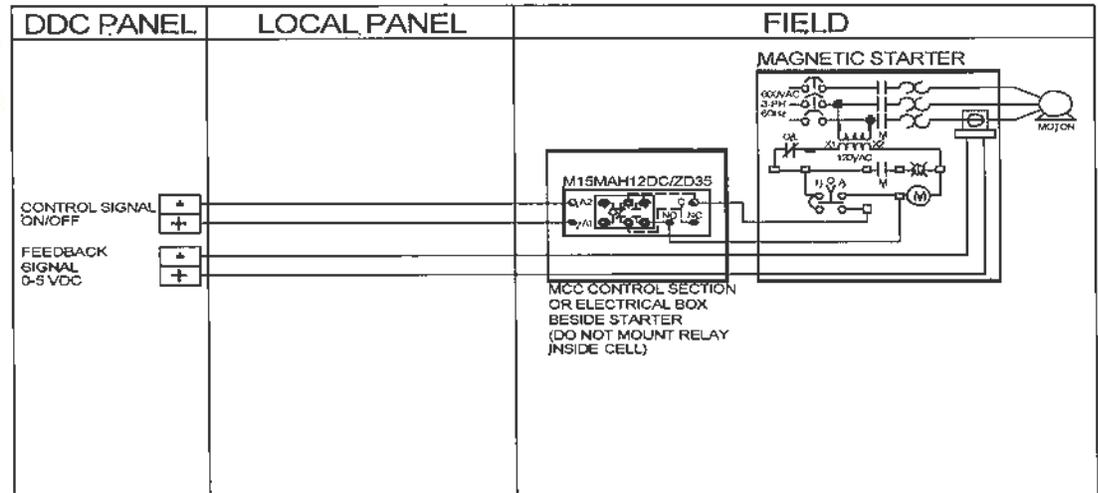


Wiring Detail:

MAG M15_FB

Wiring Detail Description:

Wiring Detail Magnetic Starter controlled by 0-10VDC Output. Status CT.

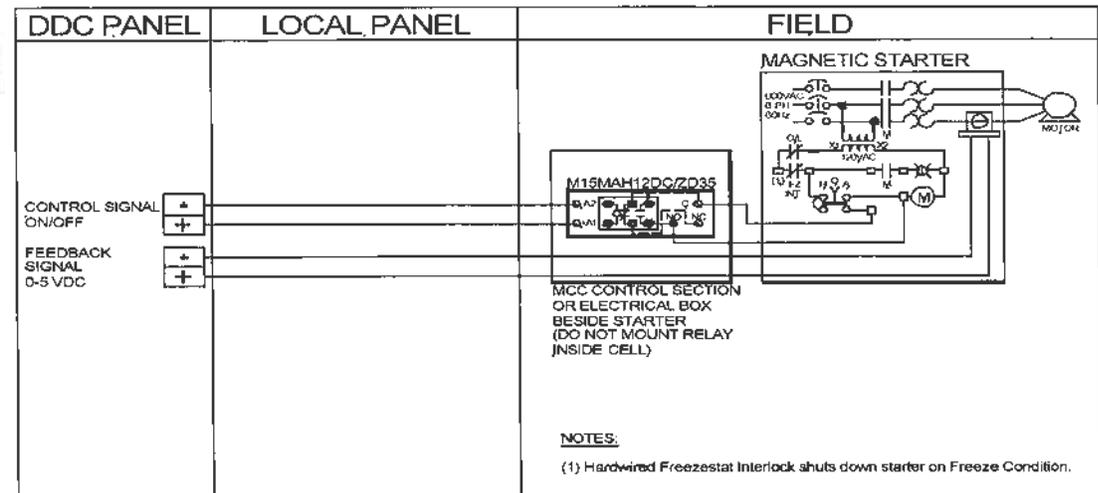


Wiring Detail:

MAG M15_FB_FZ

Wiring Detail Description:

Wiring Detail Magnetic Starter controlled by 0-10VDC Output with Freezestat Interlock. Status CT.



Harry Stevens Building

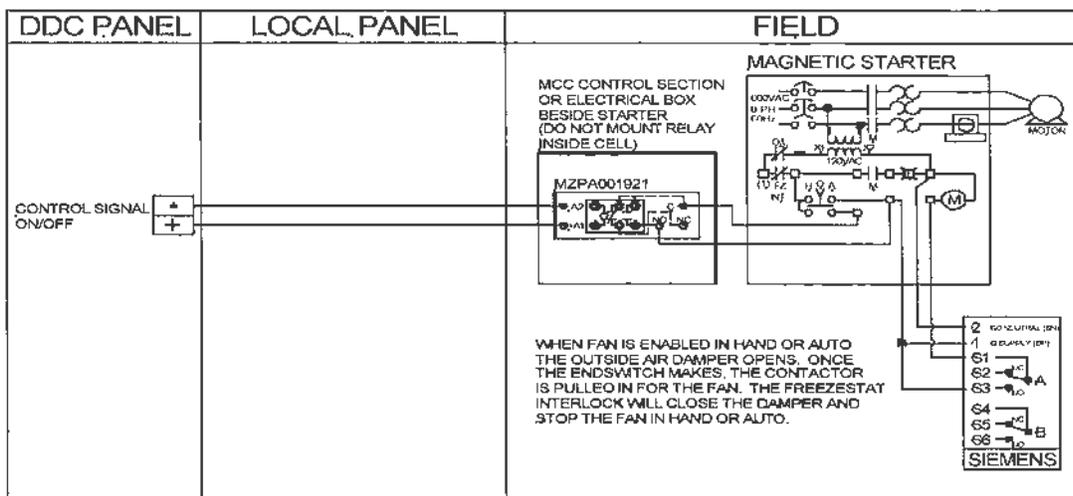
Wiring Details (Single) Report

Wiring Detail:

MAG_MZP_FB_FZ_DMP

Wiring Detail Description:

Wiring Detail Magnetic Starter controlled by 24VAC Output with Freezestat Interlock, 2 position damper, Status CT.

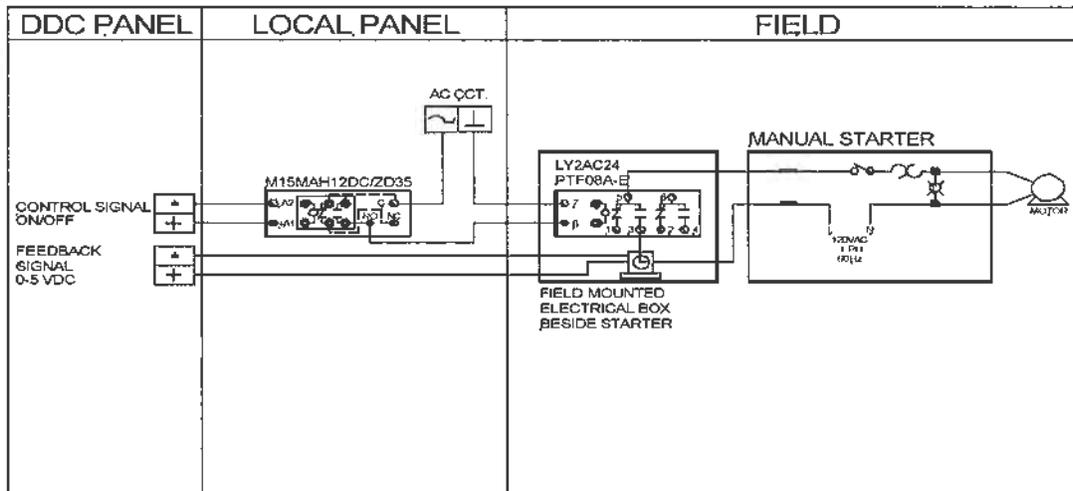


Wiring Detail:

MTR M15_FB

Wiring Detail Description:

Wiring Detail Manual Starter controlled by 0-10VDC Output. Status CT.

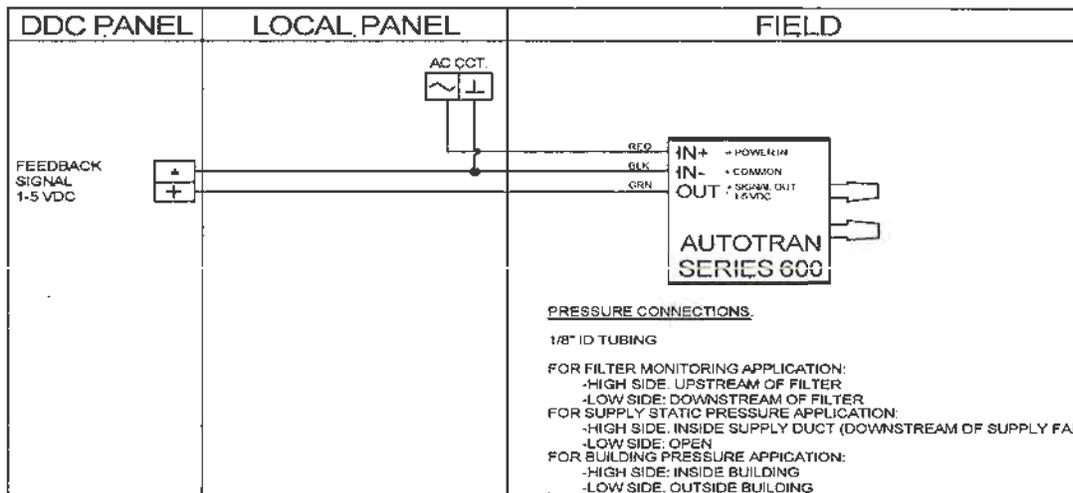


Wiring Detail:

PRE Auto600

Wiring Detail Description:

Wiring Detail AutoTran Series 600 Pressure Sensor.



Harry Stevens Building

Wiring Details (Single) Report

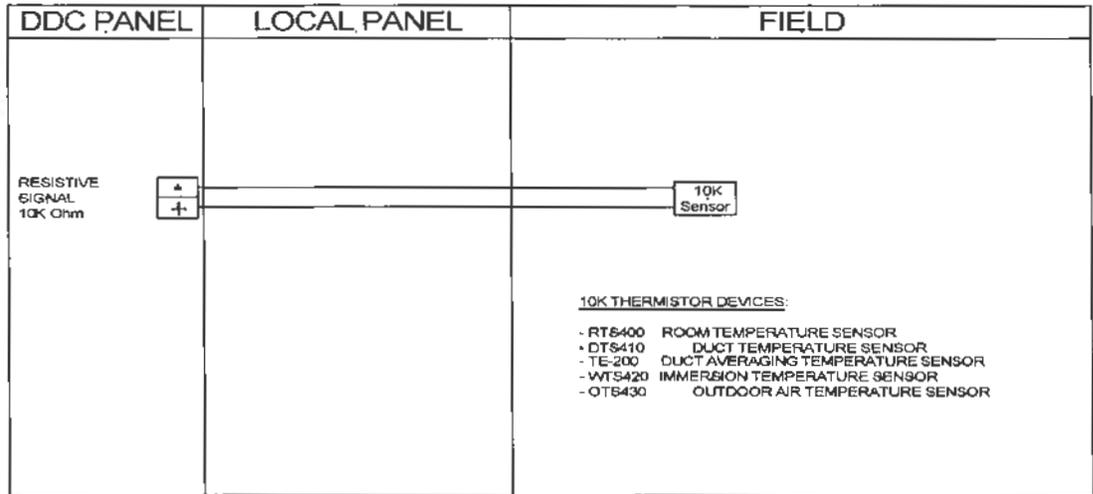
Wiring Detail:

TMP 10K Device

Wiring Detail

Description:

Wiring Detail
10K Thermistor
Device

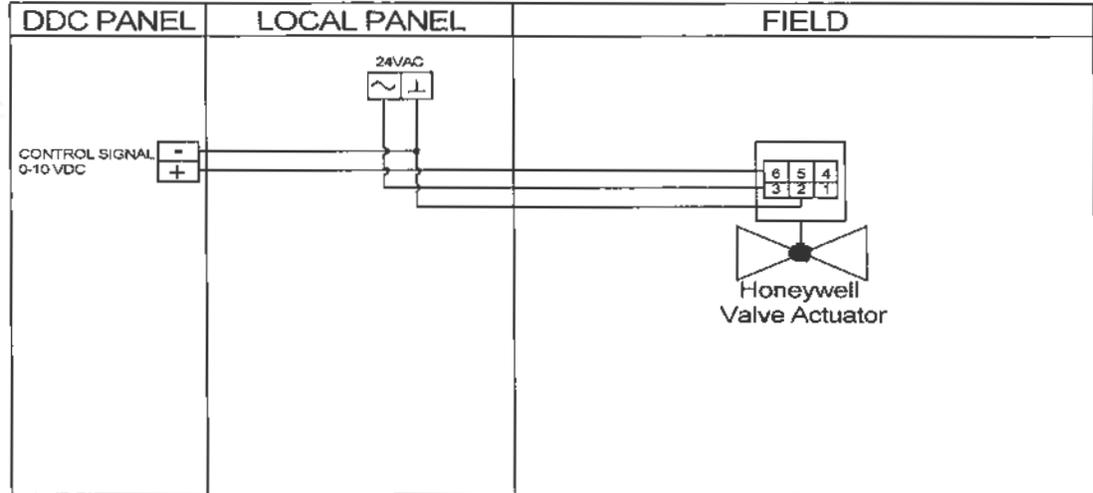


Wiring Detail:

VLV Bel_MOD

Wiring Detail

Description:
Wiring Detail
Honeywell
Modulating Valve
Actuator.

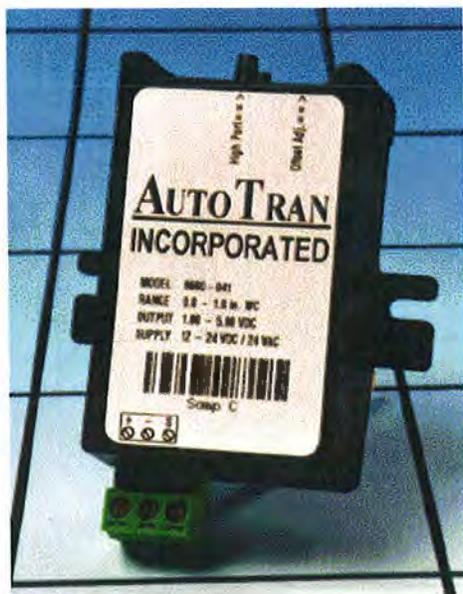


Harry Stevens Building

Bill of Material Schedule

| Part | Description | Quantity |
|-------------|--|----------|
| 600D212D4 | PRESSURE TRANSDUCER 1-5VDC 2" WC | 1 |
| 90-DM3A-D-T | SENSOR CO2 DUCT MOUNT | 5 |
| DAC-304 | Delta Application Controller 3IP/4BO | 1 |
| DAC-633 | Delta Application Controller 6IP/3BO/3AO | 1 |
| DLC-312 | Delta Douglas Lighting Controller 12BO | 5 |
| DSC-1212H | Delta System Control Enet/HOA 12IP/12AO | 1 |
| DSC-1280 | Delta System Controller 12IP/8AO | 2 |
| DSC-1616H | Delta System Control Enet/HOA 16IP/16AO | 1 |
| DSC-2424E | DELTA TURBO REPLACEMENT PANEL | 2 |
| DSM-050 | INTERNET IP ROUTER PANEL | 1 |
| DTS410 | SENSOR DUCT TEMPERATURE | 26 |
| EPT750 | ELECTRONIC TO PNEUMATIC TRANSDUCER | 8 |
| EXP120 | EXPANSION CARD 8 UNIVERSAL IP | 1 |
| EXP130 | EXPANSION CARD 16 UNIVERSAL IP | 1 |
| EXP161 | EXPANSION CARD 8 UNIVERSAL OP | 4 |
| LF24-S | ACTUATOR SPRING RETURN 24V | 2 |
| M15MAH12DC | RELAY SS 12VDC | 27 |
| NF24-SR | ACTUATOR 24VAC 2-10VDC SR 60 IN LB | 1 |
| NM24-SR | ACTUATOR AIR DAMPER MODULATING | 43 |
| OTS430 | OUTDOOR TEMPERATURE SENSOR | 2 |
| RTS400 | D.C. ROOM TEMPERATURE SENSOR-OLD STYLE B | 27 |
| RTS400-1 | ROOM TEMPERATURE SENSOR BLANK COVER | 1 |
| S100-1L | SENSOR CURRENT AC 0-10,0-20-0-50A 0-5VDC | 16 |
| S200-2 | | 1 |
| TSFC204T10 | SENSOR DUCT AVERAGING 20' | 3 |
| WTS420-1 | IMMERSION TEMPERATURE SENSOR | 10 |
| ZD35 | RELAY BASE FOR: M15MAH001812VDC | 27 |

SERIES 860 PRESSURE TRANSDUCER



Features & Applications

- Available in pressure ranges from 0.25" WC to 0-40 PSI
- Stability of $\pm 0.5\%$ F.S.O.!
- Perfect for a variety of applications such as duct static, VAV, fan control, medical applications & more!
- Easy wiring via a pluggable screw terminal block!
- Customizable pressure ranges as well as customizable outputs.
- Able to handle extremely high overpressure!
- Internally conditioned allowing it to automatically accept unregulated 12-24 VDC or 24 VAC power.
- Standard 2-year warranty!

