

University of  
**Lethbridge**



**University of Lethbridge  
Design and Construction  
Standards**

**October 2010**

## **01 00 00    General Requirements**

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The University of Lethbridge requires that all future development of the core campus be performed with reference and adherence to the Core Campus Expansion Plan located at: [www.uleth.ca/exp/](http://www.uleth.ca/exp/)

### **01 10 00    Summary**

#### **01 11 00    Summary of Work**

##### **01 11 13    Work Covered by Contract Documents**

- All design must comply with current provincial and federal codes in effect governing the jurisdiction of work.
- Record drawings shall be produced and submitted for ALL University projects. All drawings must conform to the University CAD drawing standards.

### **01 80 00    Performance Requirements**

#### **01 81 00    Facility Performance Requirements**

##### **01 81 13    Sustainable Design Requirements**

###### **.1 LEED Accreditation**

- The University of Lethbridge requires that all new building design and construction follow the requirements of the LEED process. It is not the intention to have all applicable projects accredited but the practice and procedures that follow with LEED accreditations shall be maintained for all projects. The University will decide whether a project does not warrant obtaining LEED certification.
- The University of Lethbridge requires that the Prime Consultant conduct a LEED energy charette with Physical Plant for all projects. The purpose of the charette is to review and refine a preliminary LEED checklist along with potential energy savings to be pursued by the design team.
- The University will only pursue LEED points based on merit and value.

###### **.2 Energy Management**

- The University requires that all designs, whether large or small, adhere to a strict energy management policy and procedure. All energy conservation methods shall be considered and reviewed prior to finalizing the design. Items to be considered include but are not limited to:
  - Free cooling
  - Heat recovery (i.e. heat wheels, etc.)
  - Variable frequency drives (on fans, pumps, etc.)
  - Variable flow systems

- High temperature differential systems (hot water and chilled water systems)
  - Variable air volume systems
  - Demand control ventilation using carbon dioxide (CO2) control
  - Time of day scheduling
  - Thermal storage (if feasible)
  - Instantaneous hot water heating
  - Low water consumption plumbing features
  - Displacement ventilation
  - Low electrical consumption high lumen output light fixtures
  - Occupancy control
- Energy management considerations should provide a simple pay back. The maximum pay back of any option will depend on the nature of the equipment and life of the materials being considered.
- High efficiency VFD compatible motors shall be used for all applications

## **01 82 00      Facility Substructure Performance Requirements**

### **01 82 13      Foundation Performance Requirements**

- .1 All construction shall employ the services of a Geotechnical Engineer who will perform an analysis of the existing site along with recommendations for possible building foundations.
- .2 All foundations must be surrounded by drainage tile.

## **01 83 00      Facility Shell Performance Requirements**

### **01 83 16      Exterior Enclosure Performance Requirements**

- .1 All exterior walls should be R20 minimum total insulating value.

### **01 83 19      Roofing Performance Requirements**

- .1 All new roofs shall carry a minimum 5 year warranty. Proof of warranty required upon project completion.
- .2 All roofs should be constructed with a minimum construction rating of R40.
- .3 All new roofs must be designed to meet all OH&S requirements including all necessary maintenance and service work tie-off points.

## **01 84 00      Interiors Performance Requirements**

### **01 84 13      Interior Construction Performance Requirements**

- .1 Wherever possible, avoid placement of washrooms over offices, classrooms or common public areas.

## **01 90 00      Life Cycle Activities**

### **01 91 00      Commissioning**

#### **01 91 13      General Commissioning Requirements**

- .1 All new construction projects will be monitored by the University of Lethbridge Building Commissioning Agent. The University will create check sheets to review the ongoing construction of the building envelope. The University Commissioning Agent shall work closely with the Architect and shall immediately notify the Prime Consultant of all deficiencies.

**01 19 19      Facility Shell Commissioning**

- .1 The University shall conduct an infrared heat analysis of all structures upon completion. All areas showing unacceptable heat loss will be repaired by the contractor immediately.

**01 93 00      Facility Maintenance**

**01 93 16      Recycling Programs**

- .1 The University of Lethbridge is among the leaders in Southern Alberta for recycling with the most advanced and organized paper recycling program of all institutions in Lethbridge.
- .2 Consult with the University Physical Plant for detailed information on the recycling programs.

**02 00 00      Existing Conditions (Update Forthcoming)**

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**03 00 00      Concrete**

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**03 80 00      Concrete Cutting and Boring**

**03 82 00      Concrete Boring**

**03 82 13      Concrete Core Drilling**

1. Drilling into the legs of any T-slabs on campus is not acceptable unless otherwise approved by the University.

**04 00 00      Masonry (Update Forthcoming)**

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**05 00 00      Metals (Update Forthcoming)**

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**06 00 00      Wood, Plastics, & Composites (Update Forthcoming)**

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**07 00 00      Thermal & Moisture Protection**

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**07 20 00      Thermal Protection**

**07 22 00      Roof and Deck Insulation**

- Roof R-value to be R40.

## **07 25 00 Weather Barriers**

### **07 27 00 Air Barriers**

- .1 All air/vapour barrier membrane installations shall be orientated according to manufacturer's specifications.
- .2 In all circumstances the air/vapour barrier shall overlap the foundation wall a minimum of 150 mm.
- .3 All joints must be overlapped (minimum 150 mm) and rolled to eliminate all creases and as per the installation manual.
- .4 All installations must meet the approval of the design Architect and the University of Lethbridge Building Envelope Commissioning team.

## **07 50 00 Membrane Roofing**

### **07 53 00 Elastomeric Membrane Roofing**

- Roof option: Elastomeric modified bitumen fully adhered roof type.

### **07 54 00 Thermoplastic Membrane Roofing**

- Roof option: Thermoplastic polyolefin membrane roof type.

## **08 00 00 Openings**

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### **08 05 00 Common Work Results for Openings**

- .1 Avoid the use of doors for all multi-fixture washrooms where possible.
- .2 A window shall be provided in all office and classroom doors to provide for some degree of visual surveillance. The requirements are:
  - Classrooms and office doors will have the same glazing detail
  - Clear vision size = 125mm X 250mm
  - Vertical centre line = 1575mm
  - Horizontal centre line = 200mm
  - Passage door windows shall be 150mm X 410mm
- .3 Provide 230mm space between door frames and sidelight window frames to accommodate room identification and tackboards.

### **08 06 00 Schedules for Openings**

#### **08 06 70 Door Hardware Schedule**

- .1 Under the current agreement with the manufacturer, all keys and cylinders shall be shipped directly to the University.
- .2 The University shall supply a limited amount of construction cylinders for use during the construction which must be returned upon completion of the project.

**Table 08 06 70-1 – Acceptable Manufacturers for Door Hardware**

Hardware Item	Acceptable Manufacturer
Keying – All keys and cylinders shall be visually keyed with the bitting list submitted to the University.	Corbin Patented 39 series supplied with 2 keys per cylinder.
Locksets	Corbin Russwin mortise model LWA Trim X613. The Offices lockset functions shall be ML2055. The Store Rooms lockset functions shall be ML2057.
Door closers	LCN-4041 X 695, dark bronze, handicap accessible.
Door Hold Open	LCN-4040 SE X 695
Panic Hardware	Von Duprin 98 RIM Device series hardware X 313 with lever handles.
Electric Strikes: Rim Exit Device Mortise Locks	Von Duprin 6111 Von Duprin 6214
Electric Panic Hardware / Option	Von Duprin 98 EL with RX switch

## **08 30 00 Specialty Doors and Frames**

### **08 31 00 Access Doors and Panels**

- .1 Locate access doors in all units at mixing boxes, coils, fans and filter sections as a minimum.
- .2 Doors shall swing outward in a negative pressure section.
- .3 Doors shall swing inward in a positive pressure section.
- .4 Doors shall be fully gasketed and insulated.
- .5 Doors shall be hinged.
- .6 Doors shall be equipped with view window for each module.
- .7 Door sizes shall be large enough to conduct normal maintenance with ease.

## **08 50 00 Windows**

- .1 Windows shall be double or triple glazed as a minimum. New building window types shall be as laid out in the energy charette conducted for the project.

## 08 60 00 Skylights and Sloped Windows

- .1 Skylights and sloped windows are not recommended and should not be used. Any use of skylights or sloped windows requires special approval from the University.

## 09 00 00 Finishes

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### 09 05 00 Common Work Results for Finishes

#### 09 05 13 Common Finishes

- .1 Bare concrete floors are preferred in all stairwell, mechanical, electrical, telecom and housekeeping areas, unless otherwise specified. All concrete floors shall be complete with an acrylic floor sealer. Installer to confirm with Manager of Caretaking on brand of sealer and method of application prior to installation.
- .2 Carpeting is preferred in all secondary corridors, classrooms and offices, unless otherwise specified.
- .3 Classroom & corridor floor carpeting shall be no less than 28 oz. broadloom or carpet tile with woven nylon and a minimum of 20 year warranty. Office floor carpet no less than 26 oz. broadloom or carpet tile with woven nylon and a minimum of 20 year warranty.
- .4 Housekeeping pads for mechanical equipment to be painted grey with edges painted yellow along the perimeter edge and on top of the pad 75mm in from the edge.
- .5 All washroom floors shall be homogenous vinyl flooring, unless otherwise approved by the University. Linoleum is to be coved 75-100 mm up the wall and sealed water tight around piping.
- .6 All floor penetrations to be sealed such that no water can penetrate to the floor below.
- .7 Around the urinals in the men's washrooms, use porcelain or ceramic tile 50X50 or 75X75 maximum. The ceramic tile on the floor shall be non-skid with epoxy grout.
- .8 Walls shall be painted with an eggshell type paint, with low VOC's.
- .9 All paint specifications shall be subject to the LEED standard as a minimum.

## 09 06 00 Schedules for Finishes

### 09 06 90 Schedules for Painting and Coating

#### 09 06 90.13 Paint Schedule

- .1 All paint types shall be as specified in the following table:

**Table 09 06 90.13-1 Acceptable Manufacturers for Paint**

Area	Paint Type	Acceptable Manufacturer
Wooden Doors	Guardsman Ultraguard	Varnish 3797-911350-505; Catalyst 3990-05005-505

	Conversion Varnish	Or Approved Equal
Metal Doors and Frames	Waterborne Acrylic Primer and Finish	Devoe Devflex Semi-Gloss 4216 HP Or Approved Equal
Textured Drywall	Drywall Primer/Sealer	Dulux 11000 Or Approved Equal
Drywall Primer/Sealer	Interior Latex High Hide Sealer	Glidden 36600 Or Approved Equal
Interior Walls (Drywall)	ICI	General Paint: Z-Coat Eggshell ICI: Life Master Eggshell Or Approved Equal
Q-Decking (Exposed Steel Ceiling)	Waterborne Flat	Spraymaster Pro Drywall Or Approved Equal
Gym Weight Room / Any Physical Activity Area	Waterborne Acrylic Semi-Gloss	Devoe Devflex 4216-00100 Or Approved Equal
Shower Rooms	Devoe Tru-Glaze Waterborne Epoxy	Product: 4406-00100 Catalyst: 4508-09999 Or Approved Equal
Concrete Floors to be painted	Devoe Tru-Glaze	Product: 4508 (Oil), 4508-00100 Catalyst: 4508-09999 Or Approved Equal
Mechanical Room Walls	Devflex Waterborne Acrylic Semi-Gloss	4216-00100 Or Approved Equal
Concrete Block	ICI	Block Filler 36250 Or Approved Equal

## 10 00 00 Specialties

### 10 06 00 Schedules for Specialties

#### 10 06 20 Schedules for Interior Specialties

- .1 Soap dispensers shall be wall mounted, NOT located in the countertops.
- .2 All washroom walls shall be provided with a laminate backsplash.