For the Most Recent Product Information Visit Our Website at www.autotraninc.com

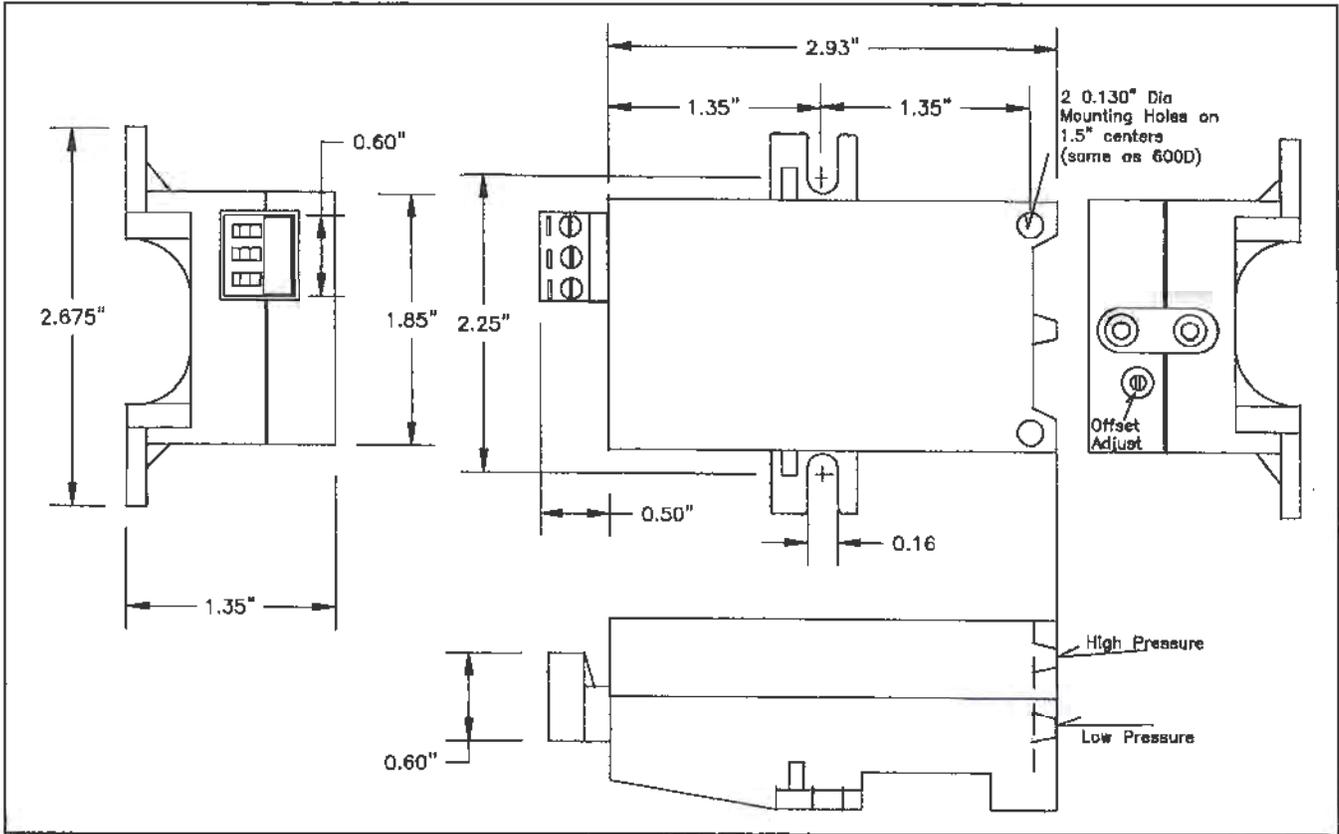
Specifications



| | |
|--|--|
| Accuracy:* | $\pm 1\%$ F.S.O. |
| Stability: | $\pm 0.5\%$ F.S.O./yr. |
| Thermal Effects: (zero) | $\pm 0.075\%$ F.S.O./ $^{\circ}$ C ($\pm 0.042\%$ F.S.O./ $^{\circ}$ F) |
| (0.5" Range) | $\pm 0.150\%$ F.S.O./ $^{\circ}$ C ($\pm 0.083\%$ F.S.O./ $^{\circ}$ F) |
| Thermal Effects: (span) | $\pm 0.005\%$ F.S.O./ $^{\circ}$ C ($\pm 0.003\%$ F.S.O./ $^{\circ}$ F) |
| Overpressure: | 20PSI or 2X FSP, whichever is greater |
| Pressure Ranges: | 0.25" WC to 40 PSI For 0.25" specifications consult factory (Custom & Bi-directional ranges available) |
| Compensated Range: | 10 $^{\circ}$ to 50 $^{\circ}$ C (50 $^{\circ}$ to 122 $^{\circ}$ F) |
| Media: | Limited only to media that will not attack Polyphenylene Sulfide (PPS), polyetherimide (PEI), silicon, or fluorosilicone, silicone RTV. Note that liquids are allowed in either or both ports. |
| Operating Humidity: | 90% R.H. non-condensing |
| Operating Temperature: | -25 $^{\circ}$ C to 70 $^{\circ}$ C (-13 to 158 $^{\circ}$ F) |
| Input Supply:** | 12-24 VDC/24VAC** |
| Supply Current: | <10mA (Voltage Output) <30mA (Current Output) |
| Load Resistance: | 2K Ω minimum on voltage out, 250 Ω max loop resistance on 4-20mA (500 Ω max loop resistance available upon request**) |
| Output Signal: | 1-5VDC, 1-6VDC, 1-10VDC**, 4-20mA*** (call for custom outputs, most available) |
| Adjustments: | Offset 60% of F.S.O. minimum |
| Electrical Connections: | Pluggable Screw Terminal Block |
| Pressure Connections: | Barbed fitting for 1/8" I.D. tubing |
| Housing: | Impact Resistant ABS Plastic |
| Dimensions: | Approx. 3.5" x 2.7" x 1.4" (8.7cm x 6.8cm x 3.5cm) with mounting flanges |
| * Includes non-linearity, hysteresis, and non-repeatability at a fixed temperature | |
| ** an input of 18-24VDC/AC is required to drive a 500 Ω load, the same input is also required for a 1-10 VDC output | |
| *** 3-wire 4-20mA | |

AUTO TRAN
INCORPORATED

7424 Washington Avenue South • Eden Prairie, MN 55344
(800) 735-8998 • (952) 942-8743 • FAX (952) 942-8753
www.autotraninc.com



How to Order

A typical order number consists of the model number, type, output signal, pressure range, and calibration pressure.

| Model | Type | Output Signal | Pressure Range* |
|-------|-------------------------------|--|---|
| 860 | D = Differential or Gage** | 0.....1 to 5 volts 1.....1 to 6 volts 2.....1 to 10 volts*** 3.....4-20mA (250Ω load) 4.....4-20mA (500Ω load)*** 5.....Custom Output | 0.....0.25 to < 5" WC 1.....5" to <13" WC 2.....0.5P to <1P 3.....1P to <5P 4.....5P to <15P 5.....15P to <30P 6.....30P to 40P |

* EXAMPLE: 860D-01 Cal Pressure 6" WC You must indicate exact pressure unit should be calibrated to since "Pressure Range" is not a specific number. (This unit has an output of 1-5 VDC & will be calibrated to 6"WC.) If a custom output is needed the exact output must be specified.

** With a gage application, one of the two ports is vented to atmosphere.

*** With a 1-10 VDC output as well as with a 4-20 mA output that needs to drive a 500Ω load a 18-24 VDC/24 VAC input is required.

Optional Items

NEMA 4 enclosure

DIN Rail Mounting Kit

Warranty

Any regular Auto Tran product that proves to be defective in material or workmanship within a warranty period of two (2) years will be repaired or replaced when returned freight prepaid.

Note: Auto Tran reserves the right to change its specifications at any time, without notice. Auto Tran is not expert in the customer's technical field and therefore does not warrant the suitability of its product for the application selected by the customer.

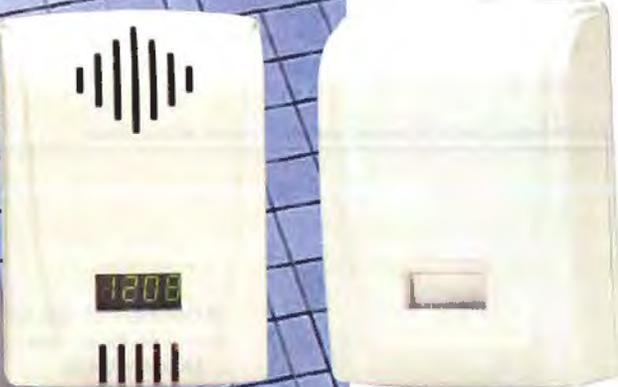


Infrared CO₂ Gas Monitor

90DM₃A

With an unparalleled reputation for product innovation, reliability and excellence, Vulcain Inc. is once again setting industry standards with the latest generation Infrared CO₂ Gas Monitor - the 90DM₃A.

The product of the most rigorous research and industrial design, the 90DM₃A, incorporates Vulcain's unique infrared sensing technology and state of the art microprocessor controlled digital transmission into a CO₂ gas monitor, offering a level of precision and efficiency second to none.



- Proven infrared technology
- Specific CO₂ monitoring
- Built-in microprocessor
- Optional relay contact closure (fail safe)
- 4-20mA or 0-5 VDC or 0-10 VDC output
- Temperature compensation
- Trouble-free operation
- No moving parts
- Menu driven easy calibration
- Optional 0-5% detection range

Ordering Information

| | |
|---------------------------|--|
| 90DM ₃ ASM-1 | 90DM ₃ A Wall Mount Enclosure, 0-2000 ppm |
| 90DM ₃ ASM-2 | 90DM ₃ A Wall Mount Enclosure, 0-50000 ppm |
| 90DM ₃ ADT-1 | 90DM ₃ A Duct Type Enclosure, 0-2000 ppm |
| 90DM ₃ ADT-2 | 90DM ₃ A Duct Type Enclosure, 0-50000 ppm |
| 90DM ₃ ASMR-1* | 90DM ₃ A Network, Wall Mount Enclosure, 0-2000 ppm |
| 90DM ₃ ASMR-2* | 90DM ₃ A Network, Wall Mount Enclosure, 0-50000 ppm |
| 90DM ₃ ADTR-1* | 90DM ₃ A Network, Duct Type Enclosure, 0-2000 ppm |
| 90DM ₃ ADTR-2* | 90DM ₃ A Network, Duct Type Enclosure, 0-50000 ppm |
| 90DM ₃ ASMO3-1 | 90DM ₃ A Wall Mount Enclosure, Relay, 0-2000 ppm |
| 90DM ₃ ASMO3-2 | 90DM ₃ A Wall Mount Enclosure, Relay, 0-50000 ppm |
| 90DM ₃ ADTO3-1 | 90DM ₃ A Duct Type Enclosure, Relay, 0-2000 ppm |
| 90DM ₃ ADTO3-2 | 90DM ₃ A Duct Type Enclosure, Relay, 0-50000 ppm |

*Only Network output comes with these models.

Package:
D3

Display Option for 90DM₃A

Protecting your health and your environment.

90DM₃A Infrared CO₂ Gas Monitor

Mounting Made Unique and Easy

To provide maximum versatility, the 90DM₃A is available with two different housing configurations, making it ideally suited to virtually any commercial or industrial gas detection application. Both enclosures are made of ABS plastic, offering maximum durability.

Designed to accurately detect the presence of CO₂ in air-handling systems, the DT Model represents a radical innovation in housing design. Unlike other units on the market today, the enclosure is totally airtight, more compact, and extremely lightweight, with a convenient mounting bracket to improve installation. All in all, its superior operational and cost efficiency make the DT Model the only choice for larger-scale CO₂ detection applications.

The SM Model is a wall-mounted unit with a compact and an aesthetically pleasing design which blends perfectly and discretely with any room decor. Easily installed directly onto drywall or other surfaces, the SM Model allows for superior gas circulation and airflow.



For further information:

USA
1971 Western Avenue, Unit 1122
Albany, NY
USA 12203

Tel: 1-800-563-2967
Fax: 1-888-967-9938

TORONTO
344 Edgeley Boulevard, Unit 13
Vaughan, ON
L4K 4B7

Tel: 1-905-660-6544
Fax: 1-905-660-7362

MONTREAL
4005 Matte Boulevard, Unit G
Brossard, QC
J4Y 2P4

Tel: 1-800-563-2967
Fax: 1-888-967-9938

E-mail: sales@vulcaininc.com
www.vulcaininc.com

VN1087-01-01-00-8.25x11-20050218-5717-14



90DM₃A SPECIFICATIONS

| | |
|------------------------------|---|
| Gas Detected: | CO ₂ |
| Detection Range: | 0-2000 ppm, *0-5% |
| Accuracy: | +/- 3% |
| Response Time: | 35 sec. (for 90% of the reading) |
| Sensor Life Expectancy: | > 10 years |
| Relay Output Rating: | 5A, 30 Vdc or 250 Vac (resistive load) |
| *Display: | LCD |
| Outputs: | 4-20 mA or 0-5 Vdc or 0-10 Vdc *1 SPDT Relay |
| Operating Humidity Range: | 0-95% RH, Non-condensing |
| Operating Temperature Range: | 32 °F to 100 °F / 0 °C to 40 °C |

GENERAL SPECIFICATIONS

| | |
|--------------------|--|
| Size: | 5.25 x 3.5 x 2 in. / 11.5 x 7.5 x 4.4 cm |
| Weight: | SM: 8.8 oz. / 200g DT: 10.56 oz. / 300g |
| Power Requirement: | 17-27 VAc or 24-38 Vdc, 200 mA |
| Warranty: | 5 Years Limited. |

*Option

DUE TO ONGOING RESEARCH AND PRODUCT IMPROVEMENT, SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.



- ① Optional LCD display
- ② Air inlet for surface Mount housing
- ③ Duct mount housing

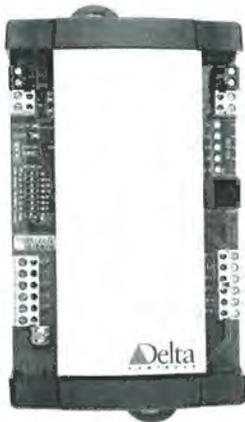
Locally Distributed by:

Application Controllers

DAC-304

Description

The DAC-304 is a fully programmable, Native BACnet™ Advanced Application Controller that communicates on an RS-485 LAN using the BACnet MS/TP protocol. The DAC-304 is designed for a wide-range of applications that have small local I/O requirements. It also supports BACstats and other Delta LINKnet devices.



Application

The DAC-304 is suitable for controlling various packaged units and equipment with small I/O requirements such as Fan Coil units, Unit Ventilators and Heat Pumps.

The fully programmable DAC-304 can be tailored to specific applications by creating and modifying BACnet objects and GCL+ programs.

Features

- Native BACnet™ firmware
- BACnet MS/TP communications
- Supports 4 BACstat network sensors on LINKnet for room sensing and control
- Supports 2 Delta Field Modules on LINKnet for I/O expansion
- Easy to mount housing
- Fully programmable in GCL+
- Application database can be loaded over the network
- Controller firmware can be flash loaded over the network
- Derived Network Addressing (DNA) for simple integration into a standard network architecture
- Service port

Specifications

BACnet Device Profile

BACnet Advanced Application Controller (B-AAC)

Inputs

3 Universal inputs - 10 bit (supporting 0-5v, 0-10V, 10kΩ, 4-20mA)

Outputs

4 Binary triac outputs

Jumper selection for internal or external power on binary outputs

LED status indication of each output

Technology

32-bit processor

512 KB (4 megabit) Flash memory

64 KB SRAM (for database)

CPU Status LED

Device Addressing

Set via DIP switch and jumpers, or software setup

Communications Ports

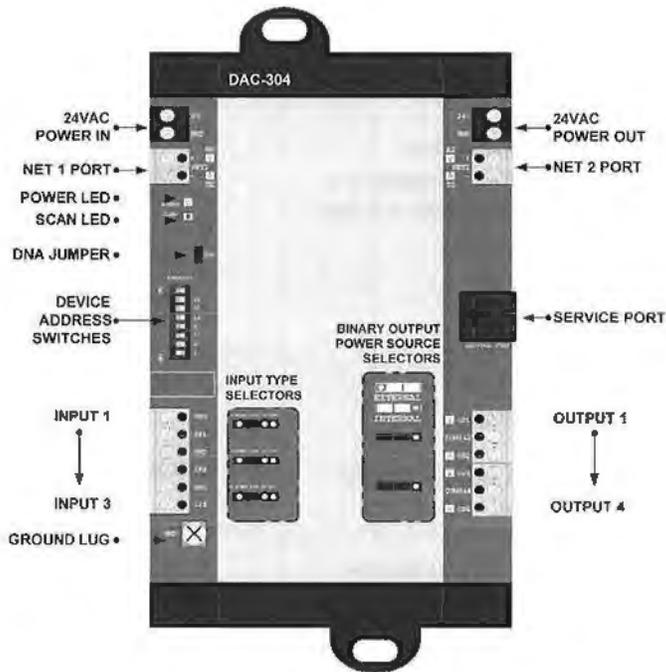
Main LAN (NET1)
BACnet MS/TP @ 9600, 19200, 38400 or 76800 bps (default)
(maximum of 99 devices per BACnet MS/TP segment)

SubLAN (NET2)
Delta LINKnet @ 76800 bps (maximum 4 devices on LINKnet, with no more than 2 DFM/DNT devices)

HVAC

Application Controllers

DAC-304: Board Layout Diagram



Specifications (Continued)

Connectors

Removable screw-type terminal connectors

Wiring Class

Class 2

Power

24 VAC

6VA, 54VA maximum with fully loaded BO's

Ambient

32° to 131°F (0° to 55°C)

10 - 90% RH (non-condensing)

Dimensions

7 5/8 x 4 x 1 7/8 in. (19.2 x 10.2 x 4.8 cm) with housing

0.551 lb. (250 g) with housing

Approvals/Standards

C-UL Listed

UL 916 Listed

CE

FCC

BTL Listed

Accessories

RPT-768—Delta Network Repeater for BACnet MS/TP

TRM-768—Delta Network Terminator for BACnet MS/TP

CON-768—Delta Network Converter

Ordering

Order the DAC-304 with the desired options according to the following product number:

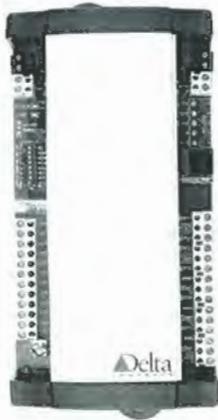
DAC-304—3 Inputs, 4 BO's (V2* or V3 Firmware)

*Note: Not all features described in this document are available when this option is selected.

Application Controllers DAC-633

Description

The DAC-633 is a fully programmable, Native BACnet™ Advanced Application Controller that communicates on an RS-485 LAN using the BACnet MS/TP protocol. The DAC-633 is designed for a wide-range of applications that have small local I/O requirements. It also supports BACstats and other Delta LINKnet devices.



Application

The DAC-633 is suitable for controlling various packaged units and equipment with small I/O requirements such as Fan Coil units, Unit Ventilators, Heat Pumps, and small Boilers or Chillers.

The fully programmable DAC-633 can be tailored to specific applications by creating and modifying BACnet objects and GCL+ programs.

Features

- Native BACnet™ firmware
- BACnet MS/TP communications
- Supports 4 BACstat network sensors on LINKnet for room sensing and control
- Supports 2 Delta Field Modules on LINKnet for I/O expansion
- Actuator power terminal (24VAC) for each analog output
- Easy to mount housing
- Fully programmable in GCL+
- Application database can be loaded over the network
- Controller firmware can be flash loaded over the network
- Derived Network Addressing (DNA) for simple integration into a standard network architecture
- Service port

Specifications

BACnet Device Profile

BACnet Advanced Application Controller (B-AAC)

Inputs

6 Universal inputs - 10 bit (supporting 0-5v, 0-10v, 10kΩ, 4-20mA)

Outputs

3 Binary triac outputs

3 Analog outputs (0-10v)

Jumper selection for internal or external power on binary outputs

LED status indication of each output

Technology

32-bit processor

512 KB (4 megabit) Flash memory

64 KB SRAM memory for database

CPU Status LED

Device Addressing

Set via DIP switch and jumpers, or software setup

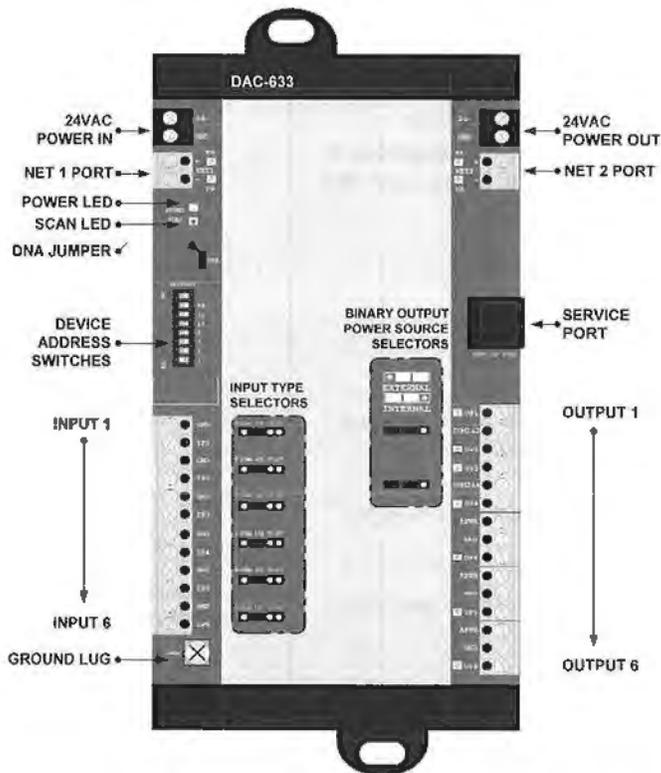
Communications Ports

Main LAN (NET1)
BACnet MS/TP @ 9600, 19200, 38400 or 76800 bps (default) (maximum of 99 devices per BACnet MS/TP segment)

SubLAN (NET2)
Delta LINKnet @ 76800 bps (maximum 4 devices on LINKnet, with no more than 2 DFM/DNT devices)

HVAC

Application Controllers DAC-633: Board Layout Diagram



Specifications (Continued)

Connectors

Removable screw-type terminal connectors

Wiring Class

Class 2

Power

24 VAC only

12VA, 48VA with BOs fully-loaded

Ambient

32° to 131°F (0° to 55°C)

10 - 90% RH (non-condensing)

Dimensions

8 5/8 x 4 x 1 7/8 in. (21.9 x 10.2 x 4.8 cm)
with housing

0.80 lb. (360 g) with housing

Approvals/Standards

C-UL Listed

UL 916 Listed

CE

FCC

BTL Listed

Accessories

RPT-768—Delta Network Repeater for BACnet MS/TP

TRM-768—Delta Network Terminator for BACnet MS/TP

CON-768—Delta Network Converter

Ordering

Order the DAC-633 with the desired options according to the following product number:

DAC-633—6 inputs, 3 AO's, 3 BO's (V2* or V3 Firmware)

*Not all features described in this document are available when this option is selected.

Douglas Lighting Controller DLC-D312/624/936

Description

The DLC-D312/624/936 is a fully programmable, Native BACnet™ Advanced Application Controller that communicates on a BACnet MS/TP RS-485 LAN. This controller is designed for lighting applications and has 12 to 36 Douglas lighting relay outputs per controller. The controller also supports up to 12 Delta BACstats connected on its LINKnet subnetwork.



Application

The DLC-D312/624/936 is suitable for controlling up to 36 lighting zones, switching a maximum of 144 Douglas lighting relays.

The controller can be mounted in various Douglas relay enclosures for both new and retrofit construction projects.

The DLC-D312/624/936 is fully programmable: GCL+ programs and BACnet objects can be created and or modified for specific lighting applications.

Features

- Native BACnet™ MS/TP firmware
- Supports switching a maximum of 4 Douglas relays per relay output
- Software monitoring of switch activity
- Supports a subnet of up to 12 BACstats
- 3, 6 or 9 Douglas relay switches or dry contact master inputs
- 1 Analog input
- Individual output status indication via LED
- Supports a master override switch with built-in sequencing
- Fully programmable in GCL+
- Application database can be flash loaded over the network
- Controller firmware can be flash loaded over the network
- Easy-to-mount housing

Specifications

BACnet Device Profile

BACnet Advanced Application Controller (B-AAC)

Inputs

3, 6 or 9 Binary inputs (Douglas 2-wire relay switch or dry contact inputs with status feedback & LED status indication)

1 Analog input, with LED status indication

Outputs

12, 24 or 36 Douglas lighting relays

Outputs (max 4 relays per output)

Uses Douglas™ WR-61xx style relays

Sweeper Ports

Sweeper input port with LED status indication master override or sweeper input port, with command sequencer

Sweeper output port with LED status indication connects to another lighting controller's sweeper input port to continue the sweep sequence

On-board Overrides

ON scan button provides ALL ON override control

OFF scan button provides ALL OFF override control

Communications Ports

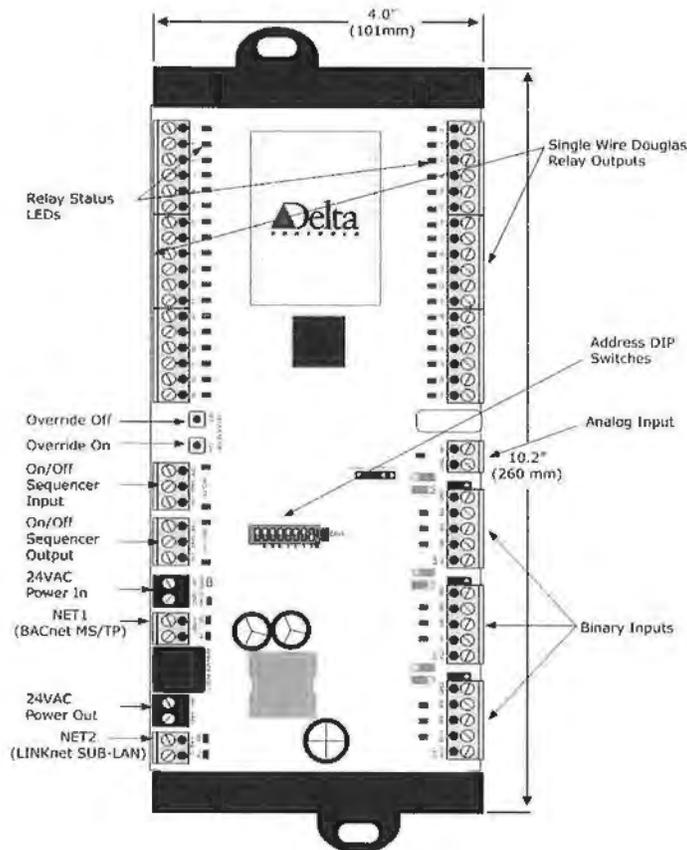
Main LAN (NET1) with LED status indication BACnet MS/TP @ 9600, 19200, 38400, 76800 bps (default) (maximum of 99 devices per BACnet MS/TP segment)

SubLAN (NET2) with LED status indication Delta LinkNet @ 76800 bps (maximum 12 network sensors on LINKnet)

Document Edition 2.0 June 2005

Lighting

Douglas Lighting Controller DLC-D312/624/936: Board Layout Diagram



Specifications (Continued)

Connectors

Removable screw-type terminal connectors

Technology

32-bit Processor

2MB (16 megabit) Flash memory

512 KB SRAM memory

Device Address

Set via DIP switch and jumpers or software setup

Wiring Class

Class 2

Power

24 VAC

50 VA (including Douglas relays and switches, 4 per output)

Ambient

32° to 131°F (0° to 55°C)

10 to 90% RH (non-condensing)

Dimensions

11.05 x 4 x 1.9 in. (28.9 x 10 x 4.8 cm) with housing

1.9 lb. (540 g) with housing

Approvals/Standards

UL 916

C-UL Listed

CE

FCC

BTL Listed

Ordering

Order the DLC-D312/624/936 with the desired options according to the following product numbers:

DLC-312—3 Binary Inputs & 12 Relay Outputs

DLC-624—6 Binary inputs & 24 Relay Outputs

DLC-936—9 Binary Inputs & 36 Relay Outputs

System Controllers

DSC-1212

Description

The DSC-1212 is a fully programmable, Native BACnet™ Building Controller that communicates on a Twisted-Pair Ethernet 10-BaseT using BACnet IP and BACnet over Ethernet, or on an RS-485 LAN using the BACnet MS/TP protocol.

The DSC-1212 also supports an additional BACnet MS/TP SubLAN for VAV and other Application Controllers. This controller is designed for a wide-range of applications that have mid-sized I/O requirements. The SubLAN may be configured to support Delta BACstats and other Delta LINKnet I/O devices.



Application

The DSC-1212 is suitable for controlling equipment such as AHUs, Boilers, Chillers and a variety of HVAC control systems.

Because of its programming capability, the DSC-1212 can be used to create or modify GCL+ programs and BACnet objects for specific applications.

Features

- Native BACnet firmware
- BACnet MS/TP communications
- Optional BACnet IP
- Optional BACnet over Ethernet capability
- Integrated housing
- 12 Universal inputs and 12 Universal outputs
- Fully programmable in GCL+
- Application database can be flash loaded over the network
- Controller firmware stored in flash memory (can be network loaded)
- Optional Hand/Off/Auto switches with position feedback
- Tri-color LED's to indicate output status

Specifications

BACnet Device Profile

BACnet Building Controller (B-BC)

Inputs

12 Universal inputs - 10 bit (supporting 0-5v, 0-10v, 10kΩ, 4-20mA)

LED status indication of each input

Outputs

12 Analog outputs - (0-10v), software configured as binary or analog

LED status indication of each output

Technology

32-bit processor

1 MB (8 megabit) Flash memory

127 KB SRAM memory (319 KB with Ethernet option)

Real-time clock with lithium battery & SRAM backup

CPU status LED

Device Type

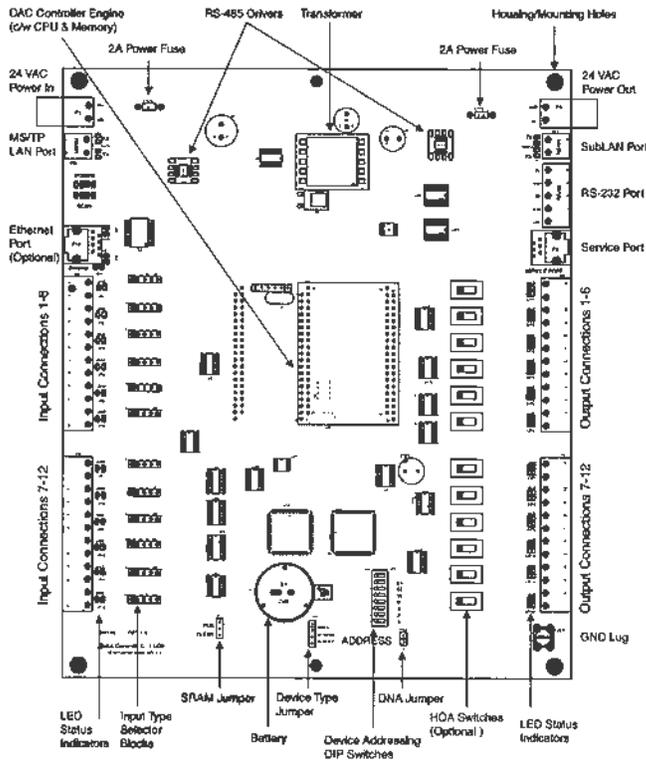
Configured as either an Area, System or Subnet device

Device Addressing

Set via DIP switch and jumpers, or software setup

HVAC

System Controllers DSC-1212: Board Layout Diagram



Specifications (Continued)

Communication Ports

Twisted-Pair Ethernet (10-BaseT) @ 10 MB (optional), BACnet IP, BACnet over Ethernet

Main LAN (NET1)
BACnet MS/TP @ 9600, 19200, 38400 or 76800 bps (default) (maximum of 99 devices per BACnet MS/TP segment)

SubLAN (NET2)
BACnet MS/TP (maximum 99 devices) or Delta LINKnet @ 76800 bps (maximum 12 devices on LINKnet, with no more than 4 DFM/DNT devices)

Serial RS-232 BACnet PTP, 9600, 19200 or 38400 bps

Connectors

Removable screw-type terminal connectors

Wiring Class

Class 2

Power

24 VAC

25 VA

Ambient

32° to 131°F (0° to 55°C)

10 - 90% RH (non-condensing)

Dimensions

10 5/8 x 8 1/8 x 2 1/2 in. (27.0 x 20.5 x 6.4 cm) with housing

2.0 lb. (900 g) with housing

Approvals/Standards

UL 916 Listed

CE

FCC

BTL Listed

Accessories

RPT-768—Delta Network Repeater for BACnet MS/TP

TRM-768—Delta Network Terminator for BACnet MS/TP

CON-768—Delta Network Converter

Ordering

Order the DSC-1212 with the desired options according to the following product numbers:

DSC-1212—Controller & Housing, MS/TP LAN

DSC-1212-V2*—Controller & Housing, *V2 Micro Firmware

DSC-1212H—Controller & Housing, MS/TP LAN, HOA Switches with Feedback

DSC-1212E—Controller & Housing, MS/TP LAN, Ethernet LAN/WAN, HOA Switches with Feedback

*Not all features described in this document are available when this option is selected.

System Controllers

DSC-1280

Description

The DSC-1280 is a fully programmable, Native BACnet™ Building Controller that communicates on a Twisted-Pair Ethernet 10-BaseT using BACnet IP and BACnet over Ethernet, or on an RS-485 LAN using the BACnet MS/TP protocol.

The DSC-1280 also supports an additional BACnet MS/TP SubLAN for VAV and other Application Controllers. This controller is designed for a wide-range of applications that have mid-sized I/O requirements. The SubLAN may be configured to support Delta BACstats and other Delta LINKnet I/O devices.



Application

The DSC-1280 is suitable for controlling equipment such as AHUs, Boilers, Chillers and a variety of HVAC control systems.

Because of its programming capability, the DSC-1280 can be used to create or modify GCL+ programs and BACnet objects for specific applications.

Features

- Native BACnet firmware
- BACnet MS/TP communications
- Optional BACnet IP
- Optional BACnet over Ethernet capability
- Integrated housing
- 12 Universal inputs and 8 Universal outputs
- Fully programmable in GCL+
- Application database can be flash loaded over the network
- Controller firmware stored in flash memory (can be network loaded)
- Optional Hand/Off/Auto switches with position feedback
- Tri-color LED's to indicate output status

Specifications

BACnet Device Profile

BACnet Building Controller (B-BC)

Inputs

12 Universal inputs - 10 bit
(supporting 0-5v, 0-10v, 10kΩ, 4-20mA)

LED status indication of each input

Outputs

8 Analog outputs - (0-10v), software configured as binary or analog

LED status indication of each output

Technology

32-bit processor

1 MB (8 megabit) Flash memory

256 KB SRAM memory (512 KB with Ethernet option)

Real-time clock with lithium battery & SRAM backup

LED indication of CPU and SCAN status

Device Type

Configured as either an Area, System or Subnet device

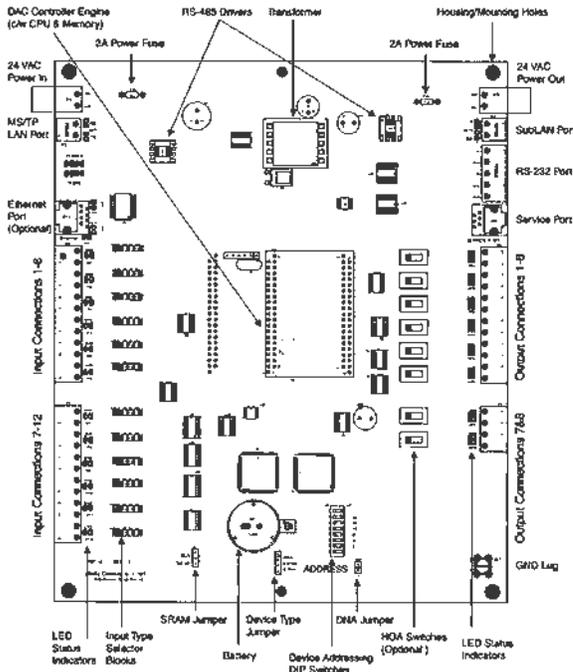
Device Addressing

Set via DIP switch and jumpers, or software setup

Document Edition 2.5 July 2005

HVAC

System Controllers DSC-1280: Board Layout Diagram



Specifications (Continued)

Communication Ports

Twisted-Pair Ethernet
{10-BaseT} @ 10 MB (optional), BACnet IP,
BACnet over Ethernet

Main LAN (NET1)
BACnet MS/TP @ 9600, 19200, 38400 or
76800 bps (default) (maximum of 99 devices
per BACnet MS/TP segment)

SubLAN (NET2)
BACnet MS/TP (maximum 99 devices) or
Delta LINKnet @ 76800 bps (maximum 12
devices on LINKnet, with no more than 4
DFM/DNT devices)

Serial RS-232 BACnet PTP (RS-232) 9600,
19200 or 38400 bps

Connectors

Removable screw-type terminal
connectors

Wiring Class

Class 2

Power

24 VAC

25 VA

Ambient

32° to 131°F (0° to 55°C)

10 - 90% RH (non-condensing)

Dimensions

10 5/8 x 8 1/8 x 2 1/2 in. (27.0 x 20.5 x
6.4 cm) with housing

2.0 lb. (900 g) with housing

Approvals/Standards

UL 916 Listed

CE

FCC

BTL Listed

Accessories

RPT-768—Delta Network Repeater for BACnet MS/TP

TRM-768—Delta Network Terminator for BACnet MS/TP

CON-768—Delta Network Converter

DSC-1280H—Controller & Housing, MS/TP LAN, HOA
Switches with Feedback

DSC-1280E—Controller & Housing, MS/TP LAN,
Ethernet LAN/WAN, HOA Switches w/Feedback

Ordering

Order the DSC-1280 with the desired options
according to the following product numbers:

DSC-1280—Controller & Housing, MS/TP LAN

DSC-1280-V2*—Controller & Housing, *V2 Micro
Firmware

*Not all features described in this document are
available when this option is selected.

System Controllers

DSC-1616

Description

The DSC-1616 is a fully programmable, Native BACnet™ Building Controller that communicates on Twisted-Pair Ethernet 10-BaseT using BACnet IP and BACnet over Ethernet, or on an RS-485 LAN using the BACnet MS/TP protocol.

The DSC-1616 also supports an additional BACnet MS/TP SubLAN for VAV and other Application Controllers. The SubLAN may be configured to support Delta BACstats and other Delta LINKnet I/O devices. This controller is designed for a wide-range of applications that have mid-sized I/O requirements.



Application

The DSC-1616 is suitable for controlling equipment such as AHUs, Boilers, Chillers and a variety of HVAC control systems.

Because of its programming capability, the DSC-1616 can be used to create or modify GCL+ programs and BACnet objects for specific applications.