#### 10 06 20.13 Toilet, Bath, and Laundry Accessory Schedule

- .1 Acceptable washroom accessories shall be as per the following table:

**Table 10 06 20-13 Acceptable Manufacturers for Washroom Accessories**

Fixture Type	Acceptable Manufacturer
Soap Dispenser	Triad
Toilet Paper Dispenser	Scott Designer #09642 Junior Jumbo
Garbage Container	Rubbermaid #3520 half round containers
Garbage Cans	Rubbermaid Office Can #2596
Garbage Container	Rubbermaid Ranger #8430
Napkin Dispenser	Frost code #622
Recycle Bag Station	West Can Marketing
Double Napkin / Tampon Dispenser	Frost #608-3
Toilet Paper Dispenser (Handi-cap)	Frost #150



## **10 10 00      Information Specialties**

### **10 11 00      Visual Display Surfaces**

#### **10 11 16          Markerboards**

- Acceptable Manufacturers: Shanahans, Panel Products, CP Distributors, or approved equal.
- Provide whiteboards in all classrooms as a standard.
- All whiteboards shall be provided with a lifetime warranty on the writing surface, 28Ga porcelain enamel. Warranty to cover any deterioration or defect of the whiteboard writing surface.
- Whiteboards shall be fixed.
- Whiteboards shall conform to specifications of the Porcelain Enamel Institute.
- Whiteboards shall be white.
- Provide full length pen-trays under all whiteboards.
- Do not install whiteboards over top of electrical outlets or control boxes.
- Classroom whiteboards – base to be mounted 915mm above the floor.

## **10 20 00      Interior Specialties**

### **10 21 00      Compartments and Cubicles**

#### **10 21 13          Toilet Compartments**

- Sturdy steel floor mounted, overhead brace type with standard mounting screws. TAMPER PROOF SCREWS ARE NOT ACCEPTABLE.
- Finish shall be baked enamel.

#### **10 21 16          Shower and Dressing Compartments**

- Partitions located in shower areas should be overhead braced and of stainless steel construction and installed with stainless steel fasteners.
- Any accessories in shower must be stainless steel with stainless steel fasteners.

### **10 26 00      Wall and Door Protection**

#### **10 26 13          Corner Guards**

- Corner guards are to be maximum length of 1220mm. Corner guards to be set on floor finish, not above base trim.

## **11 00 00     Equipment**

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### **11 50 00     Educational and Scientific Equipment**

#### **11 53 00     Laboratory Equipment**

##### **11 53 13     Laboratory Fume Hoods     (Update Forthcoming)**

- .1 Specific requirements for laboratory exhaust systems shall be reviewed with the University Safety and Risk Management Department and the University Project Manager. ANSI/AIHA Z9.5-2003 American National Standard for Laboratory Ventilation and NFPA-45 Standard on Fire Protection for Laboratories Using Chemicals shall be followed.
- .2 Design of fume hood exhaust systems should be in accordance with CSA Standard Z316, latest edition and the Minimum Guidelines for Laboratory Fume Hoods (PWGSC). Testing of fume hood performance as it pertains to installation and lab design shall follow ANSI/ASHRAE 110-1995 Method of Testing Performance of Laboratory Fume Hoods.
- .3 All systems shall have adequate supply of make-up air tempered to room temperature.
- .4 All spaces shall be designed under negative pressure to the adjacent spaces and as per Table 23 06 00.
- .5 Provide a duct washdown system for all perchloric acid exhaust systems. Perchloric duct system must be dedicated.
- .6 Use Type 316 stainless steel ducts.
- .7 Provide a face velocity monitor on all fume hoods.
- .8 All laboratory hoods and safety cabinets shall be equipped with visual and audible alarms to warn laboratory workers of unsafe air flows (Alnor 335).
- .9 Provide an eye wash station in laboratories that have at least one fume hood. Design should be in accordance with ANSI A358.1-2004 Emergency Eyewash and Shower Equipment.
- .10 Where corrosive material is used in the laboratory, locate eyewash station within 3 metres of material.

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## **12 00 00     Furnishings**

### **12 05 00     Common Work Results for Furnishings**

- .1 The bottom of all modesty panels for desks must be no lower than 330mm from top of floor.

## **12 40 00     Furnishings and Accessories**

### **12 46 00     Furnishing Accessories**

#### **12 46 19     Clocks**

- All new buildings shall have the University standard central wireless clock system. For further information contact the University Electrical Department.

## **13 00 00     Special Construction (Update Forthcoming)**

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## **14 00 00     Conveying Equipment**

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### **14 20 00     Elevators**

- .1 All elevators require voice annunciation.
- .2 Access to elevators to conform to Barrier Free Standards.
- .3 Provide a freight elevator in all new buildings. Must be sized to accommodate a 2.4m cart.

## **21 00 00     Fire Suppression**

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### **21 05 00     Common Work Results for Fire Suppression**

- All facilities to be fully sprinklered for fire suppression.

#### **21 05 53     Identification for Fire-Suppression Piping and Equipment**

- .1 Provide as-built drawings of all new installations of sprinkler systems to the University Drafting Department for all renovations or new projects.

### **21 12 00     Fire-Suppression Standpipes**

- .1 Standpipe and hose systems should be provided on a separate feed coming from the main fire protection header.

## **22 00 00     Plumbing**

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### **22 05 00     Common Work Results for Plumbing**

- .1 Mechanical Department requires a minimum of 48 hours notice when tying into existing building mechanical systems. This includes:
  - Domestic cold water piping
  - Domestic hot water piping
  - Chilled water piping
  - Hot water heating piping
  - Glycol heating piping
  - RO piping
  - Compressed air system piping
  - Fire protection piping

- .2 The University will decommission all existing systems.
- .3 Mechanical rooms shall be provided with at least one non-freeze hose bib with back flow preventer.
- .4 Mechanical rooms shall be provided with a minimum of one floor drain.
- .5 Provide a mop sink in all mechanical rooms that contain any of the following items: air handling units, pumps, boilers, chillers, sump pits.
- .6 Provide an additional floor drain in mechanical rooms near any of the following items: air handling units, pumps, boilers, chillers, sump pits.
- .7 The University has a standard for tagging of equipment. This may be obtained from the University Utilities department.
- .8 All drawings must include a schedule of all equipment (including Chiller, Pumps, VAVs, RHC, etc.). These schedules should itemize the parameters for balancing and also the location of service areas. Schedules are to be provided electronically in spreadsheet format. Consult the University Engineering department for more information.
- .9 For mechanical rooms not accessible to an elevator, provide a lifting device and supports to move heavy equipment up and down stairs safely and easily.
- .10 Drain valves are required downstream of branches serving areas on DCW, DHW, and DHWR. Provide shut-off valves for these lines on every level of the building.
- .11 Double nut hangers on all thread after lead adjust on 2" (50mm) pipe and smaller.
- .12 Ball valves required for all gauges and auto vents.
- .13 All gauges to be liquid filled, minimum size 63mm.
- .14 All mechanical piping to be supported from above. No floor supports.
- .15 Use lug type butterfly valves 2.5 inches and up.
- .16 SPARE PARTS LIST. As applicable, the following is to be provided at the completion of construction:
  - One case of cartridges for each waterless urinal installed.
  - One rebuild kit for each faucet, flushometer, PRV, backflow and wall hydrant installed.
  - Spare seal for each pump installed.

#### **22 05 53 Identification for Plumbing Piping and Equipment**

- .1 Provide directional arrows on all lines (when applicable) indicating the direction of fluid flow.
- .2 Refer to the following table (Table 22 05 53-1) for the piping and valve identification legend and colours:

**Table 22 05 53-1 Piping and Valve Identification Legend**

Pipe Marker Legend	Valve Tag Legend	Primary Colour	Band Colour
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Chilled Water Supply	CH.W.S.	Green	Red
Chilled Water Return	CH.W.S.	Green	Red
Domestic cold Water	D.C.W.	Green	None
Domestic Hot Water Supply	D.H.W.S.	Yellow	Green
Domestic Hot Water Recirc.	D.H.W.R.	Yellow	Green
Heating Water Supply	H.W.S.	Yellow	None
Heating Water Return	H.W.R.	Yellow	None
Reheat Water Supply	R.H.S.	Yellow	None
Reheat Water Return	R.H.R.	Yellow	None
Glycol Supply	Gly.S.	Purple	None
Glycol Return	Gly.R.	Purple	None
Storm Sewer	St.S.	L. Blue	None
Sanitary Sewer	San.S.	Brown	None
R.O. Water	R.O.	White	None
Compressed Air	C.A.	Med. Blue	None
Fire Protection Water	F.P.W.	Red	White
Sprinkler Water	S.W.	Red	White
Vent Piping Plumbing	V	Brown	Blue
Natural Gas	GAS	Orange	None

- .3 Provide data dot labels on all T-bar frame and access panel identification for all concealed areas. Refer to the following table (Table 22 05 53-2) for required duct access door labels:

**Table 22 05 53-2 T-Bar and Access Dots**

Item	Colour
Cleaning and Service Access	Yellow
Control Devices	Black
Dampers (Backdraft, Balance, Control)	Blue
Dampers (Fire)	Red
Smoke Dampers & Detectors	Red
Pipe Mounted Devices	Blue

## **22 06 00 Schedules for Plumbing**

- .1 Submit alignment reports for pumps and fans after installation is complete.

### **22 06 10 Schedules for Plumbing Piping and Pumps**

- .1 Provide pump curves.