Features

- Native BACnet firmware
- BACnet MS/TP communications
- Optional BACnet IP
- Optional BACnet over Ethernet capability
- Integrated housing
- 16 Universal inputs and 16 analog outputs
- Fully programmable in GCL+
- Application database can be flash loaded over the network
- Controller firmware stored in flash memory (can be network loaded)
- Optional Hand/Off/Auto switches with position feedback
- Tri-color LED's to indicate output status

Specifications

BACnet Device Profile

BACnet Building Controller (B-BC)

Inputs

16 Universal inputs - 10 bit (supporting 0-5v, 0-10v, 10kΩ, 4-20mA)

LED status indication of each input

Outputs

16 Analog outputs - (0-10v), software configured as binary or analog

LED status indication of each output

Technology

32-bit processor

1 MB (8 megabit) Flash memory

127 KB SRAM memory (319 KB with Ethernet option)

Real-time clock with lithium battery & SRAM backup

LED indication of CPU and SCAN status

Device Type

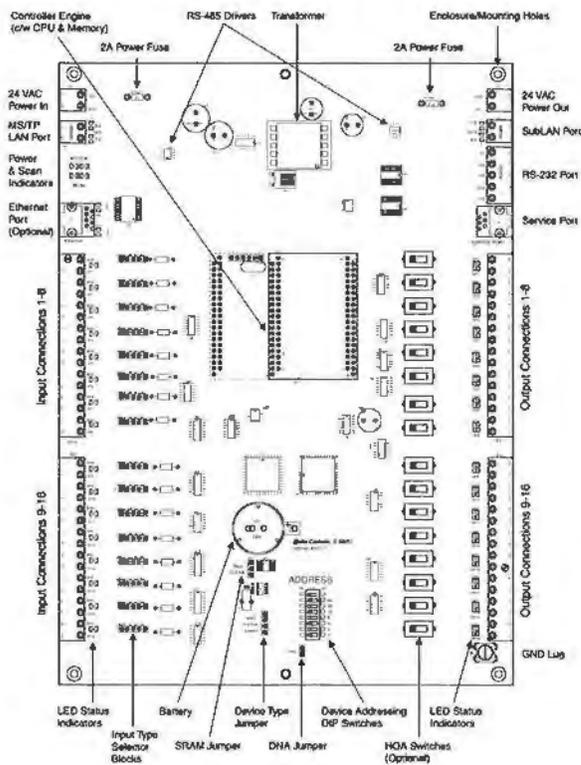
Configured as either an Area, System or Subnet device

Device Addressing

Set via DIP switch and jumpers, or software setup

HVAC

System Controllers DSC-1616: Board Layout Diagram



Specifications (Continued)

Communication Ports

Twisted-Pair Ethernet
(10-BaseT) @ 10 MB (optional), BACnet IP,
BACnet over Ethernet

Main LAN (NET1)
BACnet MS/TP @ 9600, 19200, 38400 or
76800 bps (default) (maximum of 99 devices
per BACnet MS/TP segment)

SubLAN (NET2)
BACnet MS/TP (maximum 99 devices) or
Delta LINKnet @ 76800 bps (maximum 12
devices on LINKnet, with no more than 4
DFM/DNT devices)

Serial RS-232 BACnet PTP, 9600, 19200 or
38400 bps

Connectors

Removable screw-type terminal connectors

Wiring Class

Class 2

Power

24 VAC with LED status indication

30 VA

Ambient

32° to 131°F (0° to 55°C)

10 - 90% RH (non-condensing)

Dimensions

12 x 8 1/8 x 2 1/2 in. (30.6 x 20.5 x
6.4 cm) with housing

2.20 lb. (1 kg) with housing

Approvals/Standards

UL 916 Listed

CE

FCC

BTL Listed

Accessories

RPT-768—Delta Network Repeater for BACnet MS/TP

TRM-768—Delta Network Terminator for BACnet MS/TP

CON-768—Delta Network Converter

Ordering

Order the DSC-1616 with the desired options
according to the following product numbers:

DSC-1616—Controller & Housing, BACnet MS/TP LAN

DSC-1616H—Controller & Housing, BACnet MS/TP
LAN, HOA Switches w/feedback

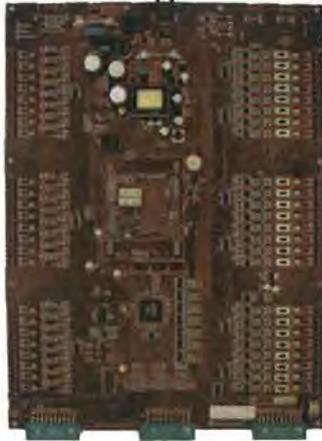
DSC-1616E—Controller & Housing, BACnet MS/TP
LAN, BACnet over Ethernet LAN, HOA Switches with
feedback

System Controllers

DSC-R2424E

Description

The DSC-R2424E is a fully programmable, Native BACnet™ Building Controller replacement for the Intelli-Con Turbo Panel. It communicates using BACnet IP, BACnet over Ethernet or on an RS-485 LAN using the BACnet MS/TP protocol. The DSC-R2424E shares the same physical footprint, I/O expansion cards, and Zone Controller Protocol as the Intelli-Con Turbo.



Application

The DSC-R2424E is suitable for controlling equipment such as AHUs, Boilers, Chillers and a variety of HVAC control systems.

Because of its programming capability, the DSC-R2424E can be used to create or modify GCL+ programs and BACnet objects for specific applications.

Features

- Native BACnet™ firmware
- V2 Intelli-Con Turbo, Intellicon and Intellicon Plus replacement controller
- Flexible input/output configuration using universal I/O points and Intelli-Con expansion cards
- Provides up to 96 I/O points
- V3 Communications: BACnet IP, BACnet over Ethernet, BACnet MS/TP or BACnet PTP
- V2 Communications: Zone Controller Protocol
- Fully programmable in GCL+
- Firmware can be flash loaded over the network
- Hand/Off/Auto switches with position feedback
- Tri-color LED's to indicate output status

Specifications

Inputs

24 Universal inputs - 10 bit (supporting 0-5V, 0-10V, 10KΩ 4-20 mA)

LED status indication per input

Outputs

24 Analog outputs (0-10V) software configured as analog or binary

LED status indication per output

Expansion I/O

3 Expansion slots (8 or 16 I/O points per slot), input or output boards available

Technology

32-bit processor

2 MB (16 megabit) Flash memory

512 KB SRAM memory

Real-time clock

SuperCap backup of clock and SRAM

Communication

Twisted-Pair Ethernet (10-BaseT) @ 10 MB, BACnet IP, BACnet over Ethernet

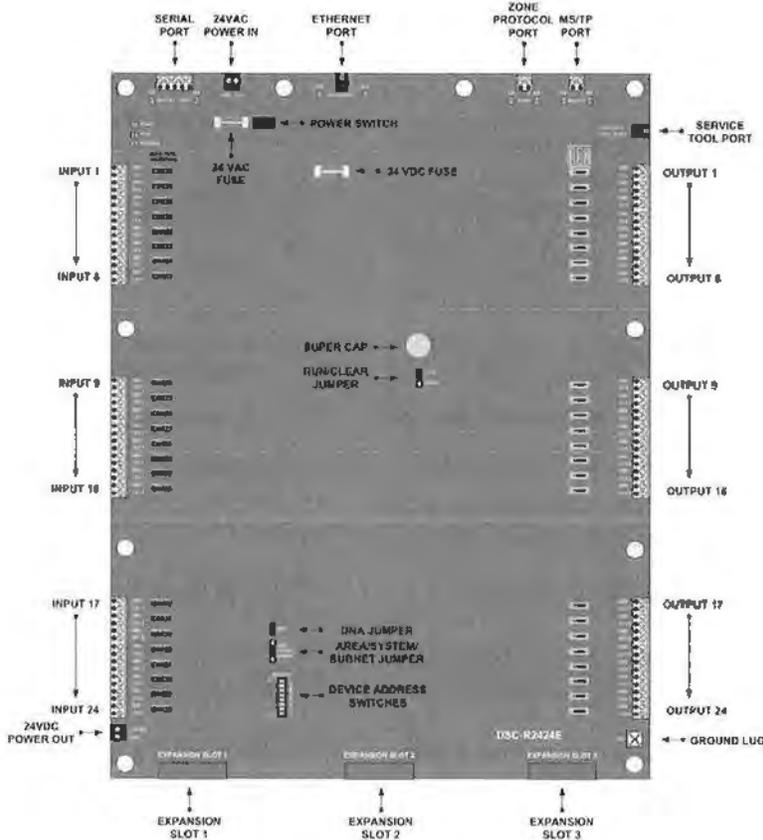
V2 Zone Protocol (NET1)
Intelli-Con Zone Protocol 38400 bps (maximum 98 devices)

Main LAN (NET2)
BACnet MS/TP 9600, 19200, 38400 or 76800 bps (default) (maximum 99 devices per BACnet MS/TP segment)

Serial RS-232 BACnet PTP 9600, 19200 or 38400 bps

HVAC

System Controller DSC-R2424E: Board Layout Diagram



Specifications (Continued)

Device Type

Configured as either an Area, System or Subnet device

Device Addressing

Set via DIP switch or software setup

Wiring Class

Class 2

Power

24 VAC with LED status indication

50 VA

Ambient

32° to 131°F (0° to 55°C)

10 - 90% RH (non-condensing)

Dimensions

15.1 x 11.1 in. (38.4 x 28.2 x 6.4 cm) with housing

2.20 lb. (1 kg) with housing

Compliance

CE

FCC

Accessories

RPT-768—Delta Network Repeater for BACnet MS/TP

TRM-768—Delta Network Terminator for BACnet MS/TP

CON-768—Delta Network Converter

Ordering

Order the DSC-R2424E according to the following product numbers:

DSC-R2424E—24 Inputs, 24 Outputs, Intelli-Con Zone Protocol, BACnet over Ethernet, BACnet MS/TP, HOA switches with feedback

Expansion I/O

EXP110—8 Digital Inputs

EXP120—8 Universal Inputs

EXP130—16 Universal Inputs

EXP140—16 Digital Outputs

EXP161—8 Universal Outputs

System Managers

DSM-050: BACnet Router

Description

The DSM-050 is a fully programmable, Native BACnet™ Building Controller that routes network traffic between BACnet IP, BACnet over Ethernet, BACnet MS/TP, and BACnet PTP. The DSM-050 comes with a 10-BaseT Ethernet network card, one RS-485 Port, two RS-232 ports, real-time clock and battery backup.



Application

The DSM-050 is intended for use as an external point of connection to a building using BACnet IP. It may also be used for interconnecting different BACnet networks within a building.

Features

- Native BACnet IP, BACnet over Ethernet, BACnet MS/TP, & BACnet PTP
- Controller firmware stored in flash memory for easy upgrade
- Database memory expandable from 256 to 1256 KB (SRAM)
- Derived Network Addressing (DNA) for simple integration into a standard network architecture

Specifications

BACnet Device Profile

BACnet Building Controller (B-BC)

Technology

32-bit Processor

1 MB (8 megabit) Flash memory

256 KB SRAM memory (expandable to 1256 KB)

Real-time clock with NiCd battery for clock & SRAM backup

LED status indication of CPU SCAN Status, Network Activity

Device Address

Set via DIP switch, or software setup

DIP switch address range: 0 to 99 per network segment

Software address range: as per the BACnet standard

Supports Delta's derived network addressing (DNA) scheme

Communication Ports

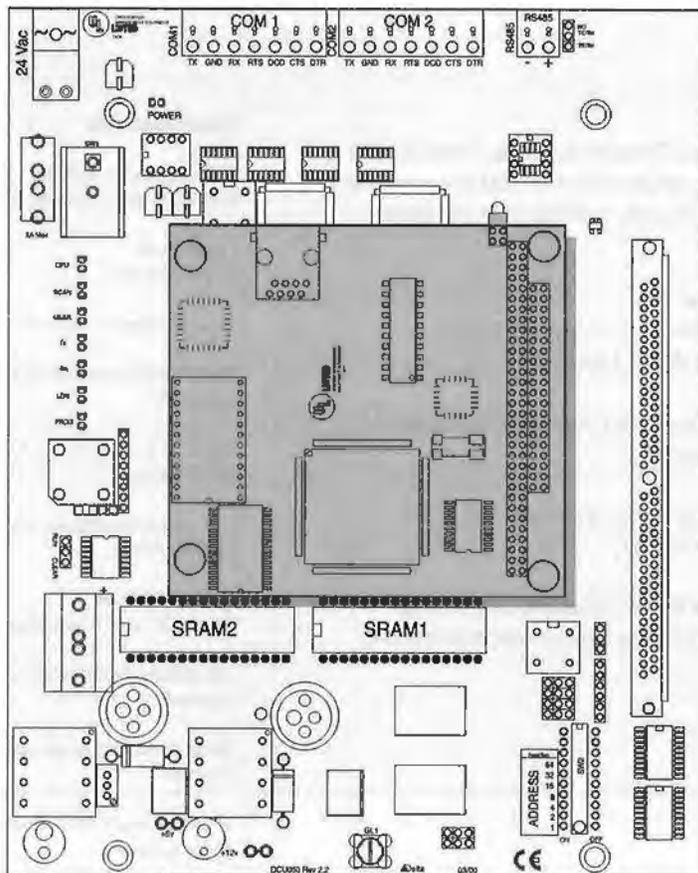
BACnet MS/TP (RS-485) 9600, 19200, 38400 or 76800 bps (default)

BACnet PTP (RS-232) 9600, 19200, 38400 bps

BACnet over Ethernet and/or BACnet IP 10 Mbps

HVAC

System Managers DSM-050: Board Layout Diagram



Specifications (Continued)

Memory

- Standard SRAM 256 KB
- Standard DRAM 4 MB (SIMM Module)
- Standard Flash 1 MB

Connectors

- Removable screw-type terminal connectors

Wiring Class

- Class 2

Power

- 24 VAC
- 40 VA with LED status indication

Ambient

- 32° to 131° F (0° to 55° C)
- 10 to 90% RH (non-condensing)

Dimensions

- 6.65 x 8.4 in. (16.9 x 21.1 cm)
- 0.8 lb. (365 g)

Approvals/Standards

- UL 916 Listed

CE

FCC

Accessories

- RPT-768—Delta Network Repeater for BACnet MS/TP
- TRM-768—Delta Network Terminator for BACnet MS/TP
- DCK790-2 V3—DCU Expandable SRAM Kit (4 MB)

Ordering

Order the DSM-050 with the desired options according to the following product number: DSM-050

DUCT AIR TEMPERATURE

TEMPERATURE

- Platinum RTD or Thermistor
- Rugged Construction
- Hinged cover case

Easy to install with hinged cover

We have engineered our duct probe to ensure long life, rapid response and to prevent heat loss from leaks. The sensor is mounted using PC board technology to eliminate strain on the sensor leads, increasing reliability. The standard version is intended for use in non-condensing atmospheres. For applications where condensation is likely to be present ask for our moisture proof version.

Our molded case with hinged cover is easy to install. The cover is fastened with one captive screw. Provision is made for a front identification tag. The back is completely smooth so it fits flush against the mounting surface. Circuit board slots inside are designed to accept a 2-wire transmitter if required.



TECHNICAL DATA

Platinum RTD's are the most stable temperature sensors between -50 and 400C. They show almost no calibration drift with time. Their stability, wide temperature range and almost linear output make them the choice in demanding applications.

Our standard RTD uses a 100 ohm thin film element to DIN 43 760 (IEC 751) with a tolerance of 0.3 deg C. We also supply thin film RTD's with a tolerance of +/- 0.1 C or 0.05 percent in values of 100, 500 and 1000 ohms.

Wire wound ceramic RTD's with accuracies as high as +/- 0.06 degrees Celcius or 0.025 percent are in stock for high precision applications.

NTC Thermistors are the most sensitive sensors known for temperature measurement from -50C to +150C.

The temperature coefficient of thermistors can be as high as several percent per degree C. This means that lead resistance from installation of thermistors in remote areas has minimal effect on system accuracy.

Since thermistors are semiconductors they must not be exposed to temperatures near their maximum operating limits or they can drift out of specified tolerance.

Our standard thermistor has a 10K resistance at 25C and a tolerance of +/- 0.2C. On request other calibrations and accuracies are available.

Operating Temperature The construction of these sensors limits their maximum operating temperature to 105C.

ORDERING DATA

TS - D - () - () - ()

| | | |
|--------------------------|--|--|
| stem length in inches | sensor type R = RTD T = Thermistor | sensor value 100 = 100 ohms 10K = 10k ohms |
|--------------------------|--|--|

e.g. TS-D-12-T-10K Duct sensor, 12" long with 10K thermistor

ENERCORP instruments Ltd

25 Shomcliffe Rd, Toronto, ON, M9B 3S4 Tel 1(800)ENERCORP or (416)231-5335 Fax 1(877)ENERCORP or (416)231-7662
 Visit our on-line catalogue at www.enercorp.com our e-mail address is info@enercorp.com

CURRENT TO PRESSURE TRANSMITTER

ESC Part #
ENERGATED SYSTEMS EPT750

- Industry Standard Valve
- Updated Electronics
- 4...20mA or 2...10VDC

The VIP-9000 is an I/P or V/P transducer for interfacing electronic control panels to pneumatic valves. A 4...20 mA or 2...10 VDC (capable of delivering 20 mA) input signal is converted by the electronics to a 3 to 15 psi pneumatic signal to position dampers and valve actuators.

We have incorporated a very low air consumption industry standard valve with new electronics to provide excellent reliability with flexible voltage or current inputs.



P
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TECHNICAL DATA

Input Signal 4 ... 20 mA or 2 ... 10 VDC. Voltage signals must be capable of delivering 20 mA.

Input Impedance 500 ohms

Output Signal 3 to 15 psi

Air Supply Required 20 psi nominal, 30 psi maximum, clean, dry, oil free air required. Add in-line filter if necessary.