### **22 06 30 Schedules for Plumbing Equipment**

**Table 22 06 30-1 Acceptable Manufacturers for Plumbing Equipment**

Item Description	Acceptable Manufacturer
Access Doors	Maaxam, Acudor, Milcor, Can.Aqua, Mifab

Air Compressors	Hydrovane, Champion
Air Dryers	Deltech, Cactus
Air Vents	Honeywell Braukmann, Watts, Taco, Amtrol
Backflow Preventers	Watts (No Equals)
Commissioning Agents	University of Lethbridge
Cleanouts	Ancon, Jay R Smith, Zurn
Drains – Floor, Roof, Cleanouts, Trap Primers, Water Hammer Arrestors	Zurn, Ancon, J.R. Smith
Drinking Fountains (Hand Operated)	Oasis
Expansion Compensators	Flexonics, United Flexible
Expansion Joints	Flexonics, United Flexible
Eye Wash Fountains	Western, Haws, Bradley, Encon
Fire Extinguishers	Ansul, Flag, Kidd, Pyrene, Pryo-chem
Fire Extinguisher Cabinets	CFH Industries, Impaction Firequip Inc., National Fire Equipment, Wholesale Fire and Rescue Ltd.
Fire Hydrants	McAvity M-67 (No Equals)
Flexible Connectors – Piping	Flexonics, United Flexible, Mueller, Flexpipe
Floor Drains	Ancon, Jay R Smith, Zurn
Floor Trap Primers	Zurn 1022
Gauges – OWG Pressure (liquid filled, stainless steel)	Ashcroft, Weiss
Gauges – Temperature	Trend
Grooved Mechanical Pipe Joints – Fire Protection Only	Victaulic
Hangers	Grinnell
Insulation – Piping and Duct	Fibreglass Canada, Manson, Knauf Manville
Jacketing – Canvas	Alpha Maritex, Clairmont, Diplag, S Fattal Thermocanvas
Meters – Water (m <sup>3</sup> )	Neptune
Meters – Gas (ft <sup>3</sup> )	Roots, Canadian Meter
Piping Hangers and Saddles	Grinnell, Myatt
Plumbing Trim	American Standard, Powers, Crane, Symmons, Delta, Sloan
Plumbing Fixtures	Crane, American Standard, Arista Newman, Haws, Bradley, Western, Sloan
Pumps – In-Line Circulators (General)	Grundfos
Pumps – In-Line DHWR	Grundfos (stainless steel body c/w bronze flanges)
Pumps – Sump	Grundfos (stainless steel)
Pumps – Seals	Type 21
Pumps – Sewage Lift	Hydromatic, Tsurumi
Pumps – Vertical In-Line and Base Mounted	Armstrong, B & G, Taco, Grundfos, Aurora
Regulators – gas	Fisher
Reverse Osmosis	ROH <sub>2</sub> O systems
Roof Drains (Cast Domes Only)	JR Smit, Zurn
Sanitary and Storm Manholes	Follow City of Lethbridge standards
Sinks – Specialty	Fiat, Cambridge
Sinks – Stainless Steel	American Standard, Kindred (Aristaline)
Sinks – Trim	Delta (No Equals)
Strainers	Armstrong, Metraflex, Kitz

Thermometers	Terrice
Urinals – Water Free	Falcon, Sloan
Valves – Butterfly (over 50mm) – Lug type only	Keystone, DeZurik, Centreline, Crane, Toyo, Kitz, Apollo
Valves – Check	Crane, Toyo
Valves – Backwater ABS	Bow, Canplus, Zurn, Watts, JR Smith
Valves – Ball (Soft Closing)	Jenkins, Toyo, Crane, MA Stewart
Valves – Globe	Bonney Forge
Valves – Silent Check	Val-matic, Metraflex, Bonney Forge
Solenoid Valves	ASCO – (No Equals)
Valves – Water Pressure Reducing	Watts
Vibration Isolation	Mason, Vibro Acoustic, Korfund
Wall Hydrants – non freeze	JR Smith
Water Closets (6L)	Caroma, Mansfield (Dual Flush)
Water closets – Seat covers	Olsonite, Centoco
Water Hammer Arrestors	Amtrol, JR Smith

## **22 08 00 Commissioning of Plumbing**

- .1 The University reserves the right to inspect and camera all underground storm, weeping tile and sanitary sewer piping prior to being permanently covered.
- .2 All piping shall be pressure tested prior to receiving insulation.
- .3 Pressure test all plumbing lines to 1.5 times system operating pressure or as specified by the Design Consultant, whichever is more stringent.
- .4 All pressure testing shall be witnessed and signed off by the Contractor and a University Representative.

## **22 10 00 Plumbing Piping and Pumps**

### **22 11 00 Facility Water Distribution**

#### **22 11 13 Facility Water Distribution Piping**

- .1 Piping shall be pitched and valves installed to allow for complete drainage of system.
- .2 All piping run within the building shall be concealed in the finished portions of the building in pipe spaces, ceilings or chases wherever possible.
- .3 No pipe shall pass in front of or interfere with any openings, doors or windows. No pipe shall pass in front of or interfere with clearances around mechanical equipment.
- .4 Piping shall not pass exposed through electrical or telecom rooms or be erected over any switchboard or other electrical gear unless required by Fire Code.
- .5 Piping shall be installed with adherence to the National Plumbing Code, the Alberta Building Code and all local authorities.

- .6 Maintain a minimum of 50mm clearance between all insulated piping and other obstructions.
- .7 Strainers are required before all PRVs and backflow prevention devices.
- .8 Bypasses shall be installed around all water meters and control valves.
- .9 Provide fireproofing material and caulking in the space between all sleeves and pipes.
- .10 Where pipes pass through fire-rated partitions, the space around the pipes shall be sealed and/or filled with fireproofing sealers.
- .11 All equipment drain lines shall be piped and sloped to the nearest possible floor drain. Provide appropriate trapping, where required.
- .12 Use instantaneous potable hot water systems. Provide heat exchangers tied into the hot water distribution system, wherever possible. Avoid the use of gas fired domestic water heaters.
- .13 All systems shall be designed and installed as per the National Plumbing Code, latest edition.
- .14 Use only type L piping hand drawn copper tubing for all weather piping. Joints shall be made with no-lead solder.
- .15 Water hammer arrestors shall be installed on cold water piping to toilet rooms where flush valves are used. Use water hammer arrestors for all quick acting automatic valves supplying equipment.
- .16 Provide a meter on the following services upon entering the new building; gas, water, electrical.
- .17 Backflow prevention devices shall be a minimum of 75mm in size.

#### **22 11 16 Domestic Water Piping**

- .1 PRV's installed in pairs parallel.
- .2 Backflow device complete with air gap fitting. Backflow size: minimum  $\frac{3}{4}$ " (19mm).
- .3 All domestic water lines are to be copper.

### **22 13 00 Facility Sanitary Sewerage**

#### **22 13 16 Sanitary Waste and Vent Piping**

- Sewer lines to be metal piping.

#### **22 13 19 Sanitary Waste Piping Specialties**

##### **22 13 19.13 Sanitary Drains**

- Pipe clamps for above grade sanitary and storm drains to be Fernco clamps only. No MJ clamps to be used.

### **22 14 00 Facility Storm Drainage**



- University of Lethbridge will inspect with camera all weeping tile lines prior to burial.
- Provide adequate cleanouts for weeping tile system so all areas can be inspected with camera. On straight runs cleanouts to be spaced 25m apart. Bends or corners in weeping tile will require additional cleanouts. Contact Mechanical Systems Manager for additional required cleanouts.

## **22 14 26 Facility Storm Drains**

### **22 14 26.13 Roof Drains**

- Provide cast iron dome type with all roof drains.
- Roof drain bodies to be insulated at time of roof drain installation.
- Refer to acceptable manufacturers' list for more details (Table 22 06 30-1).

## **22 40 00 Plumbing Fixtures**

### **22 42 00 Commercial Plumbing Fixtures**

- LEED standard flow requirements shall be used as a minimum for all plumbing fixtures.
- Supply tubes used for all plumbing fixtures to be braided stainless steel hose.
- No screwdriver stops for shutoffs, use ball valves.
- Use electrical power for automated sensor fixtures.
- Wall hydrants to be recessed chrome, concealed with vacuum breaker.

### **22 42 13 Commercial Water Closets, Urinals, and Bidets**

- Wall hung waterless urinals shall be used for all applications. Refer to acceptable manufacturer's list (Table 22 06 30-1).
- Floor mounted dual flush, low flow water closets shall be used for all applications. Refer to acceptable manufacturers' list (Table 22 06 30-1).

### **22 42 16 Commercial Lavatories and Sinks**

- Refer to architectural specifications prior to the selection of hanging requirements.
- Provide infrared hands free water flow with all lavatories.
- Provide adequate wall access to valves for maintenance on all fixtures.
- Service sinks are to have back splash protection on two sides minimum.
- Provide recessed DHW hose bibb connection underneath lavatory in all washrooms with urinals. Conceal hose bibb with access door mount flush with the wall.
- Refer to acceptable manufacturer's list for more details (Table 22 06 30-1).

- Provide flexible bubbler guard on water fountains.

## 23 00 00 Heating, Ventilating, and Air-Conditioning

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### 23 05 00 Common Work Results for HVAC

#### .1 Outdoor Conditions

- All ambient weather design information shall be as supplied by the Alberta Building Code:

Lethbridge Design Conditions:

Elevation: 910m

Design Winter DB: -30°C

Design Summer DB: 31°C

Design Summer WB: 18°C

#### .2 Indoor Conditions

- All spaces listed in Table 23 06 00-1 specify maximum and minimum occupancy temperatures. The maximum shall be used for summer and the minimum for winter design conditions.
- For zone relative humidity requirements, refer to the air handling section, unless otherwise noted.
- All university spaces shall be designed according to ASHRAE Standard 62-04 (or latest version) or Table 23 06 00-1, whichever is more stringent.

#### .3 General

- All ductwork shall be pressure tested as per the SMACNA Standards for Leak Testing Ductwork.
- All hangers and spacing shall be as per SMACNA Standards.

#### .4 The University has a standard for tagging of equipment. This may be obtained from the University Utilities department.

#### .5 All drawings must include a schedule of all equipment (including Chiller, Pumps, VAVs, RHC, etc.). These schedules should itemize the parameters for balancing and also the location of service areas. Consult the University Engineering department for more information.

#### .6 A dashed area line should be shown on the drawings where equipment requires area for maintenance and access (i.e. coil pulls, motor access).

#### .7 Air handling units shall be located with adequate space for maintenance and coil pulls. Where an area does not appear to meet this criterion, it shall be noted to the University.

#### .8 Avoid the use of mechanical rooms as air plenums.

#### .9 For mechanical rooms not accessible to an elevator, provide a lifting device and supports to move heavy equipment up and down stairs safely and easily.

- .10 Provide access doors for maintenance with all air intake dampers/louvers.
- .11 Marine lights for inspection shall be located in all sections. Lights should be wired to a single switch located on the outside of the air handling unit.
- .12 Provide two lights in each fan and filter module.
- .13 Provide inspection windows in all fan sections as a minimum.
- .14 Provide a minimum of one 115V receptacle on the outside wall near middle section of air handling unit.
- .15 SPARE PARTS LIST. As applicable, the following is to be provided at the completion of construction:
  - Spare belts for each fan installed.
  - Spare seal for each pump installed.
  - One set of bag filters for each AHU installed.
  - Four sets of pre-filters for each AHU installed.
  - One complete gasket set for each heat exchanger installed.

## 23 06 00 Schedules for HVAC

Table 23 06 00-1 Indoor Conditions

Space	Min Occ. Temp (°C)	Max Occ. Temp (°C)	RH Range (%)	Occ. Load (Person / 100m <sup>2</sup> )	Min Total Air Req'd (AC/hr)	Min Total Outside Air Req'd (LPS / Person)	Min Total Outside Air Req'd (LPS/m <sup>2</sup> )	Hours of Occ. (1-24 hr)	Room Press. (+/-/E)	Min Outside Air Percent (%)	Pre Filter Eff (%)	Final Filter Eff. (%)	Lighting Req'd (fc)	Noise Level (NC)	Remarks
<b>Education</b>															
Classrooms	20	24	*	50	6	8	--	6-22	+		30	85		<40	
Computer Rooms	19	24	*	35	6	8	--	6-22	+		30	85		<40	
Lab with Fume Hood	20	24	*	30	6	10	--	1-24	-		30	85		<40	Special containment control exhaust systems may be req'd
Lab without Fume Hood	20	24	*	30	6	10	--	1-24	-		30	85		<40	
Chemical Storage	20	24	*	--	6	--	--	6-22	+		30	85		<40	
General Library Area	20	24	*	20	6	8	--	6-22	+		30	85		<40	
Music Rooms	20	24	*	12	6	8	--	6-22	+		30	85		<40	
Auditorium	20	24	*	150		8	--	6-22	+		30	85		<40	
Theatre	20	24	*	150		8	--	6-22	+		30	85		<40	
Conference Rooms	20	24	*	40-50	6	10	--	6-22	+		30	85		<40	
Study Area	20	24	*	30	6	8	--	6-22	+		30	85		<40	
Photo Studio	20	24	*	10	6	8	--	1-24	+		30	85		<40	
Dark Room	20	24	*	10	--	--	2.5	1-24	-		30	85		<40	
Art Studio	20	24	*	10	6	8	--	1-24	-		30	85		<40	

Space	Min Occ. Temp (°C)	Max Occ. Temp (°C)	RH Range (%)	Occ. Load (Person / 100m <sup>2</sup> )	Min Total Air Req'd (AC/hr)	Min Total Outside Air Req'd (LPS / Person)	Min Total Outside Air Req'd (LPS/m <sup>2</sup> )	Hours of Occ. (1-24 hr)	Room Press. (+/-/E)	Min Outside Air Percent (%)	Pre Filter Eff (%)	Final Filter Eff. (%)	Lighting Req'd (fc)	Noise Level (NC)	Remarks
<b>Animal Research</b>															
Dry Labs	20	25	30-50	30	6	10	--	6-18 with manual override	+		30	85		<40	May require additional equip. loads
Wet Labs	20	25	50-55	150-250 cm <sup>2</sup> / animal	10-20	--	--	1-24	-		30	95		<40	Min height = 18 cm. Constant temperature.
Animal Holding Rooms	20	25	50-55	150 cm <sup>2</sup> / animal	10-20	--	--	1-24	-		30	95		<40	Min. height = 18 cm. Constant temp.
Operating Suites	20	25	50-55	20	15-25	15	--	1-24	+		30	95		<40	Constant temp.
Microscopy	20	25	30-50	30	6	8	--		+		30	85		<40	
NMR suites	20	25	30-50	30	6	8	--	1-24	+		30	85		<40	
NMR Equip. Area	10	27	30-50	30	--	--	--	1-24	-		30	85		<40	Based on equip. loads
NMR Control Room	20	25	30-50	7	6	8	--	1-24	+		30	85		<40	
<b>Facilities Support</b>															
Caretaking Closets	20	25	--	--	--	--	--	6-22	-		30	--		<40	
Mechanical Rooms	--	--	--	--	--	--	--	1-24	E		30	--		<40	
Electrical Rooms	20	25	--	--	--	--	--	1-24	E		30	--		<40	
Telecom Rooms	20	25	--	--	--	--	--	1-24	E		30	--		<40	
Laundry	20	20	--	10	--	15	--	6-22	-		30	--		<40	
Carpentry Shop	18	25	--	--	--	--	--	6-22	-		30	--		<40	

Space	Min Occ. Temp (°C)	Max Occ. Temp (°C)	RH Range (%)	Occ. Load (Person / 100m <sup>2</sup> )	Min Total Air Req'd (AC/hr)	Min Total Outside Air Req'd (LPS / Person)	Min Total Outside Air Req'd (LPS/m <sup>2</sup> )	Hours of Occ. (1-24 hr)	Room Press. (+/-/E)	Min Outside Air Percent (%)	Pre Filter Eff (%)	Final Filter Eff. (%)	Lighting Req'd (fc)	Noise Level (NC)	Remarks
Welding Shop	18	25	--	--	--	--	--	6-22	-		30	--		<40	
Painting Shop	18	25	--	--	--	--	--	6-22	-		30	--		<40	
<b>Service Areas</b>															
Reception Area	20	24	*	60	6	8	--	6-22	+		30	85		<40	
Private Offices	20	24	*	9	6	10	--	6-22	E		30	85		<40	
Corridor	20	24	*	--	--	--	0.25	6-22			30	85		<40	
Copy Rooms	20	27	*	--	--	--	2.5	6-22	-		30	85		<40	
Kitchen	20	24	*	20	--	8	--	4-22	-		30	85		<40	Special exhaust equip. may be present
Dining / Cafeteria	20	24	*	100	6	10	--	6-22	E		30	85		<40	
Receiving Dock / Area	15	27	*	10	--	--	0.75	6-22	E		30	--		<40	
Warehouse	15	25	*	5	--	--	0.25	6-22			30			<40	
Bar / Lounge	20	24	*	100	6	15	--	12-4	-		30	85		<40	
Washrooms	20	24	*	--	--	25 LPS / Fixture	--	1-24	-		30	85		<40	
Storage	20	24	*	15	--	0.75	--	6-22	+		30	85		<40	
Multi-use Rooms	20	24	*	100	6	15	--	6-22	+		30	85		<40	
Elevators	20	24	*	--	--	--	5.0	1-24			30	85		<40	
<b>Athletics</b>															
Gymnasium	18	24	*	30	--	10	--	5-22	+		30	85		<40	
Gym Storage	20	24	*	15	--	--	0.75	5-22	+		30	85		<40	
Fitness Centre	18	24	*	50	--	15	--	5-22	+		30	85		<40	

Space	Min Occ. Temp (°C)	Max Occ. Temp (°C)	RH Range (%)	Occ. Load (Person / 100m <sup>2</sup> )	Min Total Air Req'd (AC/hr)	Min Total Outside Air Req'd (LPS / Person)	Min Total Outside Air Req'd (LPS/m <sup>2</sup> )	Hours of Occ. (1-24 hr)	Room Press. (+/-/E)	Min Outside Air Percent (%)	Pre Filter Eff (%)	Final Filter Eff. (%)	Lighting Req'd (fc)	Noise Level (NC)	Remarks
Swimming Pool	18	24	*	--	--	--	2.5	5-22			30	85		<40	
Locker / Change Rooms	20	24	*	--	--	--	2.5	5-22	-		30	85		<40	
<b>Student Residence Spaces</b>															
Bedrooms	20	24	*	--	--	15 LPS / Room	--	1-24			30	85		<40	
Living Rooms	20	24	*	--	--	15 LPS / Room	--	1-24			30	85		<40	
Baths	20	24	*	--	--	18 LPS / Room	--	1-24			30	85		<40	
Lobbies	20	24	*	30	--	8	--	1-24			30	85		<40	
Conference Room	20	24	*	50	--	10	--	6-22			30	85		<40	
Assembly Rooms	20	24	*	120	--	8	--	6-22			30	85		<40	
Dormitory Sleeping Areas	20	24	*	20	--	8	--	1-24			30	85		<40	

Notes: \* - refer to air handling unit requirements section

**Table 23 06 00-2 Acceptable Manufacturers for Mechanical Equipment**

<b>Item Description</b>	<b>Acceptable Manufacturer</b>
Access Doors	Maaxam, Acudor, Milcor, Can.Aqua, Mifab
Actuators – Low Voltage	Belimo, Honeywell, Siemens
Air Handling Units	Engineered Air, Trane, Carrier, York
Custom Air Handling Units – Indoor or Outdoor Pre-manufactured	Haakon, Ventrol, Racon
Air Separators, Relief Valves	Armstrong, Bell & Gossett, Taco
Air Terminals – Grilles Registers, Diffusers	E.H. Price, Titus, Nailor
Air Valves – Mixing, Constant Volume and VAV	E.H. Price, Titus, Trane, Nailor
Air Vents	Honeywell Braukmann, Watts, Taco, Amtrol
Backdraft Dampers	Airolite, Vent-Aire, Penn, T.A. Morrison
Balancing Dampers	Maxam, Ruskin, Nailor
Balancing Agents	Hydro-air
Building Management System	Honeywell EBI
Chemical Treatment	Guardian (No Equals)
Chillers (Centrifugal	Carrier, Trane, York
Commissioning Agents	University of Lethbridge
Coils – Heating and Cooling	Trane, Aerofin, Eng Air, York, Carrier
Controls Contractors	Honeywell
Convectors – HW	Engineered Air, Trane, Sigma
Dampers – Control, Backdraft	Ruskin, Tamco
Dampers – Fire Combination	Ruskin, Controlled Air, Canada Advanced, Nailor Hart, Kerr-Hunt
Diffusers, Registers and Grilles	Price, Titus, Nailor
Evaporative Cooling	Munters Media (No Equals)
Expansion Compensators	Flexonics, United Flexible
Expansion Joints	Flexonics, United Flexible
Fan Coil Units	Trane, Engineered Air, York
Fans – Bathroom Exhaust	ACME, Broan, Penn, Nutone, Cook
Fans – Centrifugal	Buffalo, Trane, Chicago, Northern Blower, Greenheck, Sheldons
Fans – In-Line Centrifugal	Greenheck, Jenn Air, Penn, Cook, Sheldons
Fans – Axial	Chicago, Greenheck, Northern Blower, Sheldons
Fasteners	Duro Dyne, Clip Pin
Filters – Pre-Filters – FL Gold - Precut	BGE, Aerostar, Dafco Filtration
Filters – Final Filters (Bag Only) Defiant (No Equals) 85%	BGE, Aerostar, Dafco Filtration
Fire Dampers	Controlled Air, Ruskin, Canadian Advanced Air, Nailor
Flexible Connectors – Ducting	Flexmaster SLP
Flexible Duct	Flexmaster FAB-4
Flow Meter – Orifice Plate	Gerand, Presso
Flow Meter – Pitot Tube	Annubar, Diamond II, New Flow Measurement
Gauges – Air	Dwyer, Magnehelic, Wika, Bourdon Haeni
Gauges – OWG Pressure (liquid filled, stainless steel)	Ashcroft, Weiss



Gauges – Temperature	Trend
Heat Exchangers – Plate	Armstrong, Bell & Gossett, Fieldco
Insulation – Pipng and Duct	Fibreglass Canada, Manson, Knauf Manville
Jacketing – Canvas	Alpha Maritex, Clairmont, Diplag, S Fattal Thermocanvas
Louvres	Airolite, Penn, Nailor, Ruskin, Price, Honeywell
Motors	GE, Marathon, Westinghouse, Weg
Power Supply – Low Voltage	Greystone
Pumps – Vertical In-Line and Base Mounted	Armstrong, B & G, Taco, Grundfos, Aurora
Radiation – Wall Fin	Engineered air, Trane, SIGMA, Rosemex
Sensors – Air Pressure	Greystone, Verus, Modis
Sensors – Carbon Dioxide (Air Quality)	Comag IR (No Equals)
Sensors – Current	Verus
Sensors – Differential Pressure	Verus, New Flow (Barton)
Sensors – Oxygen	BW Technologies
Sensors – Temperature	Greystone, Honeywell
Sidestream Filter (HW)	Pall
Silencers – Fan and Duct	Vibro Acoustics, Vibron, Korfund, I.A.C., Koopers
Strainers	Armstrong, Metraflex, Kitz
Suction Guides and Diffusers	Armstrong, Bell Gossett, Taco
Tank – Diaphragm Type Expansion	Amtrol, Expanflex, Taco
Tanks – Expansion	Bell & Gossett, Amtrol, Taco, Expanflex, Anthes
Thermometers	Terrice
Unit Heaters – Cabinet	Trane, Engineered Air, Rosemex, Sigma
Unit Heaters – HW	Engineered Air, Trane, Rosemex, Sigma
Valves – Butterfly (over 50mm) – Lug Type Only	Keystone, DeZurik, Centreline, Crane, Toyo, Kitz, Apollo
Valves – Check	Crane, Toyo
Valves – Circuit Balancing	Armstrong, B & G, Dahl
Valves – Drain, Radiator	Jenkins, Dahl, Crane, Toyo
Valves – Eccentric Plug	DeZurik
Valves – Ball (Soft Closing)	Jenkins, Toyo, Crane, MA Stewart
Valves – Globe	Bonney Forge
Valves – Pressure Balanced Mixing	Symmons
Valves – Relief	Kunkle, Watts
Valves – Silent Check	Val-matic, Metraflex, Bonney Forge
Solenoid Valves	ASCO – (No Equals)
Valves – Suction Diffusers Combination Check and Balance	Armstrong, B & G, Taco
Variable Frequency Drives	Danfoss Graham
Vibration Isolation	Mason, Vibro Acoustic, Korfund
Water Hammer Arrestors	Amtrol, JR Smith
Wiring – LON	Cat 5-E (Purple)
Wiring – Low Voltage	Belden Cable

## **23 20 00 HVAC Piping and Pumps**

- .1 Make up water meters for HWH or CW to be measured in m<sup>3</sup> (tenths) one litre.
- .2 All gauges to be liquid filled, minimum size 63mm.