Air Consumption for Sizing 0.008 scfm at 15 psi

Air Capacity for Air Mains Size 16 scim

Maximum Air Capacity 515 scim at 20 psi supply

Linearity +/- 1% of span

Hysteresis 0.75% of span

Operating/Storage Temperature -29 to 60C / -40 to 71C (-20 to 140F/-40 to 160F)

Humidity 5 to 95% rH, non-condensing

Dimensions 3-7/8"H x 3"W x 2-1/2" D (98x76x67mm)

Connections Screw terminal and barbed fittings for 1/4" OD plastic tubing

Mounting Upright position. Supplied with plastic track for panel mounting

ORDERING DATA

VIP-9000

ACCESSORIES

PRESSURE GAUGE

Size 1 1/2" dia
Mount 1/8" NPT back
Range 0+30psi/0+200kPa
Accuracy 2%
Movement Bourdon tube
ORDER # VIP-PG



MOUNTING "T"

Thread 1/8" NPT female
Hose 1/4" O.D./0.170 I.D.
Material Brass
Mount Through tab holes
ORDER # VIP-T



BETTER INLINE FILTER

This filter is rated at 0.2 microns and changes colour when contaminated by oil. Use to protect VIP-9000.
Hose 1/4" O.D./0.170 I.D.
ORDER # VIP-F02



GOOD INLINE FILTER

This filter is rated at 10 microns. Does not change colour. Use to protect VIP-9000 from dirt particles only.
Hose 1/4" O.D./0.170 I.D.
ORDER # VIP-F10



ENERCOP instruments ltd

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On-Off Control, 24 VAC/DC Power

- LF24 us
- LF24-S us (LF24 us with aux. switch)

On-Off Control, 120 VAC Power

- LF120 us
- LF120-S us (LF120 us with aux. switch)

On-Off Control, 230 VAC Power

- LF230 us
- LF230-S us (LF230 us with aux. switch)

Floating Control, 24 VAC/DC Power

- LF24-3 us (LF24 us with floating point control)
Input impedance: 1000 k Ω
- LF24-3(-S) us (LF230 us with aux. switch)

Proportional Control, 24 VAC/DC Power

- LF24-SR us
Control signal: 2 to 10 VDC
4 to 20 mA (with 500 Ω resistor)
Input impedance: 100 k Ω
Feedback output: 2 to 10 VDC

- LF24-SR-S us (LF24-SR us with aux. switch)

- LF24-SR-MP us
Control signal: 6 to 9 VDC
Input impedance: 100 k Ω
Auxiliary power output: 20 VDC, 40 mA short circuit protected, to power controller

- LF24-SR-S-MP us (LF24-SR-MP us with aux. switch)

Common Data

| | |
|--------------------------|--|
| Power consumption: | 2.5 to 5.5 W running, 1 to 3.5 W holding (models vary) |
| Transformer sizing: | 7 VA (LF24 us, LF230 us), 7.5 VA (LF120 us), 6 VA (LF24-SR-MP us), 5 VA (LF24-S us, LF24-SR us), class 2 power |
| Electrical connection: | 3 ft, 18 GA appl. cable, 1/2" conduit fit. (plenum LF24-3 us, LF24-SR us) |
| Electrical protection: | 120/230V actuators/aux. switches double insulated |
| Overload protection: | electronic throughout rotation |
| Angle of rotation: | 95° (adjustable with integral stop) |
| Direction of rotation: | selected by switch: CW=CW with decrease signal CCW=CCW with decrease signal |
| Spring return direction: | CW/CCW mounting |
| Position indication: | visual indicator |
| Auxiliary switch: | 1 x SPDT. 5° to 85° (-S) |
| Running time: | <40 to 75 sec. (on-off) 150 sec. independent of load (proportional) spring: <25 sec. @-4°F to +122°F [-20°C to +50°C] <60 sec. @-22°F [-30°C] |
| Ambient temperature: | -22° F to 122° F [-30° C to 50° C] |
| Housing: | NEMA 2 / IP54 |
| Agency listings: | UL 873, CSA 4813 02, CE |
| Noise level: | max. 62 dB(A) |
| Weight: | 3.1 lbs to 3.5 lbs (models vary) |

Application/Operation

For fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Actuator is mounted directly to a 3/8" to 1/2" diameter damper shaft by means of its universal clamp, or up to a 3/4" shaft with the optional K6-1 clamp. A crankarm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft.



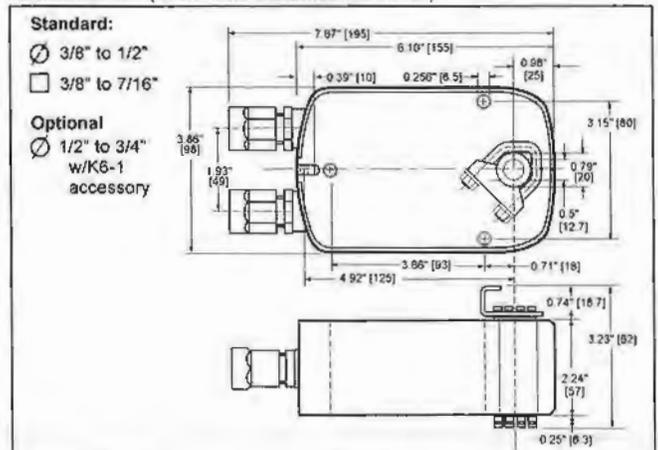
LF24(-S) us, LF120(-S) us and LF230(-S) us control is on-off from an auxiliary contact of a fan motor contactor or a manual switch. The LF24-SR(-S) us operates in response to a 2 to 10 VDC, or with the addition of a 500 Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The LF24-SR(-S)-MP us operates in response to a 6 to 9 VDC control signal and includes a 20 VDC, 40 mA auxiliary power output, used to power the controller. The LF24-3(-S) us control is 3 wire, floating point from a triac or relay, or on-off. The LF24-3(-S) us and LF24-SR(-S) use a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. Power consumption is reduced in holding mode.

True spring return operation is provided for reliable fail-safe application and positive close-off on air-tight dampers. Consistent torque is provided to the damper with, and without, power applied to the actuator. The LF series provides 95° of rotation with a graduated position indicator showing 0° to 90°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. Power consumption is reduced in holding mode.

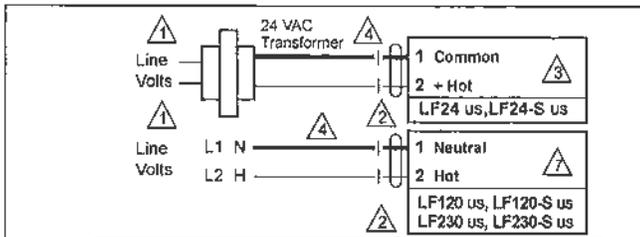
The (-S) models are provided with 1 built in auxiliary switch. This SPDT switch is provided for safety interfacing or signaling, for example, for fan start-up. The switching function is adjustable between 0° and 95°. 120 and 230 V actuators, and all auxiliary switches are double insulated so an electrical ground connection is not necessary.

* Based on 4 in-lb/ft² damper torque loading. Parallel blade. No edge seals.

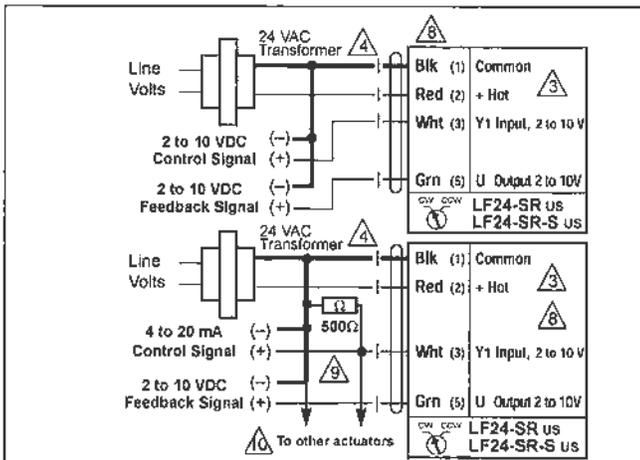
Dimensions (All numbers in brackets are metric.)



Wiring diagrams



On-off



Proportional (2 to 10 VDC, 4 to 20 mA control signals)

Typical Specification:

LF24/120/230 (-S) us and general

Spring return damper actuators shall be direct coupled type which require no crankarm and linkage, capable of direct mounting to a shaft up to a 3/4" diameter and center on a 1/2" shaft. The actuators must be designed so that they may be used for either clockwise or counterclockwise fail-safe operation. The actuators must be designed so that they may be used for either clockwise or counterclockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, 1 SPDT auxiliary switch shall be provided having the capability of being adjustable. Actuators with auxiliary switch, and 120/230 VAC models, must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be UL listed and CSA certified, have a 2 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

LF24-SR (-S) US

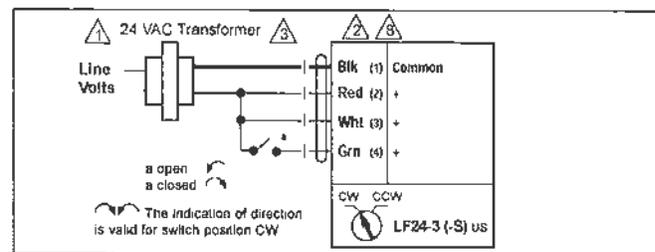
The actuator must provide proportional damper control in response to a 2 to 10 VDC, or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. A 2 to 10 VDC feedback signal shall be provided for position feedback or master-slave applications.

LF24-3(-S) us

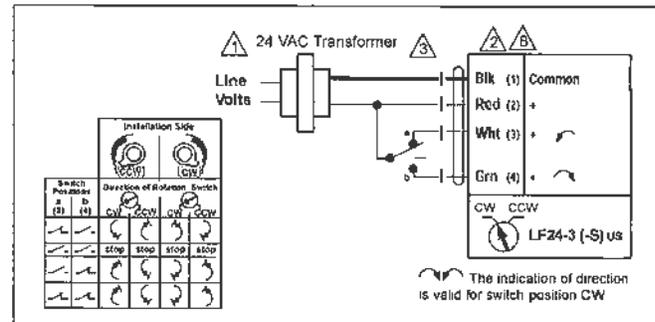
Actuator shall offer floating-point type control.

LF24-SR(-S)-MP us

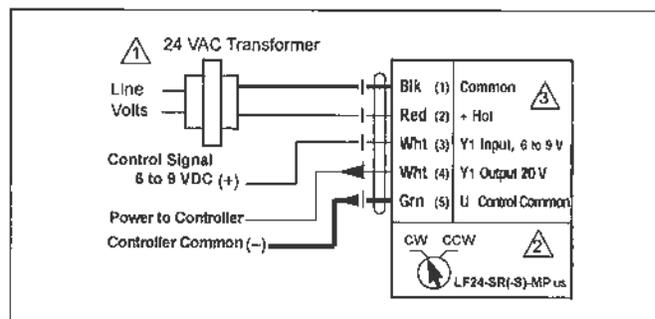
The actuator must provide damper control in response to a 6 to 9 VDC control input from an electronic controller or positioner. A built-in 20 VDC auxiliary power output capable of sourcing up to 40 mA shall be provided to power controllers.



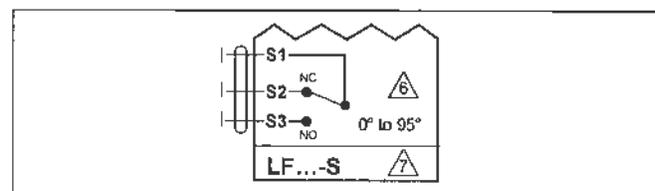
On-Off control of LF24-3 (-S) us



Floating point control of LF24-3 (-S) us



2 to 10 VDC control of LF24-SR(-S)-MP (-S) us



Auxiliary switch models - All LF-series with '-S' suffix

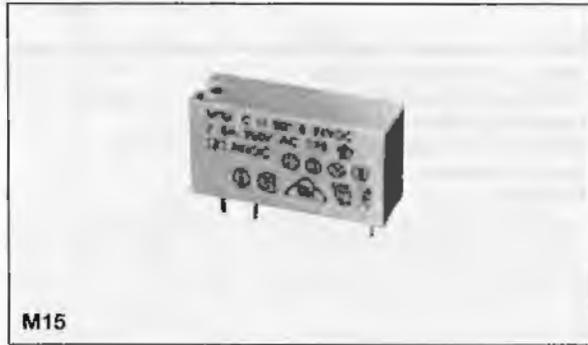
Notes:

- 1 Provide overload protection and disconnect as required
- 2 Actuators may be connected in parallel. Power consumption must be observed.
- 3 May also be powered by 24 VDC
- 4 The Common connection from the actuator must be connected to the Hot connection of the controller
- 5 The actuator Hot must be connected to the control board Common
- 6 For end position indication, interlock control, fan startup, etc. "-S" models incorporate one built-in auxiliary switch 1 x SPDT, 5A (1.5A) @250 VAC, UL listed, adjustable 0° to 95°
- 7 Meets UL & CSA requirements without the need of an electrical ground connection
- 8 Actuators with plenum rated cable do not have numbers on wires, use color codes instead
- 9 The ZG-R01 500Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC
- 10 Up to 4 actuators may be connected in parallel. With 4 actuators wired to one 500Ω resistor, a +2% shift of control signal may be required. Power consumption must be observed

Miniature Power Relays Series M15

Type M15 . . . 100/001

Monostable



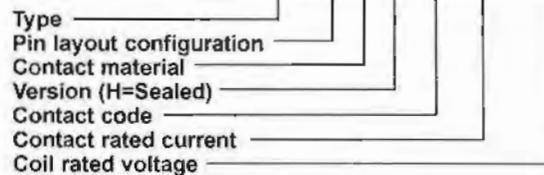
- Miniature size 15 mm high
- PCB mounting
- 4 kV / 8 mm insulation
- Switching capability 8 A / 250 VAC
- DC coils 2 to 147 VDC
- General purpose, industrial electronics
- Sealed according IP 67 standard
- 4 different pin layout configurations
- Low coil power consumption

Product Description

Miniature sealed relay according to IP 67. Suitable for automatic soldering. Produced on fully automated production line.

Space saving design for compact packages. Very low contact noise due to short bounce time (NO contact)

Ordering Key M15 M A H 001 8 24VDC



- | | |
|---------------------------------|-------------------------|
| Pin layout configuration | Contact material |
| M = 3.5 mm | A = Ag CdO |
| B = 5.0 mm | B = Ag Ni |
| F = 2.5 mm | C = Ag CdO, Au plated |
| E = 3.2 mm / 5.0 mm | D = Ag CdO, gilded |
| | E = AgNi, Au plated |
| | F = Ag, gilded |
| | S = Ag SnO ₂ |

Type Selection

| Contact configuration | Contact rating | Contact code |
|--|----------------|--------------|
| 1 normally open contact (SPST-NO {1-form A}) | 8 A | 100 |
| 1 change over contact (SPDT-CO {1-form C}) | 8 A | 001 |

Coil Characteristics, DC (20 °C)

| Rated voltage VDC | Winding resistance Ω ± 10% | Operating range | | Drop out voltage ≥ VDC |
|-------------------|----------------------------|-----------------|----------|------------------------|
| | | Min. VDC | Max. VDC | |
| 3.0 | 40 | 2.00 | 5.3 | 0.150 |
| 5.0 | 115 | 3.40 | 9.0 | 0.250 |
| 6.0 | 160 | 4.00 | 10.6 | 0.300 |
| 8.0 | 290 | 5.40 | 14.2 | 0.400 |
| 12.0 | 640 | 8.40 | 21.2 | 0.600 |
| 18.0 | 1450 | 12.60 | 31.9 | 0.900 |
| 24.0 | 2550 | 16.00 | 42.2 | 1.200 |
| 48.0 | 10250 | 33.50 | 84.7 | 2.400 |
| 110.0 | 31000 | 73.01 | 147.0 | 5.500 |



Temperature Influence

Operating voltages for step excitation. Minimum operating voltage is referred to +20 °C/+68 °F ambient temperature; maximum operating voltage is referred to +40 °C/+104 °F ambient temperature.

| t °C | t °F | K1 | K2 |
|------|------|------|------|
| 0 | 32 | 0.92 | 1.15 |
| 10 | 50 | 0.96 | 1.12 |
| 20 | 68 | 1.00 | 1.09 |
| 30 | 86 | 1.04 | 1.05 |
| 40 | 104 | 1.08 | 1.00 |
| 50 | 122 | 1.12 | 0.94 |
| 60 | 140 | 1.16 | 0.88 |
| 70 | 158 | 1.20 | 0.81 |

Values of minimum and maximum operating voltage in respect to ambient temperature (t) may be obtained applying following formulas:

$$V_{\min t} = K1 \cdot V_{\min 20}$$

$$V_{\max t} = K2 \cdot V_{\max 40}$$

Contact Characteristics

| | |
|---|-----------------------------|
| Rating | 8 A |
| Material (standard version) ¹⁾ | Ag CdO |
| Current (for AC) | |
| Rated current | 8 A |
| Max. switching current | 10 A |
| Voltage | |
| Rated voltage | 250 VAC - 50 Hz |
| Max. switching voltage | 440 VAC (max 1500 VA) |
| Max. switching voltage (VDE 0435) | 380 VAC |
| Power | |
| Max. switch. power with resistive load in AC | 2000 VA |
| Max. switch. power with resistive load in DC | See diagram 1 |
| Min. switching current ²⁾ | 100 mA at 24 VDC |
| Life | |
| Expected life at: | |
| 8 A-250 VAC - cos φ = 1 | 100000 cycles |
| 5 A-250 VAC - cos φ = 0.4 | 100000 cycles |
| Mechan. life at max. switching frequency of 18.000 cycles/h | 30 x 10 ⁶ cycles |

General Data

| | |
|---|--|
| Operating time at rated voltage | ≤ 9 ms |
| Operating bounce time | ≤ 1 ms |
| Release time | ≤ 3 ms |
| Release bounce time | ≤ 3 ms |
| Ambient temperature ²⁾ | - 40 °C to +70 °C |
| Vibration resistance | 2,5 mm p.p. 5 ÷ 45 Hz 10 G, 45 ÷ 100 Hz |
| Shock resistance | 10 G, 11 ms |
| Inside protection according to IEC 144 | IP 67 sealed |
| Weight | 10 g |
| Working class/type of service | C / Continuous |

¹⁾If required, the contacts can be supplied with flash gilded silver contacts for storage purpose (24 VDC/10mA), as well as with gold plated silver contacts for very low switching levels, in the range of 10 mA and 10 mV. AgNi contacts for DC loads and AgSnO₂ contacts for heavy loads are also available.

²⁾Supplying the relay coil at the maximum voltage given in the table "Temperature Influence", the maximum ambient temperature value decreases from 70° to 40°C.