## **23 21 00 Hydronic Piping and Pumps**

### **.1 General**

- Standby pumps shall be provided for all hot water heating and distribution systems.
- All pumps shall have bronze impellers.
- Pump schedules shall indicate system served, operation (primary or backup), flow, pump head, rpm, motor horsepower, location, make and model number and electrical characteristics.
- All inlet and outlet piping to pumps shall provide minimum losses wherever possible, check valves and strainers required.
- Pumps should be provided with suction guides, discharge diffusers or check valves and strainers, as required.
- Pump seals shall be provided by John Crane Seals, no equals.
- Pumps shall be installed on supported slabs and shall be provided with concrete inertia subbases with spring isolators.
- Pumps installed on "Slab on Grade" shall be mounted on a 150mm high concrete pad with anchor bolts. The space between pad and base shall be grouted to eliminate all voids.
- All piping connections to pumps shall be supported independently so that no strain is imposed on the pump casing.
- Triple duty valves and suction diffusers shall be of the same manufacturer as the pump supplier in all cases.
- Pumps shall be provided with variable frequency drives, wherever applicable.
- Drain valves are required downstream of branches serving areas on DCW, DHW, and DHWR.
- Double nut hangers on all thread after lead adjust on 2" (50mm) pipe and smaller.
- Use lug type butterfly valves 2.5 inches and up.
- Refer to acceptable manufacturer's list (Table 23 06 00-2) for more pump details.
- For acceptable valves suppliers, refer to the acceptable manufacturer's list (Table 23 06 00-2).

## **.2 Valves**

- All valves for any one project shall be the product of one single manufacturer.
- Valves shall be installed with the bonnet in the upright position to prevent deterioration or corrosion of the bonnet and packing.
- Valve body materials shall be compatible with piping system materials.
- A valve drain shall be provided at the base of each water piping riser and automatic air vents shall be provided at the top of each riser and at the high point of the system.
- Use ball valves for all sizes up to 50mm.
- Provide extended stems where required.
- Use butterfly valves for all sizes over 50mm.

### **23 21 13 Hydronic Piping**

#### **23 21 13.23 Aboveground Hydronic Piping**

- .1 All mechanical piping to be supported from above. No floor supports.

### **23 23 00 Refrigerant Piping**

- .1 Refrigerant liquid and suction piping shall be type L hard drawn ACRS tubing.
- .2 A nitrogen purge shall be maintained when soldering all joints. Copper to copper joints shall be made with brazing alloy similar to Sil-Fos. Copper to brass joints shall be made with silver solder.
- .3 Main piping fittings for dryers, sight glasses, expansion valves, and controls shall be flare or compression type fittings.
- .4 Prior to being charged with refrigerant, the system shall be evacuated to 500 microns and held for at least 24 hours under this vacuum.
- .5 Install all refrigerant piping as per specific equipment manufacturer's recommendations.
- .6 Install isolation valves at all refrigerant system accessories.
- .7 Installations shall be complete with dryers, sight glass and thermostatically controlled solenoid valves for pump down operations.
- .8 Installations shall be provided with necessary protective device including, but not limited to, electric overload devices, low-suction pressure cutouts (manually reset), oil traps, crankcase heaters and antirecycling.
- .9 Outdoor condensing systems to be used year round, without air handling unit free cooling, shall be designed for -30°C ambient conditions.
- .10 Outdoor condensing systems to be used year round with air handling unit free cooling, shall be designed for -10°C ambient conditions.

- .11 Dual circuited refrigerant systems shall be designed with intertwined air handling coils.

## **23 30 00 HVAC Air Distribution**

### **.1 General**

- All air handling systems should be designed with:
  - Accordance to Table 23 06 00-1 and all applicable standards
  - Free cooling
  - Variable air Volume complete with VFD zone static pressure fan control
  - Carbon dioxide monitoring and control
- Use custom type air handling units as a standard of design for all units greater than 10,000 LPS. For all units less than 10,000 LPS it is possible to provide standard modular type air handling units. For a complete list of acceptable manufacturers, refer to Table 23 06 00-2. Consult with University prior to the design of an air handling unit for preferred components and manufacturers.
- Air handling units should be tied into the central chilled water and hot water systems of the building, wherever possible.
- Packaged DX refrigeration air handling units shall not be used for standard design systems unless it is in a special process application. All use of DX refrigeration including heat pumps must have approval by the University.
- Standard design of air handling units based on 2.0m/s (400fpm) face velocity.
- Use all methods of heat recovery for energy efficient operation, where possible.
- Provide double wall casing for all units. Interior wall perforated liner may be provided in fan sections only.
- Air handling units shall be located in mechanical rooms. Do not use rooftop air handling units unless approved by the University.
- Use air blenders with mixed air units.
- Air handling units shall be ARI tested and certified. If a unit is not ARI certified, a factory performance inspection is required.
- All drain lines from the air handling units shall be piped and trapped appropriately.
- Provide fan curves.
- Submit alignment reports for pumps and fans after installation is complete.

### **.2 Coils**

- Provide automatic air vents at all hydronic coils at the highest point.

- Coils shall be fully drainable and piped for counterflow operation.
- Coils should not be selected with more than 120 fins per inch.
- Provide stainless steel IAQ sloped drain pans at all cooling coils
- Hot water, chilled water and refrigeration coils shall be ARI certified and tested.
- Each coil shall have isolation valves on supply and return.

### **.3 Humidification**

- Provide humidification in all air handling units with stainless steel mounting frames.
- Use Munters Media type for all humidification and evaporative cooling. Media cooling shall be set up for a 'once through' application. Pumped return systems are not acceptable. Media sections shall be piped to allow for multiple staging of the system. Piping with solenoid should be brought to the outside of the unit for accessibility.
- The use of steam injection humidification is not acceptable.
- Water used for humidification shall be individually metered at the device.

## **23 33 00 Air Duct Accessories**

### **23 33 13 Dampers**

- Low leak dampers (2%) should be used as a minimum. Refer to acceptable manufacturers list for more information.
- Fire dampers to be accessible for maintenance. Dampers that are not accessible will be removed and the contractor is responsible for providing suitable access.
- Locate all balancing dampers in the duct take-offs. Diffusers supplied with a balancing device inherent in the device will not be accepted.
- Supply dampers are to be located in the ductwork, not an integral part of the diffuser housing.

## **23 34 00 HVAC Fans**

- Frames for humidification in AHU's are to be stainless steel.

## **23 36 00 Air Terminal Units**

### **23 36 16 Variable-Air-Volume Units**

- Design and indicate in schedule minimum ventilation requirements for each zone.
- Use reheat coils on all boxes for temperature control, where required. For more information see Terminal Heating Units section.
- Provide VAV boxes to site with factory mounted DDC controls.

- VAV schedule shall include minimum and maximum Airflows, noise criteria levels, and coil ratings.
- Where more than one box is required to control a single zone, zone shall be controlled with only one temperature sensor.
- Boxes should be located in corridors and common areas wherever possible. Avoid locating boxes above classrooms and offices.
- Provide reheat coils with all variable volume boxes, where required.
- Reheat coils shall be designed for a minimum of a 17°C water temperature differential.
- Refer to acceptable manufacturer's list (Table 23 06 00-2) for vendor details.

#### **.1 Zoning**

- Offices
  - Zone all offices with similar configuration and load type.
  - Offices shall be zoned to allow for 2 to 3 rooms with one Variable Air Volume Box control.
  - Locate temperature sensor in an area out of direct sunlight and on an interior wall. Locate the sensor 100mm above the light switch within 300mm of outer edge of door frame.
- Classrooms
  - Classrooms shall be zoned individually.
  - Locate temperature sensor in a common area out of direct sunlight and on an interior wall. Locate the sensor 100mm above a light switch and/or within 300mm of outer edge of door frame.
  - Use displacement ventilation in classrooms where permitted.
- Other
  - Where areas with different operating schedules are served by one air handling unit, provide a means of area isolation to reduce air flow and energy usage.
  - Zone air systems with similar space function, occupied hours and air quality requirements.

### **23 37 00 Air Outlets and Inlets**

- .1 Drain pans shall be stainless steel and double sloped. Locate drain pans in the first module of all air handling units.
- .2 Air intake systems should be designed with a means of snow/moisture removal (ie...mist eliminators, specific duct designing). Ductwork drains should be provided at all air intakes where required. Avoid all West facing air intakes where possible and always consider the Lethbridge wind in all designs.

- .3 Ensure adequate spacing between exhaust and intake louvers.
- .4 Low leak type dampers (2% leakage) shall be used as minimum quality.

## **23 40 00 HVAC Air Cleaning Devices**

- .1 Main supply air handling units shall be equipped with 24 X 24 inch 85% efficient Defiant material/synthetic bag type filtration with (febrex) FL Gold prefilters. Cartridge filters are not acceptable on any air handling units. Refer to acceptable manufacturers list (Table 23 06 00-2).
- .2 Air handling units shall be designed with a summer and winter prefilter location.

## **23 50 00 Central Heating Equipment**

### **23 52 00 Heating Boilers**

- Select boilers with a full 100% redundancy.
- Fire tube type boilers should be used for capacities above 1500kW.
- Water tube flex boilers should be used for capacities below 1500 kW.
- Boilers shall be selected based on hot water distribution only. Steam boilers are not acceptable.
- Heat recovery devices such as boiler flue economizers should be provided wherever possible.

#### **.1 Heating Distribution**

- Design hot water heating distribution with a minimum temperature drop of 15C across any end device.
- Provide variable volume flow on all secondary distribution systems. Pumps to be supplied with variable frequency drive.
- Allow for 100% redundancy in all heating distribution systems.
- Allow for all terminal units (wall fin radiation, reheat coils, etc.) to be on a separate loop with a separate distribution pump. Provide a three way mixing valve to allow for temperature reset of the terminal devices.
- For further information see Section on Pumps and Hydronic Piping Systems.
- Side stream filter required for all heating systems.

## **23 63 00 Refrigerant Condensers**

- .1 The manufacturer's minimum recommended clearances, including distances from landscaping, shall be maintained.
- .2 Where water cooled condensing units are required, cooling towers, evaporative condensers or a closed loop cooling system shall be used. A once through cooling water to waste system is not permitted without the approval of the University.

## **23 64 00      Packaged Water Chillers**

### **23 64 16      Centrifugal Water Chillers**

- Centrifugal water chillers should be utilized for all proposed loads over 352 kW (100 tons). For loads of under 352 kW, consult with the University prior to selecting a cooling source.
- Select all chillers based on a comparison of efficiency versus cost.
- Select chilled water systems for 5.6C (42F) Leaving Water Temperature. Base the Return Water Temperature on the design of the system. Optimize the temperature differential wherever possible.
- Refrigerant selection shall be discussed with the University Utilities Department prior to equipment selection.
- Chillers shall be selected based on peak load efficiency and all part loads shall be shown according to ARI Standard 550/590-1988.
- Chiller control panel interfaces shall be capable of communicating on the University Building Control system. Consult the University Utilities Department for exact requirements.
- Chillers shall be CSA/CUL and ARI certified.
- Chillers shall be selected for 100% load. No additional load redundancy is required unless the application demands. It is acceptable, cost permitting, to provide two chillers sized at half of the total chilled water load.
- Provide adequate maintenance for all chilled water equipment in mechanical space. Drawings should reflect an outline of the manufacturer's suggested access areas.
- Refer to the Acceptable Manufacturer's List (Table 23 0-6 00-2) for approved chiller suppliers.

#### **1. Cooling Distribution**

- Provide variable frequency drives on all chilled water distribution pumps.
- All pumps shall have bronze impellers.
- Pump schedules shall indicate system served, operation (primary or backup), flow, pump head, rpm, motor horsepower, location, make and model number and electrical characteristics.
- All inlet and outlet piping to pumps shall provide minimum losses wherever possible, check valves and strainers required.
- Pump seals shall be provided by John Crane Seals, no equals.
- Pumps shall be installed on supported slabs and shall be provided with concrete inertia subbases with spring isolators.
- Pumps installed on "Slab on Grade" shall be mounted on a 150mm high concrete pad with anchor bolts. The space between pad and base shall be grouted to eliminate all voids.



- All piping connections to pumps shall be supported independently so that no strain is imposed on the pump casing.
- Triple duty valves and suction diffusers shall be of the same manufacturer as the pump supplier in all cases.
- Pumps shall be provided with variable frequency drives, wherever applicable.
- Refer to acceptable manufacturer's list (Table 23 06 00-2) for more pump details.
- Pump bases to be grouted.

## **23 65 00      Cooling Towers**

- .1 Provide direct evaporative cooling towers. Indirect cooling towers may also be used, budget permitting.
- .2 Provide chemical treatment for all open direct cooling towers.
- .3 Provide electric sump heater for cooling tower operation to -10C.
- .4 Locate cooling towers away from common walkways.
- .5 All outside water lines for cooling tower to be insulated and complete with heat tape.
- .6 Make up water to be metered to cooling tower.
- .7 Cooling tower fan motor to be supplied with variable frequency drive.

## **23 80 00      Decentralized HVAC Equipment**

### **23 82 00      Convection Heating and Cooling Units**

#### **23 82 36      Finned-Tube Radiation Heaters**

- Cabinet shall be constructed with a minimum of 14 gage metal enclosure.
- Finned tube radiation shall be designed for a minimum of 17°C temperature differential.
- Cabinet shall be installed around the perimeter of all buildings.
- Finned Tube Radiation shall be designed such that it provides all nighttime heating for buildings. Designing buildings to heat at night with air handling systems is not acceptable.
- Radiant heating panels should not be used unless approved by the University.
- Design of all storage areas should incorporate finned tube radiation. Unit heaters are not to be used in this application unless approved by the University.

## 25 00 00 Integrated Automation

### 25 05 00 Common Work Results for Integrated Automation

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#### 25 05 53 Identification for Integrated Automation

- .1 Identify all systems, equipment, components, controls and sensors with laminated plastic tag indicating point identification name, point address (program name), control panel, control panel location.

## 25 30 00 Integrated Automation Instrumentation and Terminal Devices

### 25 35 00 Integrated Automation Instrumentation and Terminal Devices for HVAC

#### 25 35 16 Integrated Automation Sensors and Transmitters

##### .1 Temperature Sensors

- Temperature Sensor with Local Adjustment – The local adjustment shall enable the occupant to adjust the temperature within the temperature range that is preset from the building Management System
- Temperature Sensor with Local Temperature Display – This feature shall enable the occupant to view a digital display of the existing temperature in that room.
- Provide sensors as per table 25 35 26-1:

**Table 25 35 26-1 Temperature Sensor types**

Room	Local Adjustment (Y/N)	Local Temp. Display (Y/N)	Temperature Range (°C)
Office	Y	Y	20-24
Classroom	N	N	20-24
Meeting Rooms	Y	Y	20-24
Common Areas	N	N	20-24
Computer Rooms	N	N	20-24
Laboratories	N	N	20-24
Storage Areas	N	N	20-24

- For a list of acceptable products please refer to the acceptable manufacturers list (Table 23 06 00-2). Any changes in the supply of any temperature sensors shall be subject to University approval.

##### .2 CO<sub>2</sub> Sensors

- Use infrared style CO<sub>2</sub> sensors only. Refer to acceptable manufacturers list (Table 23 06 00-2) for more information.

##### .3 Wiring

- All control wiring shall be installed in conduit, unless approved otherwise.

## **25 90 00     Integrated Automation Control Sequences**

### **25 94 00     Integrated Automation Control Sequences for Plumbing**

- .1 Weeping Tile Sumps and Sanitary Sumps on Emergency Power
  - Provide redundant pumps in all sumps.
  - Provide a high level alarm for each sump compartment.
  - Provide a pump status at the BMS for each pump.
  - Check valves to be plastic PVC type on all sump piping systems.
  - Drainage tile system cleanouts shall be provided in order to be able to flush the lines.
  - Refer to the Acceptable Manufacturer's List (Table 23 06 00-2) for more information.

### **25 95 00     Integrated Automation Control Sequences for HVAC**

- .1 Provide programming and hardware necessary to operate mechanical systems as per the following, unless otherwise approved by the University.
- .2 Provide a points list for all projects itemizing which points are analog input, analog output, digital input and digital output. Points should be shown under the proposed panel they are intended to be wired to.
- .3 System Start/Stop Routines
  - Occupied time: Equipment shall be controlled based on the University time of day scheduling for each area. Consult the University for the current schedule.
- .4 Air Handling Unit Control
  - Humidity Control: The humidity PID loop shall open and close three solenoid valves in rotating sequence to ensure even CELDEK usage. The controlling variable shall be the return air humidity. The return humidity set point shall be a fixed user adjustable value initially set at 20%RH. Provide high and low limits.
  - Alarm Monitoring: Provide the following alarms as a minimum:
    - Low temperature switch
    - High supply duct static pressure
    - Fan drive status (off/hand/auto)
    - Low mixed air plenum static pressure
- .5 Heating Pumps
  - If any of the primary heating water circulating pumps fails to start after 60 seconds of the start command a pump failure alarm shall be annunciated at the BMS and the next primary heating water circulating pump shall be commanded to start.
- .6 Radiation System

- Provide start/stop control through the BMS. The radiation/terminal units supply pump shall be controlled based on a constant volume supply with a temperature control valve at the inlet. The control valve function shall modulate to mix the radiation supply at a preset temperature lower than the main heating supply temperature.
- The duty heating pump speed shall be controlled through a variable frequency drive to maintain the pressure differential between the heating distribution supply and return mains. The set point shall be initially set at 75kPa and adjusted during commissioning based on the measured data obtained from the water balancing procedure.
- The two-way control valve shall be modulated to maintain the heating water supply temperature set point.
- The heating water supply temperature set point shall be adjusted with outdoor air temperature based on the following schedule: at 10°C outside air temperature the heating water supply temperature set point shall be 54 °C. At -20 °C outdoor temperature the heating water supply temperature set point shall be 75 °C.

#### .7 Condenser Water System

- The cooling tower packaged controls shall modulate the fan speed and modulate capacity control dampers to maintain the condenser water supply temperature set point.
- The cooling tower sump level shall be maintained by the cooling tower packaged level controller. Sump Heater shall be used to maintain sump temperature above 5 °C.

#### .8 Primary Chilled Water

- Chillers shall be manually enabled/disabled through the BMS.
- When a chiller is enabled through the BMS, the primary chilled water return isolation valve shall open and the distribution pump shall start.
- Chiller will start when chilled water and condenser water flow is confirmed by the chiller's packaged controller.
- Chilled water supply temperature will be maintained at a BMS set point by the chiller's packaged controlled.

#### .9 Supply Air Terminal Units

- Each terminal shall control the perimeter heating control valve reheat coil valve and the damper actuator with PID loop control.
- The damper's actuator shall modulate to maintain the terminal units constant volume airflow set point.
- The reheat coil valve and perimeter heating control valve shall modulate in sequence to maintain the room temperature set point.
- The setback temperature shall set the room temperature back for unoccupied hours. The perimeter heating control valve shall be modulated to maintain room setback temperature set point.

- Shall be available to view the following points from the BMS for all supply air terminal units:
  - Room temperature
  - Heating/cooling mode
  - Room temperature set point
  - Air flow
  - Damper position
  - Heating valve position (reheat and radiation)
  - Time Scheduling and/or Occupancy Sensors (if requested)

#### .10 Cabinet Unit Heaters and Unit Heaters

- Unit heater fan shall be cycled on when the line voltage thermostat falls below set point. Temperature sensors for standard unit heaters are not required to be tied into the BMS unless approved by the University.
- When the fan is cycled on, the line voltage solenoid isolation valve shall be opened.

#### .11 Exhaust Fan Control

- When an exhaust fan is commanded on, the damper shall first be opened. When the damper end switch confirms the position, the fan shall be started.
- Provide a fan status at the BMS for each fan.
- Provide a fan failure alarm at the BMS for each fan.

## **26 00 00    Electrical**

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- .1 All electrical work, equipment and materials used shall conform to the following (latest editions):
  - Canadian Electric Code
  - Electrical Protection Act of Alberta
  - CSA Standards
  - Canadian Underwriters Laboratories
  - Alberta Building Code
  - Occupational Health and Safety
  - National Fire Protection Association
  - Institute of Electrical and Electronics Engineers lighting standards
- .2 The Electrical Design Consultant shall meet with the University Utilities Electrical Department and the Project Manager to develop and prepare a program and layout for all new buildings and renovations.
- .3 The Electrical Design Consultant is required to physically visit the site and verify all existing conditions and to review the work area.
- .4 The University Electrical Department requires a MINIMUM of 48 hours' notice prior to any electrical service shutdowns.
- .5 Electrical trade contractor to obtain electrical permit from City of Lethbridge for all electrical work.

## 26 05 00 Common Work Results for Electrical

### 26 05 36 Cable Trays for Electrical Systems

- .1 Cable trays shall be side rail style with ladder.
- .2 Cable trays shall be manufactured of galvanized aluminum.

### 26 05 48 Vibration and Seismic Controls for Electrical Systems

- .1 Electrical equipment and associated piping and duct work shall be mounted on vibration isolators to minimize transmission of vibration and noise to building structures or spaces.
- .2 All rotating equipment shall be balanced both statically and dynamically.
- .3 Equipment supporting structure shall have no natural frequencies within plus or minus 20% of the operating speeds.