³⁾Typical value

Insulation

| | |
|---|-------------------------|
| Insulation Resistance at 500 VDC | 2 x 10 ⁷ M Ω |
| Test voltage (1 min.) | |
| Open contacts | 1000 VAC |
| Coil/Contacts | 4000 VAC |
| Insulation group according to VDE 0110 | |
| Contact/Coil IGR | C/660 |
| Open/Contact IGR | C/250 |

Special loads - Motor loads

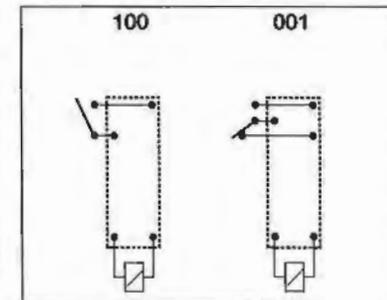
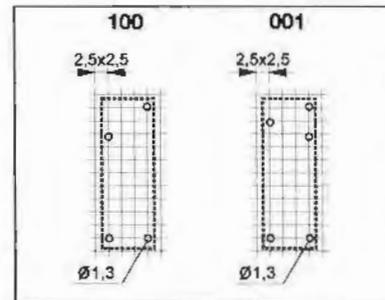
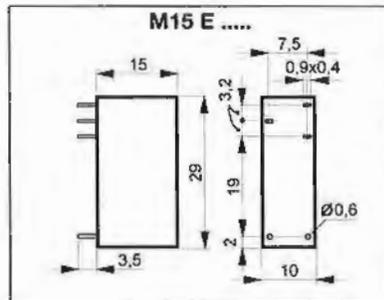
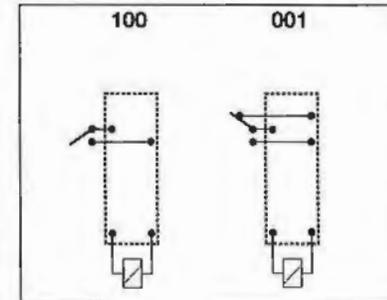
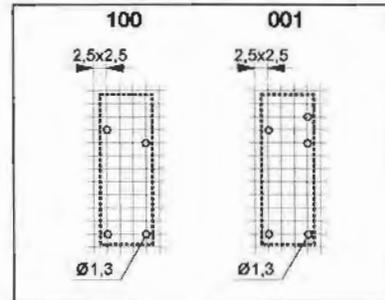
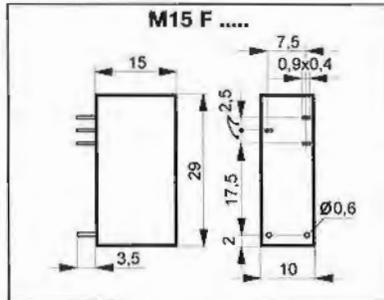
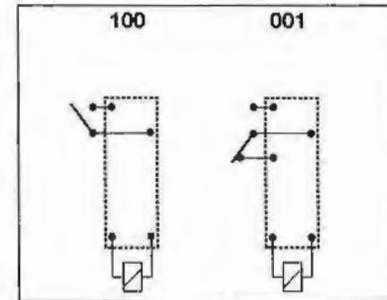
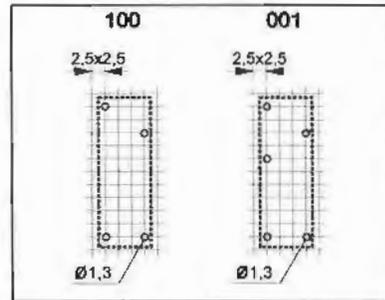
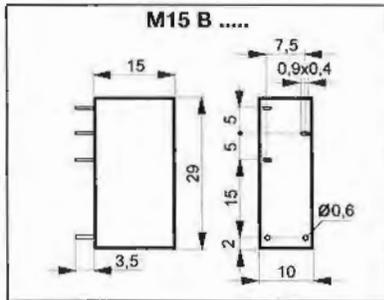
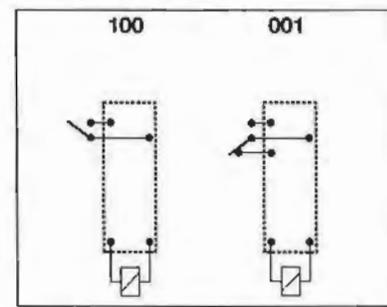
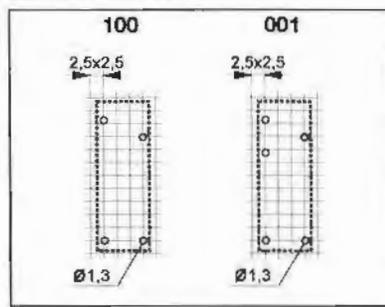
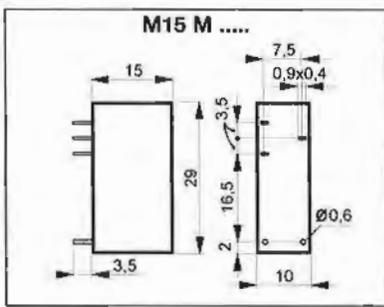
| | AC1 | (IEC 947-5) | | Motor loads | | | |
|----------------|---------|-------------|--------|-------------|---------|--------------------|---------|
| | 250 VAC | AC 15 | DC13 | AgCdO | | AgSnO ₂ | |
| | | 250 VAC | 24 VDC | 115 VAC | 250 VAC | 115 VAC | 250 VAC |
| M15 001 | 8A | 2.5A | 5A | 1/8 HP | 1/3 HP | 1/3 HP | 3/4 HP |



Dimensions

Pin View

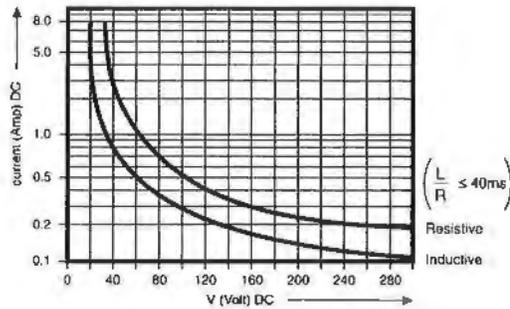
Wiring Diagrams



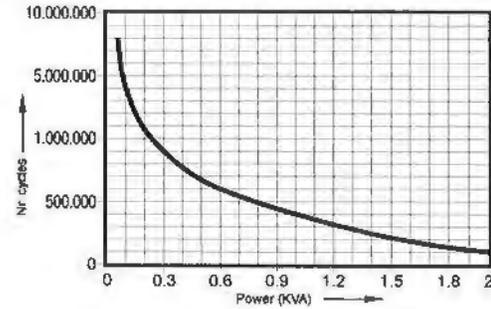
View from solder side.

Diagrams

1 Max. switching power DC



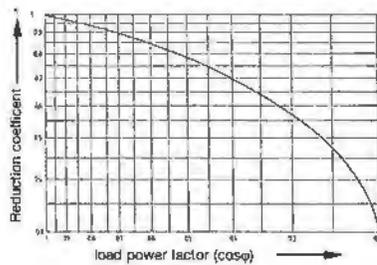
2 Expected switching cycles/switching current at 250 VAC. For resistive loads and repetition rate 360 cycles/h.



Diagrams

3 Reduction of expected life against load power factor $\cos \varphi$

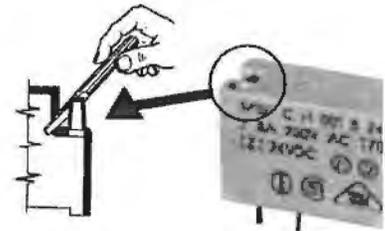
For all types



Application Hints

Use of sealed relays

The M15 relay types are completely sealed (according to IEC 68 part 2 - 17 (DIN 40046) QC 2 - test). They are flux proof and are suited for automated soldering (wave soldering) as well as for immersion washing. If maximum utilization of the switching capacity is required, it is recommended to open the relay after completion of the soldering/washing process by breaking out the corresponding pin as indicated.



Product safety

Operations outside the stated ratings shown in this catalogue may result in a possible failure or unsafe operating conditions.

Approvals



The approvals are not generally applicable to all relay versions of a particular type.

For further information please apply for relevant data sheets ref. 3.84.00.10.X

NF24-SR (-S) US



Proportional damper actuator, spring return failsafe, 24 V for 2 to 10 VDC, or 4 to 20 mA control signal.
Output signal of 2 to 10 VDC for position indication



Torque min. 60 in-lb, for control of air dampers

Application

For proportional modulation of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications.

The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft.

The actuator operates in response to a 2 to 10 VDC, or with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication or master-slave applications.

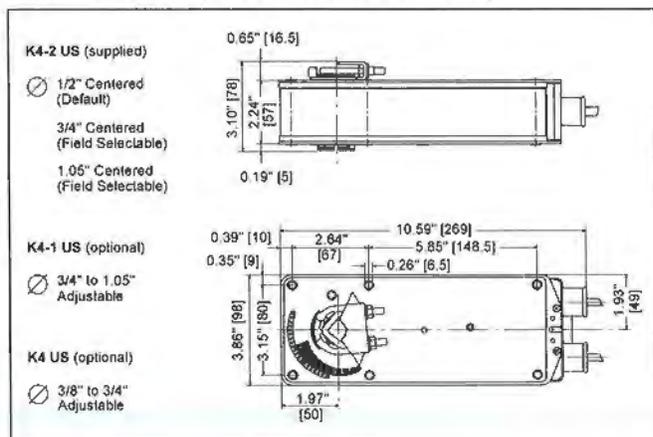
Operation

The NF series actuators provide true spring return operation for reliable fail-safe application and positive close-off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The NF series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°.

The NF24-SR US uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact fail-safe position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches.

| Technical Data | NF24-SR US |
|----------------------------------|---|
| Power supply | 24 VAC ± 20% 50/60 Hz 24 VDC ± 10% |
| Power consumption | running: 3 W; holding: 1 W |
| Transformer sizing | 6 VA (class 2 power source) |
| Electrical connection | 3 ft, 18 GA appliance cable 1/2" conduit connector |
| Overload protection | Electronic throughout 0 to 95° rotation |
| Operating range Y | 2 to 10 VDC, 4 to 20mA |
| Input impedance | 100 kΩ (0.1 mA), 500Ω |
| Feedback output U | 2 to 10 VDC (max. 0.5 mA) for 95° |
| Angle of rotation | 95°, adjustable 30° to 95° w/accessory |
| Torque | 60 in-lb [7 Nm] constant torque |
| Direction of rotation | spring: reversible with cw/ccw mounting motor: reversible with built-in switch |
| Position indication | visual indicator, 0° to 95° (0° is spring return position) |
| Auxiliary switches (NF24-SR(-S)) | 1 x SPDT 7A (2.5A) @ 250 VAC, UL listed adjustable 5° to 85° |
| Running time (nominal) | motor: 150 sec constant, independent of load spring: < 60 sec |
| Humidity | 5 to 95% RH non-condensing |
| Ambient temperature | -22°F to +122°F [-30°C to +50°C] |
| Storage temperature | -40°F to +176°F [-40°C to +80°C] |
| Housing | NEMA type 2 / IP54 |
| Housing material | zinc coated metal |
| Agency listings | UL 873 listed, CSA C22.2 No.24 certified |
| Noise level | max. 45 dB (A) |
| Servicing | maintenance free |
| Quality standard | ISO 9001 |
| Weight | 6.0 lbs (2.7 kg.) |

Dimensions [All numbers in brackets are in millimeters.]



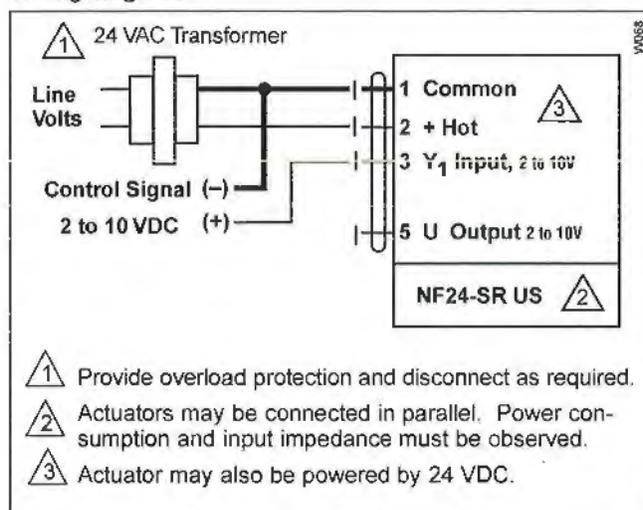
Proportional damper actuator, spring return failsafe, 24 V for 2 to 10 VDC, or 4 to 20 mA control signal.
Output signal of 2 to 10 VDC for position indication

Accessories

| | |
|----------|---|
| AV 10-18 | Shaft extension |
| IND-AF2 | Damper position indicator |
| K4-1 US | Universal clamp for up to 1.05" dia jackshafts |
| K4-H | Universal clamp for hexshafts 3/8" to 5/8" |
| KH-AF | Crankarm for up to 3/4" round shaft |
| KH-AF-1 | Crankarm for up to 1.05" jackshaft |
| KH-AFV | V-bolt kit for KH-AF and KH-AF-1 |
| PTA-250 | Pulse width modulation interface |
| Tool-06 | 8mm and 10 mm wrench |
| SGA24 | Min. and/or man. positioner in NEMA 4 housing |
| SGF24 | Min. and/or man. positioner for flush panel mounting |
| ZG-R01 | 500Ω resistor for 4 to 20mA control signal |
| ZG-HTR | Thermostat/Heater Kit |
| ZDB-AF2 | Angle of rotation limiter |
| ZG-100 | Universal mounting bracket |
| ZG-101 | Universal mounting bracket |
| ZG-102 | Multiple actuator mounting bracket |
| ZG-103 | Universal mounting bracket |
| ZG-104 | Universal mounting bracket |
| ZG-106 | Mounting bracket for Honeywell® Mod IV replacement or new crankarm type installations |
| ZG-107 | Mounting bracket for Honeywell® Mod III or Johnson® Series 100 replacement or new crankarm type installations |
| ZG-108 | Mounting bracket for Barber Colman® MA 3../4..., Honeywell® Mod III or IV or Johnson® Series 100 replacement or new crankarm type installations |
| ZG-AF US | Crankarm adaptor kit for AF/NF |
| ZG-AF108 | Crankarm adaptor kit for AF/NF |
| ZS-100 | Weather shield (metal) |
| ZS-150 | Weather shield (polycarbonate) |
| ZS-260 | Explosion-proof housing |
| ZS-300 | NEMA 4X housing |

Note: When using NF24-SR US actuators, only use accessories listed on this page.

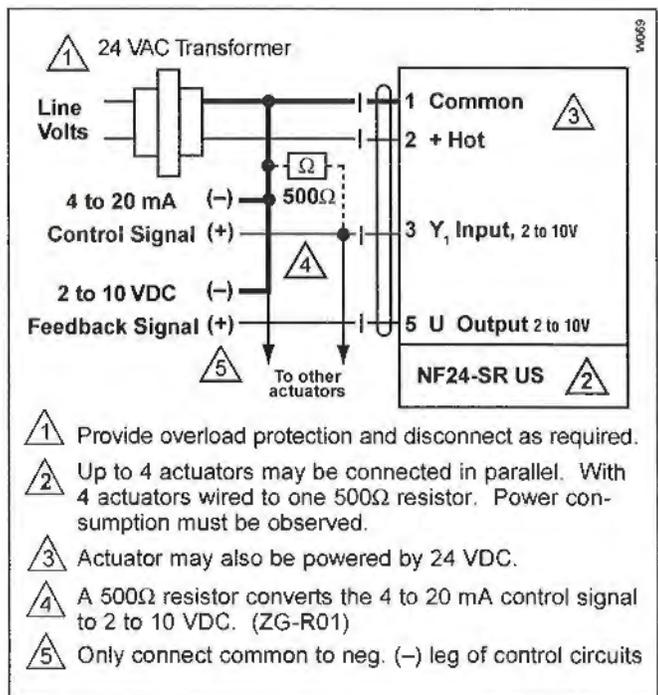
Wiring diagrams



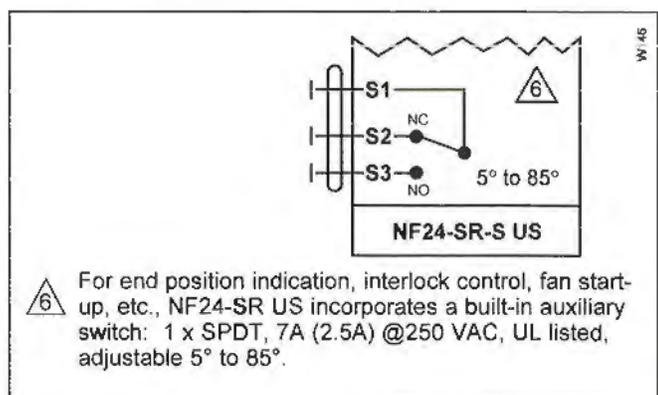
0 to 10 VDC control of NF24-SR US

NF24-SR US Typical Specification

Spring return control damper actuators shall be direct coupled type which require no crankarm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuator must provide proportional damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counterclockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback or master-slave applications. Actuators shall be UL listed and CSA certified, have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.



4 to 20 mA control of NF24-SR US with 2 to 10 VDC feedback output



Auxiliary switch wiring

NM24-SR US



Proportional damper actuator, non-spring return, direct coupled, 24 V, for 2 to 10 VDC and 4 to 20 mA control signal



Torque min. 70 in-lb, for control of air dampers surfaces up to 18 sq. ft.

Application

For proportional modulation of dampers in HVAC systems. Actual actuator sizing should be done in accordance with the damper manufacturer's specifications. The actuator mounts directly to the damper operating shaft with a universal V-bolt clamp assembly.

Operation

The actuator operates in response to a 2 to 10 VDC, 2 to 10 V phasecut or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication or master-slave applications.

A built-in microprocessor automatically tests for the amount of rotation required to modulate the damper fully closed to fully open. The actuator will self-adjust to run at a consistent running time of 150 seconds, and rescale the input signal so the entire 8 volt control range is used to provide maximum resolution of the control system.

The microprocessor will also correct for compression of tight close-off gaskets with age, providing the actuator is not on its mechanical stops. A functional test of the actuator-damper assembly may be done by pressing in the manual override button, this will activate the actuators test mode and cycle the actuator fully open and closed. A 2 to 10 VDC feedback (U) is provided with full 8 volt output range proportional to the operational rotation of the damper.

A digital rotation sensing circuit protects the actuator in a stall anywhere in its 95° working range without the need of limit switches.

Auxiliary switches are easily fastened directly onto the actuator body for signalling and switching functions.

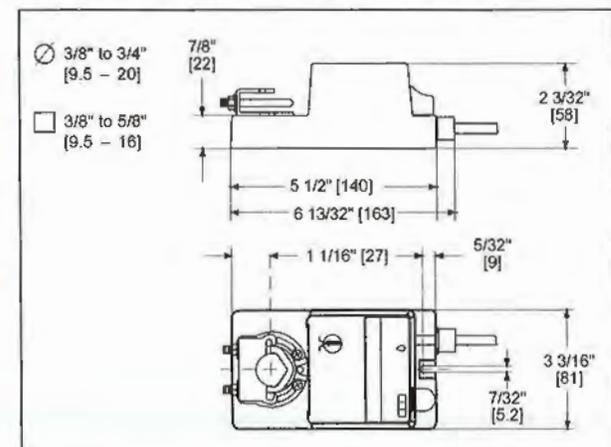
Accessories

- AV 10-18 Damper shaft extension
- SN1,SN2 Auxiliary switches
- ZG-H2 Actuator operator handle
- ZG-NMSA-1 Shaft adaptor for short shafts

Note: When using NM24-SR US actuators, only use accessories listed on this page.