### 26 05 53 Identification for Electrical Systems

- .1 All electrical equipment and circuits shall be marked and labeled for identification purposes. Laminated nameplates shall be used on the exterior surfaces of all electrical apparatus, including switchboards, control centre safety switches, circuit breakers, pull boxes, junction boxes and panelboards.
- .2 All panelboards, disconnect switches and transformers shall be labeled indicating the source of power, voltage and load.

## 26 06 00 Schedules for Electrical

Table 26 06 00-1 Acceptable Manufacturers for Electrical Equipment

Item Description	Acceptable Manufacturer
Automatic Transfer Switch	
Central Distribution Panel	Cutler Hammer, Schneider, Siemens
Clocks (Public)	Primex
Contactors	Furnas, Allen Bradley, Square D
Disconnect Switches	Cutler Hammer, Schneider, Siemens
Distribution Switch Gear	Cutler Hammer, Schneider, Siemens
Door Access Control System (BacNet)	Honeywell
Electrical Manhole	Precast
Emergency Light Packs	Lumacell, Edwards
Exterior Lighting Control	Leviton Lite Keeper
Fire Alarm System	Edwards
Electronic Ballast (Instant Start)	Phillips, Advance, Motorola
Exit Lighting (LED)	Lumacell
Magnetic Motor Starter	Cutler Hammer, Siemens, Schneider
Manual Motor Starter	Cutler Hammer, Siemens, Schneider
Motor Control Centre	Cutler Hammer, Siemens, Schneider
Panelboards	Cutler Hammer, Siemens, Schneider
Receptacles	Leviton, Hubbell, Pass and Seymour, Bryant
Line Voltage Switches	Leviton, Hubbell, Pass and Seymour, Bryant

Low Voltage Switches	Douglas (new)
Dimmers	Leviton, Hubbell, Pass and Seymour, Bryant
Low Voltage Lighting Controls	Douglas (New)
Transformers (Dry Type)	Hammond, FPE, Siemens
Variable Frequency Drives	Danfoss
Local Smoke Alarms	Firex 406C
Surface Raceway systems	Wiremold
Hand Dryers	Galaxy, Nova
Room Occupancy Sensors	Leviton, Watt, Stopper
Electrical Metering	Ion

## **26 06 50 Schedules for Lighting**

- .1 The levels of Foot Candle Illumination shall be designed and installed as per the following table:

**Table 26 06 50-1 – Recommended Average Illumination**

<b>Area</b>	<b>Recommended Average Foot Candles</b>
Corridors, Stairwells, Locker Rooms, Storerooms, Foyers, etc.	20
Library Study Areas	50
Study Carrels	50
Laboratories	70-100
Classrooms and Lecture Theatres	50-60
Offices	50-60
Mechanical and Electrical Rooms	20
Swimming Pools	50
Entrances	10

## **26 10 00 Medium-Voltage Electrical Distribution**

- Each feed into any campus building/structure shall be monitored and metered.

## **26 12 00 Medium-Voltage Transformers**

### **26 12 16 Dry-Type, Medium-Voltage Transformers**

- Transformers shall be mounted on isolators to minimize transmission of vibration noise to building structure.
- The sound pressure levels around electrical equipment in equipment spaces shall not exceed 85 dBA on the A reading.

## **26 20 00 Low-Voltage Electrical Distribution**

- Electrical distribution systems shall be 600V/208V, 3 phase, 60 Hz.
- Distribution systems to use copper wiring.

- Mount all receptacles 254mm above the floor on centre in all areas, unless otherwise approved by the University.
- Mount all switches at 1220mm above finished floor and no greater than 300mm outer edge of door frame.
- A minimum of 20 amp circuits shall be provided for lighting and power. All lighting and power circuits shall be kept separate from each other, with dedicated separate lighting and power panels, unless otherwise approved by the University.
- Provide common trip for all multiple pole breakers.
- Ground fault interrupters shall be provided for all exterior circuits and all circuits in wet areas such as toilet rooms, kitchens, locker rooms and wet labs. Interrupters shall comply with all applicable codes.
- When replacing low voltage switches in existing areas, the contractor shall replace the low voltage switch with the same manufacturer as the existing unit. For new installations see the acceptable manufacturer's list for further details.

## **26 24 00 Switchboards and Panelboards**

### **26 24 16 Panelboards**

- The main distribution panel shall have an amp meter, voltmeter, kWh meter, amp and volt switches.
- The main distribution panels shall have one main breaker and several branch feeder breakers.
- All panelboards shall be bolt on style.
- Panelboards shall have an isolated neutral bus and a ground bus bonded to the cabinet.
- Green ground wire shall be installed with all circuits.
- Panelboards shall have surge protection.

### **26 24 19 Motor-Control Centers**

- Structures shall be totally enclosed, dead front, free standing.
- Guide rails for control units, accessible wireways, and terminal blocks for control wiring shall be provided.
- Starter shall be of the combination type with circuit breakers. Each starter shall have two normally open and two normally closed auxiliary contacts wired to the terminal blocks, hand-off-auto switch, red run light and green off light.
- Starters shall be wired so that at the loss of electrical power they revert back to automatic operation when power is restored.
- The motor control centre shall be sized for a minimum 25% spare capacity.
- MCC shall be complete with bus bar, rails, wireways and other appurtenances so that no additional hardware is required for future expansion.



## **26 29 00      Low-Voltage Controllers**

### **26 29 13      Enclosed Controllers**

#### **26 29 13.13      Across-the-Line Motor Controllers**

- All motors shall be high – efficiency type, (VFD rated).
- For more information on approved motor starter manufacturers, see the acceptable manufacturer list (Table 26 06 00-1).

### **26 29 23      Variable-Frequency Motor Controllers**

- All drives shall be equipped with the following features:
  - Integral flush mounted display in VFD cover with keypad for programming;
  - Password protected;
  - Fault shutdown and indication;
  - Automatic restart following power outage;
  - Ability to disconnect motor load for setup or trouble;
  - Dual function manual speed control (from potentiometer AND keypad);
  - Adjustable maximum and minimum speed;
  - Acceleration and deceleration time adjustment;
  - Controller “stop” interlock from an NC dry contact;
  - Drive fault contact;
  - Stop/Start push buttons on keypad;
  - Transient voltage protection;
  - Three dry “C” type contacts programmable for any combination of the following:
    - Running
    - Fault lockout
    - Stopped
    - At speed
    - Under speed
    - Forward/Reverse
    - Low reference
    - Manual/Auto Mode
    - Local/Remote Mode
    - Lon Works, free topology compatible
  - Soft Start sequence;
  - Regenerative braking;
  - Minimum of three skip frequencies;

- Provide Hand / Off / Auto selector switch with manual speed control potentiometer;
- Output speed monitoring signal to be selective between 4-20 mA or 0-10 Volt;
- Door interlock fused disconnect switch, lockable in the off position.
- VFD's shall be mounted as close to the motor as possible.
- All VFD's shall be commissioned by a factory representative with the University commissioning agent present. The factory representative is to completely calibrate and verify all drive circuits after installation to on site equipment.
- Provide a minimum of a 2 year parts and labour warranty for all VFD's.

## **26 30 00      Facility Electrical Power Generating and Storing Equipment**

- Existing buildings shall only have loads connected to the emergency power system as required by the governing codes and as approved by the University Utilities Electrical Department.
- Equipment in new structures such as fire alarm systems, emergency lighting and security panels shall be provided with emergency backup power supply. All other equipment shall be identified on a case by case basis.

## **26 50 00      Lighting**

### **26 51 00      Interior Lighting**

- .1 The use of incandescent lamp sources shall be kept to a minimum. In general, incandescent lamps shall be used only for dimming applications. All other applications shall be reviewed and approved by the University Electrical Department.
- .2 The levels of Foot Candle Illumination shall be designed and installed as per table: 26 06 50-1.
- .3 Lamps shall be T8 or better. Use of particular lamp types will require approval from the University Electrical Department.
- .4 Lamps shall be 841 or better.
- .5 All ballasts shall be electronic.
- .6 Daylighting shall be reviewed for all applications and used to the fullest extent.

### **26 56 00      Exterior Lighting**

- .1 All outdoor lighting shall be controlled by BMS. Photocells shall be placed to provide optimum turn on time for security considerations.
- .2 Exterior lighting shall be base mounted ballasts (pole).
- .3 All lamps shall be Metal Halide.

**27 05 00    Common Work Results for Communications**

- Conduit, cabling and outlets are to form a complete and operating Category 5 Enhanced horizontal cabling system.
- Cable system shall have end-to-end Category 5 Enhanced rated products with components manufactured by AMP.
- Voice and data backbone cables are to be installed in conduit.
- System design and operation must conform to applicable standards and codes.
- Prior to commencement of work, submit shop drawings typical of product and installations of each communications subsystem to University of Lethbridge Telecommunications.
- Submit a sample of proposed test forms and procedures to the University of Lethbridge Telecommunications prior to start of testing.
- Submit test documentation and final report to the Engineer and University of Lethbridge Telecommunications, at the completion of the work.
- Prior to start of testing, advise the University of Lethbridge Telecommunications.
- System Supplier – contractor must demonstrate to the Owner that the firm has actively carried out data system installations for a period of at least five consecutive years and shall be approved by University of Lethbridge Telecommunications.
- Submit a list of a minimum of three references where the contractor has performed work within the past three years for review by the University of Lethbridge.
- NOTE: The contractor shall confirm labeling criteria with University of Lethbridge Telecommunications personnel prior to labeling cables.
- Conduct the following tests on each voice backbone cable:
  - Continuity test
  - Open circuit
  - Closed circuit
  - Polarity reversal
  - Pair transposition
- Conduct the following tests on each data cable:
  - Wire map
  - Length
  - Insertion loss
  - NEXT
  - PSNEXT
  - ELFEXT
  - PSELFEXT
  - Return loss
  - Propagation delay
  - Delay skew

- Measurements shall be performed or corrected to a temperature of 20C.
- Testing shall be performed in accordance with ASTM D4566 and CAN/CSA T529, Item 10.2.1.8.
- Record results on cabling contractor supplied forms as accepted by the University of Lethbridge.
- The marginal test functions on the testers will be set to off. Tag numbers for cable drops are to conform to labeling specification on the patch panel the cable is fed from.
- The University of Lethbridge reserves the right to request additional testing when failures are encountered.
- Submit test results to the University of Lethbridge for review.
- The University of Lethbridge reserves the right to perform random tests prior to project closeout.
- The University of Lethbridge will provide and install all active equipment components, including UPS.
- Coordinate active equipment locations with the University of Lethbridge prior to terminating cables.
- Provide copies of all system test data to the University of Lethbridge for evaluation. Tests results are to be provided in Microsoft Word format.

**27 05 28**

#### **Pathways for Communications Systems**

- Acceptable pathways include only specified cable tray and conduit systems. The use of 'J' hooks in communications pathways is NOT acceptable. Any pathway support or structure other than cable tray or conduit is to be approved by University of Lethbridge Telecommunications.
- All telecommunication and data wiring to be installed in cable trays and conduit.
- Do not exceed recommended bend radius limits for the cable.
- Do not exceed the maximum tensile strength rating of the cable when pulling into conduit or cable trays.
- Provide wire management accessories on the equipment racks to route incoming horizontal cables in an orderly manner.
- Do not strap voice or data cabling to any pathway, cable is to be grouped in loose bundles in tray.
- Do not leave excess cabling (slack) in tray or roof spaces. Any excess cabling (slack) is to be dressed on equipment rack as described in this document. Check with University of Lethbridge Telecommunications before cable termination.