Dimensions

(All numbers in brackets are in millimeters.)



| Technical Data | NM24-SR US |
|-----------------------|---|
| Power supply | 24 VAC, \pm 20%, 50/60 Hz 24 VDC, \pm 10% |
| Power consumption | running: 1.3 W; holding: 0.5W |
| Transformer sizing | 3.5 VA (Class 2 power source) |
| Operating range Y | 2 to 10 VDC, 4 to 20 mA |
| Input impedance | 100kΩ (0.1 mA), 500Ω |
| Feedback output 'U' | 2 to 10 VDC, 0.7 mA max |
| Electrical connection | 3 ft, 18 GA plenum rated (UL CL2P) cable, 1/2" conduit connector |
| Overload protection | electronic throughout 0 to 95° rotation |
| Torque (Note 1) | min 70 in-lb (8 Nm) |
| Damper area (Note 2) | 18 sq ft |
| Direction of rotation | reversible with Switch L/R L = CW with an increase in voltage R = CCW with an increase in voltage |
| Position indication | clip on indicator |
| Manual override | button on actuator |
| Angle of rotation | 0 to 95°, adjust with mechanical stops |
| Running time (35-95°) | 150 seconds independent of max. angle of rotation or torque |
| Running time (0-35°) | 0 to 150 seconds proportional to max. angle of rotation (Note 3) |
| Run time stability | \pm 5% |
| Humidity | 5 to 95% RH, non-condensing |
| Ambient temperature | -4 to +122° F (-20 to +50° C) |
| Storage temperature | -40 to +176° F (-40 to +80° C) |
| Mounting position | not sensitive to position |
| Housing | NEMA 2 |
| Housing material | UL 94-5V (flammability rating) |
| Noise level | less than 35 dB (A) |
| Agency listings | UL 873 listed, CSA C22.2 No.24 certified, CE |
| Quality standard | ISO 9001 |
| Servicing | maintenance free |
| Weight | 1.8 lbs. (0.8kg.) |

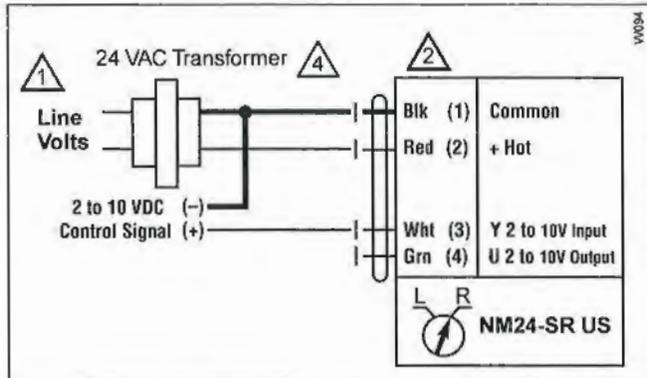
Note 1 Minimum torque is produced at minimum voltage, minimum temperature.

Note 2 Damper area is calculated using approximately 4 in-lb/sq ft of damper area. This is an average torque requirement for good quality dampers operating under a 1" WC pressure drop. Check damper specifications for exact torque requirements.

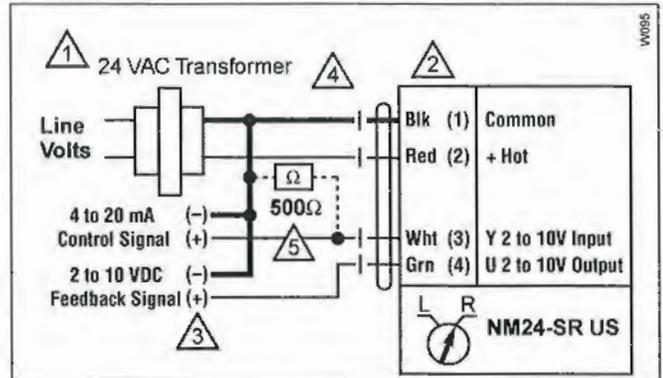
Note 3 The on board microprocessor measures the actuators full stroke on startup. It then adjusts the actuator speed to ensure 150 second run time for 35°-95°. Below 35° stroke, the speed is constant and run time varies with rotation angle.

Proportional damper actuator, non-spring return, direct coupled, 24 V, for 2 to 10 VDC and 4 to 20 mA control signal

Wiring diagrams



2 to 10 VDC control of NM24-SR US



4 to 20 mA control of NM24-SR US with 2 to 10 VDC feedback output

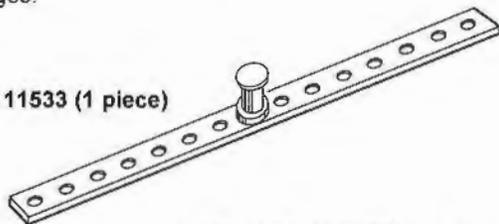
Bulk packaging - NM24-SR.1 US

The bulk packaging option for the NM... series has been discontinued since October 2003

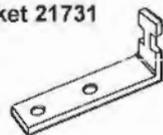
T-Type bracket

These are included in the single-actuator packages.

Part # 11533 (1 piece)



L-Type bracket 21731



Part #: 12503-00001 (24 pieces)
(includes 21731) shipped separately upon request.

Notes:

- 1 Provide overload protection and disconnect as required.
- 2 Actuators are provided with color coded wires. Wire numbers are provided for reference.
- 3 Connect actuator common (Wire 1) to Negative (-) leg of control circuits only.
- 4 May also be powered by 24 VDC.
- 5 The 500Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC.

Typical Specification:

Control damper actuators shall be electronic direct coupled type which require no crank arm and linkage. Actuators shall be UL and CSA listed, have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall have reversing switch and gear disengagement button on the cover, and be electronically protected from overload at all angles of rotation. Actuators shall respond to 2 to 10VDC output relative to position regardless of the amount of damper rotation. Actuators shall have brushless DC motor. Run time shall be constant and independent of torque and angular rotation between 35° and 95°. A 2 to 10 VDC feedback signal shall be provided for position indication or master-slave applications. Actuators shall be as manufactured by Belimo.

Rev. 02/12/07

Features & Options

- Quick-Response Sensor
- Etched Teflon Leadwires
- Well-Vented, Light-Colored Sensor Guard
- Three Enclosure Styles
- Wide Selection of Temperature Sensing Elements
- Limited Lifetime Warranty



Outside Air Units are designed to be mounted outdoors. The 5¼" UV-resistant plastic shield keeps the sensor out of the sunlight and allows for excellent air circulation. The Outside Air Unit comes standard in a Weather Tight (EU) UV-resistant enclosure which carries an IP 66 rating (similar to NEMA 4X) and is light in color to reflect sunlight and minimize reading error. Outside Air Units are also available in a cast aluminum Weatherproof (WP) enclosure which carries a NEMA 3R rating or a BAPI-Box (BB) which is made of UV-resistant polycarbonate and carries an IP66 rating. BAPI also offers optional liquid-tight fittings. For a comparison of the enclosure styles, please see the App. Notes section.



Outside Air Unit with Weather Tight (EU) Enclosure



Outside Air Unit with Weatherproof (WP) Enclosure



Outside Air Unit with BAP-Box (BB) Enclosure

Sealant Filled Connectors



Twist-on (above)
Crimp-on (below)



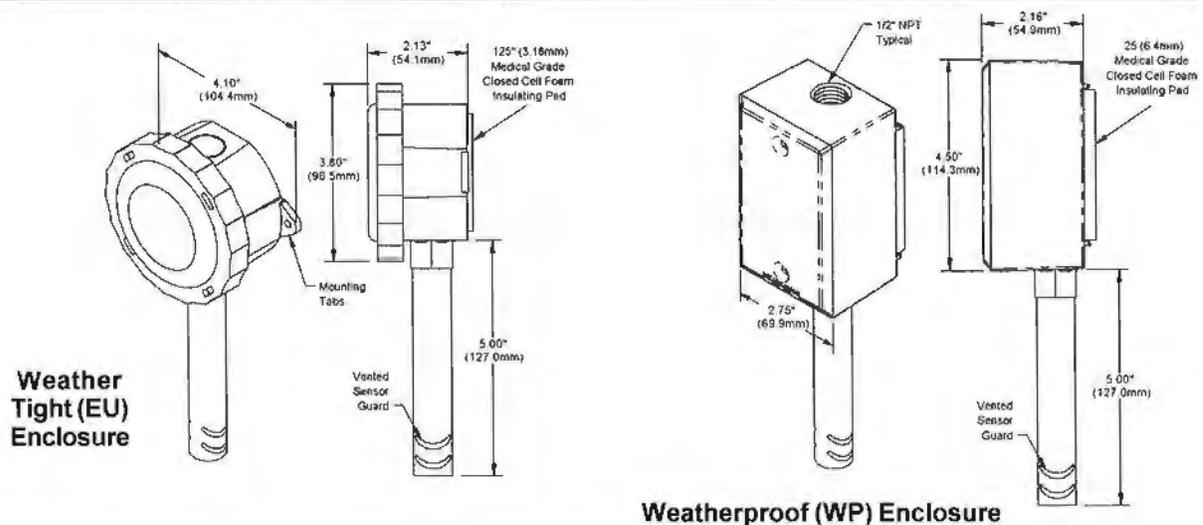
Our Sealant Filled Connectors contain a moisture-excluding sealant which encapsulates the electrical connection and adds an extra layer of protection against moisture and oxidation. For more info, see the Accessories Section.

All Outside Air Units have etched Teflon leadwires and can withstand high humidity and condensation and perform under real world conditions. This is especially important in an outside air application which can be exposed to rain, snow and large temperature swings.

For detailed specs on the individual Sensors & Transmitters, turn to the "Sensors" Section.

*Some items may not be CE compliant, call BAPI for additional information.

Specifications



Rev. 02/12/07

Specifications

Enclosure Material:

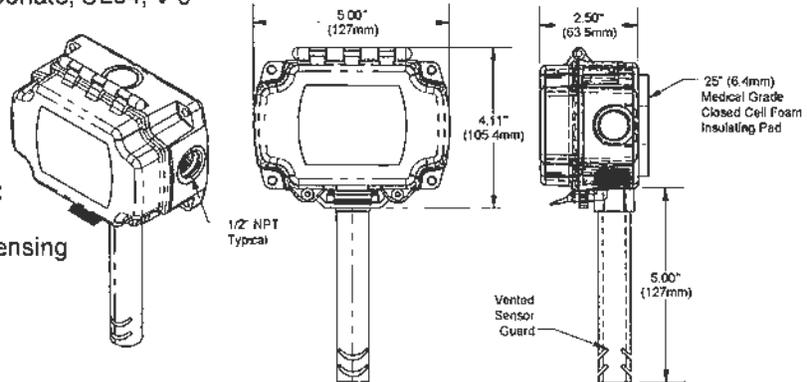
- EU Model: ABS Plastic, UL94, V-0
- BB Model: UV-resistant polycarbonate, UL94, V-0
- WP Model: Cast Aluminum

Enclosure Rating:

- WP Model: NEMA 3R
- EU Model: IP66
- BB Model: IP66

Environmental Operation Range:

- Temperature: -40 °C to 85 °C
- Humidity: 0 to 100%, non-condensing



BAP-Box (BB) Enclosure

Ordering Information Outside Air Units - Temperature

| BAI | | Sensor Type Use the designator number (shown to the left in bold) to indicate the sensor | |
|----------------------|--------------|--|--|
| # | | THERMISTORS | RTDs |
| | 1.8K | 1.8K Ω @ 25 °C | 100 100 Ω Platinum @ 0 °C, .385 Ω /°C temp. coeff. |
| | 3K | 3K Ω @ 25 °C | 100(3W) 3 Wire 100 Ω Plat. @ 0 °C, .385 Ω /°C temp. coeff. |
| | 3.3K | 3.3K Ω @ 25 °C | 1K(375) 1K Ω Platinum @ 0 °C, 3.75 Ω /°C temp. coeff. |
| | 10K-2 | 10K Ω @ 25 °C | 1K(Ni) 1K Ω Nickel @ 21°C, 5 Ω /°C temp. coeff. |
| | 10K-3 | 10K Ω @ 25 °C | 1K 1K Ω Platinum @ 0 °C, 3.85 Ω /°C temp. coeff. |
| | 10K-3(11K) | 5,238 Ω @ 25 °C | 2K 2K Ω Silicon @ 20 °C, 8 Ω /°C temp. coeff. |
| | 20K | 20K Ω @ 25 °C | |
| | 50K | 50K Ω @ 25 °C | SEMICONDUCTORS |
| | 100K | 100K Ω @ 25 °C | 334 LM334 Semiconductor |
| | | | 592 AD592 Semiconductor, 273 μ A @ 0 °C |
| | | | 592-10K AD592 Semicond. w/ 10 k Ω shunt resistor, 2.73 V @ 0 °C |
| | | TEMPERATURE TRANSMITTERS <i>Must include a "range" figure</i> | |
| | T100[range] | 100 Platinum RTD, 100 Ω @ 0 °C with 4 to 20 mA Output | |
| | T100M[range] | 100 Platinum RTD, 100 Ω @ 0 °C with MATCHED* 4 to 20 mA Output | |
| | T1K[range] | 1K Platinum RTD, 1,000 Ω @ 0 °C with 4 to 20 mA Output | |
| | T1KM[range] | 1K Platinum RTD, 1,000 Ω @ 0 °C with MATCHED* 4 to 20 mA Output | |
| | T10K[range] | 10K Thermistor, 10,000 Ω @ 25 °C with 4 to 20 mA Output | |
| | | TEMPERATURE TRANSMITTER RANGES | |
| | | Custom temperature transmitter ranges are available. Common ranges are listed below | |
| | | 32 TO 122F 0 TO 50C -30 TO 140F -34 TO 60C | |
| | | 20 TO 120F -7 TO 48C -22 TO 158F -30 TO 70C | |
| | | -20 TO 120F -29 TO 48C -52 TO 152F -47 TO 67C | |
| | | 0 TO 150F -18 TO 66C | |
| Configuration | | | |
| | -O-BB | BAPI-Box Enclosure - IP66 rated, UV-resistant polycarbonate | |
| | -O-EU | Weather Tight Enclosure - IP 66 UV-resistant enclosure | |
| | -O-EUD | Weather Tight Enclosure - IP66 rated UV-resistant enclosure (Probe is attached to the base of the enclosure, similar to a duct sensor) | |
| | -O-WP | Weather Proof Enclosure - NEMA 3R rated cast aluminum enclosure | |

EXAMPLE

BAI 10K-2 -O-EU Outside Air Unit with Weathertight Enclosure and 10K-2 Thermistor

Example Part Number: BAI10K-2-O-EU

Your Part Number

Call BAPI if you have questions about the above ordering grid or the configuration of the product you are ordering.

Features & Options

- Low Profile Enclosure
- Setpoint Adjustment (optional)
- Occupant Override (optional)
- Communication Jack (optional)
- Bi-Metal Indicator (optional)
- Test and Balance Switch (optional)
- Wide Selection of Temperature Sensing Elements
- Limited Lifetime Warranty



Delta Style Enclosure

Setpoint

The optional Setpoint is a linear slidepot adjustment that comes in various ranges, and is available as Reverse or Direct Acting.

Legend

An optional Setpoint Legend can be imprinted on the base of the enclosure. Common Legends include "Cool/Warm", "65 to 80"(°F), "55 to 85"(°F), and "5 to 30"(°C). (See ordering grid.)

Override

The optional Override is a discreet momentary signal that can be configured to be compatible with any controller.

Communication Jack

Available with RJ11 (4 pin), RJ12 (6 pin), RJ45 (8 pin), or 3.5 mm phono plug style jack.

Bi-Metal Indicator

An optional Bi-Metal Indicator shows room temperature; accurate to ± 1 °F. The display is protected by an acrylic plate and comes with a 50 to 90 °F or 10 to 30 °C legend.

Test and Balance Switch

A three-position slider can be provided on the back of the unit to change the sensor output as follows—the "Low" setting is "Full Cool", "Normal" is the live sensor value, and "High" is "Full Heat".

For detailed specifications on the individual Sensors & Transmitters, turn to Section F.

*Some items may not be CE compliant, call BAPI for additional information.

Custom Logo Plates

For companies that prefer a personalized look to their Room Units, all of BAPI's Delta Style Enclosures are available with a company's individual logo printed on the front. See pages E4-5 for details. Combination Temp./ Humidity options are also available. See pages B4-5.



Delta Style Enclosure with Setpoint, Override and Bi-Metal Indicator

Specifications

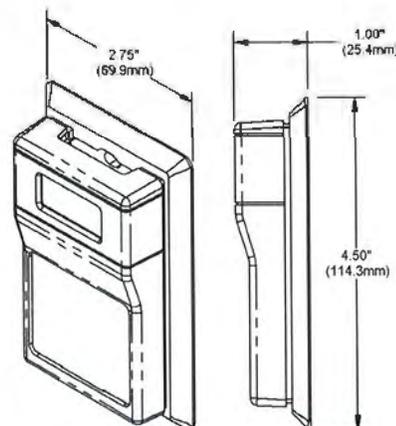
Environmental Specifications:

Temperature: 32 to 122 °F (0 to 50 °C)

Humidity: 0 to 95%, non-condensing

Material: ABS Plastic

Rating: UL 94, V-0



| Ordering Information | | Delta Style Room Units - Temperature | |
|---|---|---|--|
| BAJ | | | |
| Sensor Type Use the designator number (shown to the left in bold) to indicate the sensor | | | |
| # | THERMISTORS | | RTDs |
| | 1.8K | 1.8K Ω @ 25 °C | 100 100 Ω Platinum @ 0 °C, .385 Ω /°C temp. coeff |
| | 2.2K | 2.2K Ω @ 25 °C | 1K(375) 1K Ω Platinum @ 0 °C, 3.75 Ω /°C temp. coeff |
| | 3K | 3K Ω @ 25 °C | 1K 1K Ω Platinum @ 0 °C, 3.86 Ω /°C temp. coeff |
| | 3.3K | 3.3K Ω @ 25 °C | 1K(JNi) 1K Ω Nickel @ 70 °F, 3 Ω /°F temp. coeff. |
| | 10K-2 | 10K Ω @ 25 °C | 2K 2K Ω Silicon @ 20 °C, 8 Ω /°C temp. coeff |
| | 10K-3 | 10K Ω @ 25 °C | |
| | 10K-3(11K) | 5,238 Ω @ 25 °C | |
| | 20K | 20K Ω @ 25 °C | SEMICONDUCTORS |
| | 47K | 47K Ω @ 25 °C | 334 LM334 Semiconductor |
| 50K | 50K Ω @ 25 °C | 592 AD592 Semiconductor, 273 μ A @ 0 °C \ddagger | |
| 100K | 100K Ω @ 25 °C | 592-10K AD592 Semiconductor with a 10 k Ω shunt resistor, 2.73 V @ 0 °C | |
| TEMPERATURE TRANSMITTERS = \$90 for T100 & T1K | | | |
| T100(range) | 100 Platinum RTD, 100 Ω @ 0 °C with 4 to 20 mA Output | | |
| T100M(range) | 100 Platinum RTD, 100 Ω @ 0 °C with MATCHED* 4 to 20 mA Output | | |
| T1K(range) | 1K Platinum RTD, 1,000 Ω @ 0 °C with 4 to 20 mA Output | | |
| T1KM(range) | 1K Platinum RTD, 1,000 Ω @ 0 °C with MATCHED* 4 to 20 mA Output | | |
| TEMPERATURE TRANSMITTER RANGES | | | |
| Custom temperature transmitter ranges are available. Common ranges are listed below | | | |
| | 65 to 80 F | 18 to 27 C | 40 to 90 F 4 to 32 C |
| | 60 to 80 F | 15 to 27 C | 45 to 96 F 7 to 35 C |
| | 55 to 85 F | 13 to 30 C | 0 to 100 F -18 to 38 C |
| | 50 to 90 F | 10 to 32 C | |
| Configuration | | | |
| -R | Delta Style Room Enclosure | | |
| | Setpoint | if setpoint is required, must select Range and Legend | |
| | | SETPOINT OUTPUT VALUE RANGE = \$6 for Setpoint | |
| | ## | Desired Range | Designator |
| | | 800 to 1200 Ω | 25 15 to 5 k Ω 61 |
| | | 909 to 1309 Ω | 26 0 to 20 k Ω 80 |
| | | 1800 to 2200 Ω | 27 4.75 to 24.75 k Ω 81 |
| | | 0 to 1 k Ω | 40 6.19 to 26.19 k Ω 82 |
| | | 500 to 1500 Ω | 41 7.87 to 27.87 k Ω 83 |
| | | 2 to 3 k Ω | 42 10 to 30 k Ω 84 |
| | | 0 to 10 k Ω | 60 |
| | | SETPOINT LEGEND (insert Designator #) | |
| | | Legend Range | Designator |
| | | 5-30 C | L1 68-70-72 L5 |
| | | 55-85 F | L2 COOL/WARM L6 |
| | | 60-85 F | L3 WARM/COOL L7 |
| | | 65-80 F | L4 |
| | Override Configuration <i>Must select one</i> | | |
| | -J | Override as a Separate Input (Not available with transmitter) | |
| | -N | Override in Parallel (//) with Sensor | |
| | -P | Override in Parallel (//) with Setpoint | |
| | -Z | No Override | |
| | Communication Jack <i>Select one if required, omit if not required</i> | | |
| | -C35 | 3.5 mm Phono Style Jack (Not available with transmitter) | |
| | -C11 | RJ11 (4 pin) Style Jack* (Not available with transmitter) | |
| | -C12 | RJ12 (6 pin) Style Jack* (Not available with transmitter) | |
| | -C45 | RJ45 (8 pin) Style Jack* (Not available with transmitter) | |
| | Indicator <i>Select one if required, omit if not required</i> | | |
| | -BM5090 | Bi-Metal Indicator: 50 to 90 °F Legend | |
| | -BM1030 | Bi-Metal Indicator: 10 to 30 °C Legend | |
| | Optional Test & Balance | | |
| | -TB | Three Position Switch - "Low" & "High" values vary, "Normal" is live sensor value Call for details. | |
| | Connection Configuration <i>Must select one</i> | | |
| | -CG | Common Ground | |
| | -DF | Differential Inputs | |
| EXAMPLE | | | |
| BAJ | 10K-2 | -R | 25L1 -J -C35 -BM5090 -CG |
| Part Number: BAJ10K-2-R25L1-J-C35-BM5090-CG | | | |
| Call BAPI if you have questions about the above ordering/pricing grid or the configuration of the product you are ordering. | | | |

SENTRY 100/200 Series

AC Current Transducers with 0-5/10VDC or 4-20mA Output

The Sentry 100/200 Series AC Current Transducers provide a voltage or current signal proportional to monitored current up to 200A. Available in both solid core and split core configurations.



FEATURES

New VFI Technology for VFDs

New Variable Frequency Integration technology uses high speed sampling to provide accurate measurements of current on the load side of VFDs.

Reliability

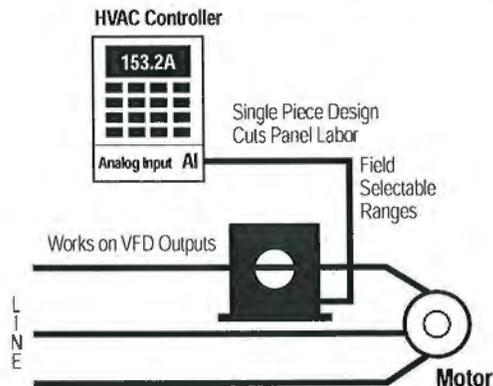
Field-proven in hundreds of thousands of installations since 1982. Solid performance even in rooftop environments. Backed by five-year warranty.

Convenience

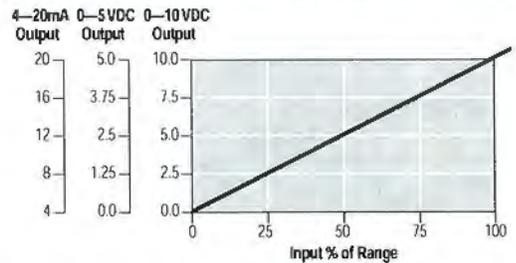
Compact size, integral mounting flange, and two-wire hookup assure an installation that is simple, fast, and secure. You save money and avoid callbacks. The split core version simplifies retrofits.

APPLICATIONS

- || **Automation Systems:** Analog current reading for remote monitoring and software alarms
- || **Fan/Pump Status:** Electronic proof of flow
- || **Sense High Current:** Accurately read the secondary current from high ratio CTs



SIGNAL DIAGRAM

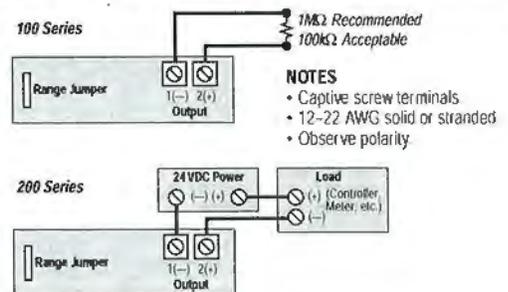


INPUT MAXIMUMS

| RANGE | MAXIMUM CONTINUOUS | MAX. 6 SEC. | MAX. 1 SEC. |
|--------|--------------------|-------------|-------------|
| 0-2A | 40A | 60A | 100A |
| 0-5A | 100A | 124A | 250A |
| 0-10A | 80A | 125A | 250A |
| 0-20A | 110A | 150A | 300A |
| 0-50A | 175A | 215A | 400A |
| 0-100A | 200A | 300A | 600A |
| 0-150A | 300A | 450A | 800A |
| 0-200A | 400A | 500A | 1,000A |

See Ordering Information for models with listed ranges.

CONNECTIONS

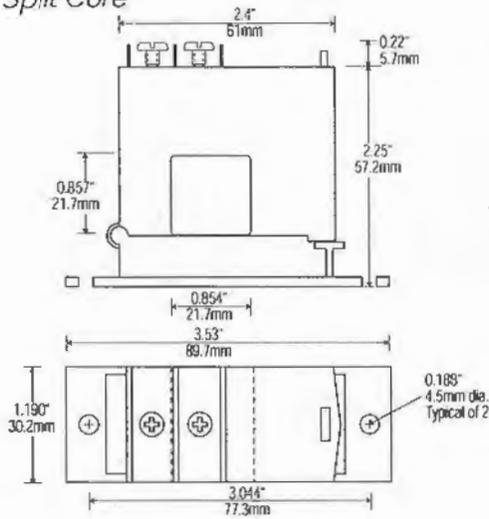


Neilsen-Kuljian, Inc.
(800) 959-4014
www.SentrySensors.com

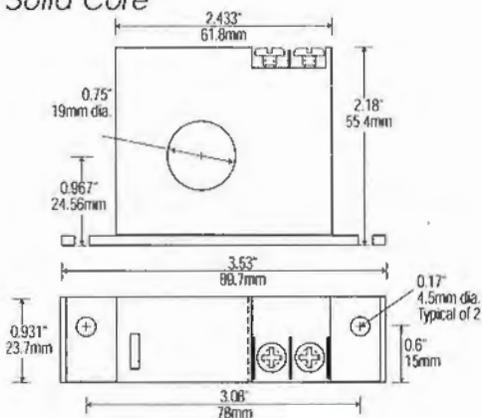
SENTRY 100/200 SERIES

AC Current Transducers with 0-5/10VDC or 4-20mA Output

Split Core



Solid Core



SPECIFICATIONS

| | | |
|------------------------|---|----------------------------|
| Output Signal | 0-5VDC, 0-10VDC, 4-20mA (see Ordering Info) | |
| Accuracy | 0-5/10VDC: | 1% FS over 5-100% of range |
| | 4-20mA: | 0.5% FS |
| Response Time, 0-90% | 0-5/10VDC: | 100 ms |
| | 4-20mA: | 300 ms |
| Frequency Range | 0-5/10VDC: | 50-60Hz |
| | 4-20mA w/o VFI: | 20-100Hz |
| | 4-20mA w/ VFI: | 10-400Hz |
| Power Supply | 0-5/10VDC: | Self-powered |
| | 4-20mA: | 12-40VDC, Loop-powered |
| Output Load, 0-5/10VDC | 1 Megohm required for rated accuracy 100K Ohm Load, add 1.3% error | |
| Output Load, 4-20mA | 950 ohms max @ 24 VDC $R_{max} = (V_{supply} - 5) / 0.020A$ | |
| Output Signal Limit | 2x rated output | |
| Isolation Voltage | UL listed to 1270 VAC, tested to 5kV | |
| Input Ranges | Field Selectable Ranges from 0-200A (see Ordering Info) | |
| Sensing Aperture | Solid core: | 0.75" dia. |
| | Split core: | 0.85" sq. |
| Case | UL 94V-0 Flammability rated thermoplastic | |
| Environmental | 0-5/10VDC: | -58/149° (-50/65°C) |
| | 4-20mA: | -4/122°F (-20/50°C) |
| | For all: | 0-95% RH, non-condensing |
| Approvals | UL, ULC, CE   | |

Need an interposing relay? See the new PowerBASE Relay on page 13.

ORDERING INFORMATION

4-20mA Output Models

(Specify VFI when measuring VFD loads)

| MODEL | RANGE | VFI | CASE |
|------------|----------------------|-----|------------|
| 200-05 | 0-2, 0-5A | No | Solid Core |
| 200-1 | 0-10, 0-20, 0-50A | No | Solid Core |
| 200-2 | 0-100, 0-150, 0-200A | No | Solid Core |
| SC200-05 | 0-2, 0-5A | No | Split Core |
| SC200-1 | 0-10, 0-20, 0-50A | No | Split Core |
| SC200-2 | 0-100, 0-150, 0-200A | No | Split Core |
| 200-05-V | 0-2, 0-5A | Yes | Solid Core |
| 200-1-V | 0-10, 0-20, 0-50A | Yes | Solid Core |
| 200-2-V | 0-100, 0-150, 0-200A | Yes | Solid Core |
| SC200-05-V | 0-2, 0-5A | Yes | Split Core |
| SC200-1-V | 0-10, 0-20, 0-50A | Yes | Split Core |
| SC200-2-V | 0-100, 0-150, 0-200A | Yes | Split Core |

VDC Output Models

| MODEL | RANGE | OUTPUT | CASE |
|----------|----------------------|---------|------------|
| 100-1L | 0-10, 0-20, 0-50A | 0-5VDC | Solid Core |
| 100-2L | 0-100, 0-150, 0-200A | 0-5VDC | Solid Core |
| 100-3L | 0-10, 0-20, 0-50A | 0-10VDC | Solid Core |
| 100-4L | 0-100, 0-150, 0-200A | 0-10VDC | Solid Core |
| SC100-1L | 0-10, 0-20, 0-50A | 0-5VDC | Split Core |
| SC100-2L | 0-100, 0-150, 0-200A | 0-5VDC | Split Core |
| SC100-3L | 0-10, 0-20, 0-50A | 0-10VDC | Split Core |
| SC100-4L | 0-100, 0-150, 0-200A | 0-10VDC | Split Core |

Contact Neilsen-Kuljian for availability of the earlier 100 Series products which have a 10% signal offset.



Neilsen-Kuljian, Inc.
(800) 959-4014
sales@SentrySensors.com

FLEX-CABLE PROBE

- Platinum RTD or Thermistor
- Conforms to any duct size
- Very easy to install
- Totally flexible

Easy to install flex-cable

Our probe is constructed using CSA rated FT6 plenum cable. Numerous sensors are encapsulated in 316 s/s sheaths at equal distances along the length of the cable. The complete assembly acts as a single temperature sensor and any temperature change is averaged across the sensors. The probe can easily be strung to fit any size duct.

For lengths up to 12 feet or for most economical applications, we average the readings of four encapsulated sensors. For 24 foot probes and more demanding applications, we use nine sensors spaced along the length of the cable.

Our molded case with hinged cover is easy to install. The cover is fastened with one captive screw. Provision is made for a front identification tag. The back is completely smooth so it fits flush against the mounting surface. Circuit board slots inside are designed to accept a 2-wire transmitter if required.



TECHNICAL DATA

Platinum RTD's are the most stable temperature sensors between -50 and 400C. Their stability, wide temperature range and almost linear output make them the choice in demanding applications.

Our standard RTD's use 100 or 1000 ohm thin film elements to DIN 43 760 (IEC 751) class B with a tolerance of 0.3 deg C. We also supply class A thin film RTD's as well as sensors with wire wound elements in class B, class A and 1/5 DIN tolerances.

NTC Thermistors are the most sensitive sensors known for temperature measurement from -50C to +150C.

The temperature coefficient of thermistors can be as high as several percent per degree C. This means that lead resistance from installation of thermistors in remote areas has minimal effect on system accuracy.

Since they are semiconductors they must not be exposed to temperatures near their maximum operating limits or they can drift out of specified tolerance.

Our standard thermister has a 10K resistance at 25C and a tolerance of +/- 0.2C. On request other calibrations and accuracies are available.

Operating Temperature The construction of these sensors limits their maximum operating temperature to 105C.

ORDERING DATA

TS - FC - () - () - () - ()

| | | | |
|-------------------------|-----------------------|--|--|
| cable length in feet | no. sensors 4 or 9 | sensor type R = RTD T = Thermistor | sensor value 100 = 100 ohms 10K = 10k ohms |
|-------------------------|-----------------------|--|--|

e.g. TS-FC-24-9-T-10K Flex-cable averaging sensor 24 feet long with nine 10K thermistors

ENERCORP instruments Ltd

25 Shorncliffe Rd, Toronto, ON, M9B 3S4 Tel 1(800)ENERCORP or (416)231-5335 Fax 1(877)ENERCORP or (416)231-7662
 Visit our on-line catalogue at www.enercorp.com our e-mail address is info@enercorp.com

IMMERSION TEMPERATURE SENSOR**WTS420****Application**

The Immersion Temperature

Sensor provides precise, remote

fluid temperature sensing.

**Features**

- Highly stable, precision thermistor material accurate to within $\pm 0.36^{\circ}\text{F}$.
- Standard brass thermowell, which screws into $\frac{1}{2}$ " NPT saddle, or threaded fitting.
- Optional stainless steel thermowell.

Description

The moisture/waterproof sensing element is sealed with a temperature conductive compound in a $\frac{4}{8}$ " stainless steel tube with brass fitting, which is removable from the thermowell for replacement without system draindown.

The brass well is the standard thermowell for insertion in non-corrosive liquid lines. Alternatively, a stainless steel well may be implemented for insertion in corrosive liquid pipe lines.

Both wells are designed to withstand a maximum temperature of 250°F and a maximum static pressure of 250 PSIG.

Ordering

To order the Immersion Water Temperature Sensor, specify the following product number with the appropriate extension to indicate options:

WTS 420-**x**, where 'x' is:

0. No well
1. Brass well
2. Stainless steel well

Specifications**Thermistor**

10 k Ω @ 77°F (25°C)

Accuracy

$\pm 0.36^{\circ}\text{F}$ from 32° – 158°F
 $(\pm 0.2^{\circ}\text{C}$ from 0° – $70^{\circ}\text{C})$

Stability

0.24°F over 5 years (0.13°C)

Range

10° – 230°F (-10° – 110°C)

Wiring

Make electrical connections to the sensor in accordance with the site installation wiring diagram and in accordance with national and local electrical codes. Twisted pair wire of at least 22 AWG and crimp-type connectors for wire connections are recommended. The sensor itself does not require shielded cable. However, it is not recommended that wiring be run in the same conduit as line voltage wiring or with wiring used to supply highly inductive loads such as motors, generators and coils.

Size

$\frac{6}{8}$ " x 2" (16.1 cm x 5 cm)

Weight

0.28 lb (130 g)

Technical specifications are subject to revision without notice.

O R C A

Open Real-time Control Architecture

WTS420

IMMERSION TEMPERATURE SENSOR

2/2

Provided by your local Delta Controls partner

420-9803

Delta Controls Inc. 17850 56th Avenue, Surrey, B.C. Tel. (604) 574-9444 Fax (604) 574-7793



ESC AUTOMATION



Now  **Listed**

The full-featured Delta Controller Engine (DCE) firmware powers a full range of BACnet devices. With a fully integrated system of Native BACnet controllers for HVAC, Access, and Lighting control it is the world's most comprehensive implementation of BACnet.

For complete details of Delta's BTL listings check:

www.deltacontrols.com

www.bacnetassociation.org



BACnet is a registered trademark of ASHRAE. ASHRAE does not endorse, approve or test products for compliance with ASHRAE standards. Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of the BACnet Manufacturers Association (BMA). BTL is a registered trademark of the BMA.

| ITEM | ACCEPTABLE PRODUCTS / SUPPLIERS / MANUFACTURERS | SHOP DWG. |
|-------------------------------|--|-----------|
| PLUMBING | | |
| FAUCETS | Acorn, Alsons, American Standard, Bradley, Cambridge, Chicago, Crane, Delta, Grohe, Kohler, Moen, Powers, Sloan, Symmons, TOTO , T&S Brass | X |
| FIXTURES | | |
| stainless steel | Acorn, AMI, Bradley, Franke, KIL, Kindred, Steel Queen | X |
| vitreous | American Standard, Crane, Kohler, TOTO | X |
| WASTE FITTINGS | McGuire, OS&B, Teck | X |
| HVAC | | |
| ACCESS DOORS | | |
| Building Surfaces | Acudor, Cendrex, E.H. Price, Maxam, Milcor, Mifab, Steel Brothers | X |
| AIR CONDITIONING UNITS | | |
| Computer Room | Air Technology Systems, Airflow, Edpac, Hiross, Liebert, Data-Aire | X |
| AIR TERMINALS | E.H. Price, Nailor, Titus | X |
| CONTROL DAMPERS | | |
| Low Leakage Type | Arrow-Foil PBDAF & OBDAF, Honeywell Moduflow D642 & D643, Johnson Proportion/Aire D-1200 & D-1300, Ruskin CD36, Tamco 1000, Nailor 1010, | X |
| EXPANSION JOINTS | Flexonics, Hyspan, Uniroyal, Keflex, Mason, Goodall, Victaulic | X |
| FANS | | |
| Cabinet | Airtex, Cook, Delhi, Greenheck, Lau, Penn | X |
| In – Line | Loren Cook, Greenheck, Twin City | X |
| FIRE DAMPERS | | |
| Folding Shutter Type | Controlled Air, Nailor, NCA, Ruskin | X |

| ITEM | ACCEPTABLE PRODUCTS / SUPPLIERS / MANUFACTURERS | SHOP DWG. |
|----------------------------|---|------------------|
| INSULATION - DUCT | Fiberglas, Knauf, Johns-Manville, Atlas, PPG, Manson, Certainteed | X |
| INSULATION - PIPING | Fiberglas, Knauf, Johns-Manville, Manson, Atlas, PPG, Certainteed | X |
| LOUVRES | Airolite, Alumavent, Westvent, Ruskin, E.H. PRICE | X |

NOTES:

- .1 The design is based upon the equipment listed in the equipment schedules and/or underlined in the Plumbing - Equipment Manufacturers Schedules.
- .2 X Denotes required submission.

End of Appendix G