## **.1 Horizontal Data Cable Termination (Blue)**

- Typical office installs will include a duplex connection with 2 blue jacks and blue wires run back to the local telecommunications closet.
- All cable pairs are to be terminated and useable. All cables will be terminated on rack mounted patch panels. Panel SL inserts are to be blue.
- Terminate cables in accordance with CAN/CSA T529 on insulation displacement contact (IDC) type terminal blocks.
- UTP cables to come in from the top of the terminal block mount and be terminated on the back side of the terminal block strip.
- Cable termination shall start at the upper left point of the terminal block mount and proceed in a left to right manner downward for each succeeding cable row.
- All cross-connection data cables to the equipment rack shall be run down the backside of the cable raceway between the racks and up before terminating on the back side of the patch panels. Check with University of Lethbridge Telecommunications before installing.
- Cable terminations to conform to CAN/CSA T529-M91, Eight Position Pin/Pair Assignments, TIA/EIA 568A configuration

## **27 10 00 Structured Cabling**

### **27 11 00 Communications Equipment Room Fittings**

- Racks are standard 19" telecommunication equipment racks.
- Patch panels are to be Category 5e Enhanced. Label kits to identify patch panel and individual ports. 44 mm wide cable management racks for each patch panel. Approved manufacturer – AMP SL series.
- Communications Room terminations shall be Category 5e patch panels AMP SL series

### **27 13 00 Communications Backbone Cabling**

#### **27 13 13 Communications Copper Backbone Cabling**

- Voice backbone to be a 100 pair 24 AWG, UTP, Thermoplastic insulated copper conductor cable in separate outer jacket to the requirements of CSA C22.2 No. 214, FT-4 fire rated jacket.
- Cable jacketing to be GRAY and shall be lead free. Cable shall exceed all TIA/EIA Category 3 or Enhanced Category 5 specifications.
- Cable shall be verified and characterized to 100 MHz. Cable shall be supplied on wooden reels.
- Communication room terminations to be on BIX blocks.

#### **27 13 23 Communications Optical Fiber Backbone Cabling**

- Backbone cable to be a 24 strand 50/125 micron core/cladding diameter, multimode fibre optic cable compliant with CAN/CSA-T529-M91.
- Cable to have a FT4 compliant riser rated sheath.
- Cable to be manufactured by AMP.
- Terminate fibre optic cable on ADC / FL1000 manufactured port rack mounted termination panel. Terminations to be with Type SC connectors. Other termination panels may be considered but must be approved by University of Lethbridge Telecommunications prior to installation.
- Terminate all fibres.

## **27 15 00      Communications Horizontal Cabling**

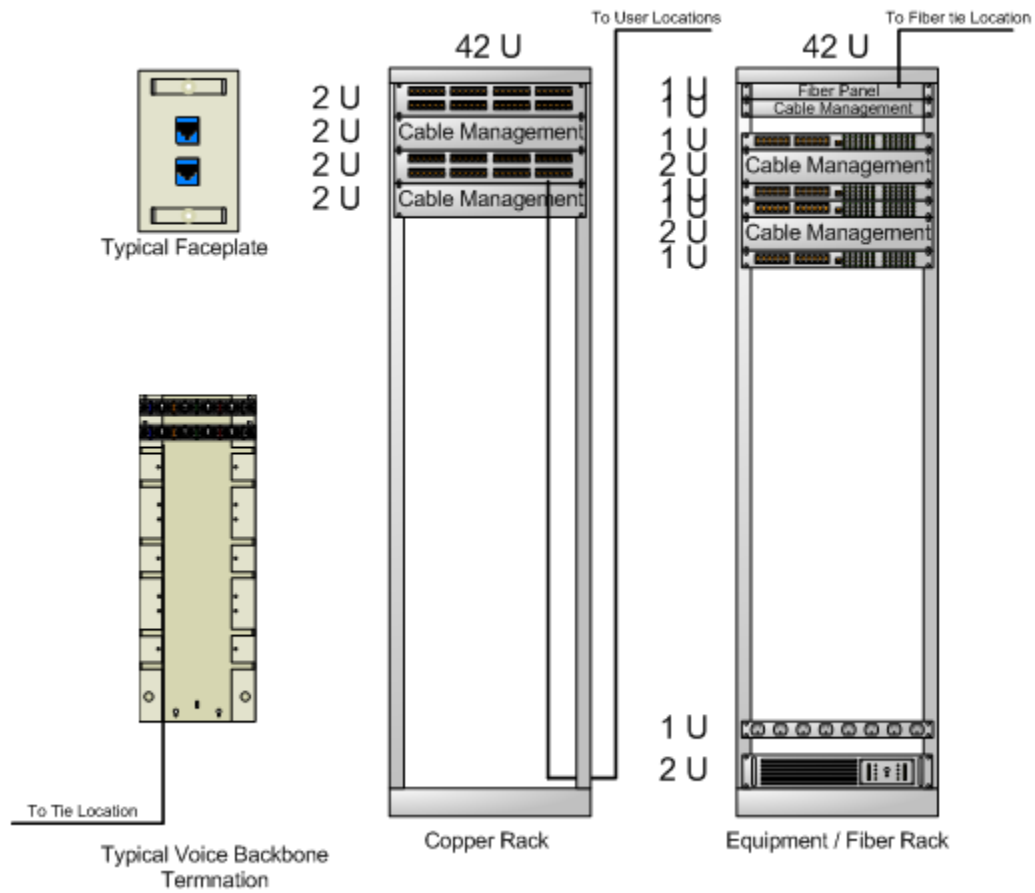
### **27 15 00.19      Data Communications Horizontal Cabling**

- 4 pair, Category 5e (CAT5) Enhanced 24 AWG UTP cable manufactured by AMP rated to 350MHz.
- Jacket colour – Blue
- Connector: Category 5e Enhanced jacks, Universal 8 position, non-keyed jack, IDC spring contacts integral with jack contacts, colour – Blue. Acceptable manufacturer – AMP SL series.
- Two (2) lines are to be installed in each location.
- Faceplate should be duplex style manufactures by AMP, unless otherwise specified by University of Lethbridge Telecommunications. Refer to typical faceplate diagram for faceplate configuration. Faceplate color should be same as other services within the same space (power, CATV, Etc).

## **27 16 00      Communications Connecting Cords, Devices and Adapters**

- Patch Cords are to be:
  - Category 5e Enhanced patch cords, 4 pair UTP, 24 AWG, 350MHz, FT4 rated
  - Patch cords with RJ-45 modular connectors at both ends
  - Patch cords to use same pin assignments as horizontal cables
  - Provide two (2) patch cords for each terminated data port. Length – 3000 mm at workspace end, 2000 mm at closet end
  - Colour – Blue
  - Manufacturer – AMP
  - Non Booted / Non Snagless
- Cable Management
  - Provide two (2) 2U rack mounted cable management units for every 2U's of Patch Panels.
  - Provide a 1U rack mounted cable management unit for each fiber optic panel to be installed.

## Typical Data Room / Faceplate Configuration



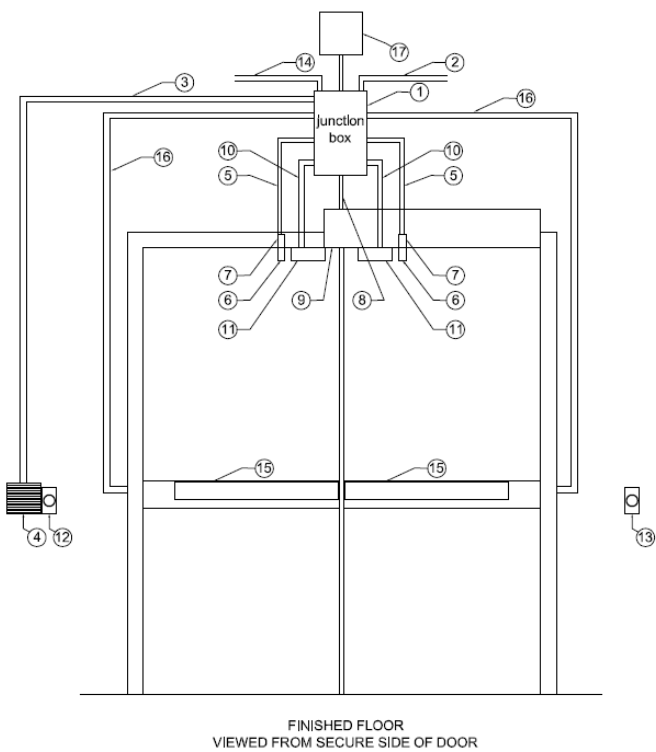
28 00 00    Electronic Safety and Security

28 10 00    Electronic Access Control and Intrusion Detection

28 13 00    Access Control

28 13 19    Access Control Systems Infrastructure

Refer to Typical Access Control Door – A, B, C, D, and E for card access system installations.



**NOTES:**

- 1 JUNCTION BOX (10" X 10" min.) MOUNTED ABOVE DOOR IN VOID ABOVE FINISHED CEILING ON SECURE SIDE OF DOOR.
- 2 25mm. CONDUIT RUN FROM FIRST DOOR TO SECOND DOOR (IF NEEDED). RUN ALL WIRING FOR ALL DEVICES BACK TO DOOR CONTROLLER AS NEEDED.
- 3 13m. CONDUIT FROM JUNCTION BOX TO CARD READER.
- 4 CARD READER MOUNTED ON NON SECURE SIDE OF DOOR.
- 5 13mm. CONDUIT FROM JUNCTION BOX TO DOOR CONTACT IN DOOR FRAME. DOOR CLOSURE HARDWARE MUST NOT INTERFERE WITH THE INSTALLATION OF THE DOOR MAGNETIC IN THE TOP OF THE DOOR.
- 6 DOOR POSITION MAGNET
- 7 N/C RECESSED CIRCULAR DOOR CONTACT.
- 8 19mm. CONDUIT FROM JUNCTION BOX TO AUTODOOR OPERATOR.
- 9 AUTODOOR OPERATOR (BY OTHERS)
- 10 13mm. CONDUIT FROM JUNCTION BOX TO MAGNETIC LOCK.
- 11 MAGNETIC LOCK (BY DOOR HARDWARE CONTRACTOR). OR SEE NOTE 17.
- 12 HANDICAPPED REQUEST TO ENTER BUTTON (BY OTHERS) MOUNTED ON NON SECURE SIDE OF DOOR.
- 13 HANDICAPPED REQUEST TO EXIT BUTTON (BY OTHERS).
- 14 37mm. CONDUIT RUN FROM CONTROL PANEL OR 25mm. FROM FIRST DOOR. RUN ALL WIRING FOR ALL DEVICES BACK TO DOOR CONTROLLER AS NEEDED.
- 15 PANIC BAR RELEASE DEVICE C/W/ REQUEST TO EXIT SWITCH AND EMERGENCY MAGLOCK RELEASE SWITCH (BY OTHERS).
- 16 13mm. CONDUIT RUN FROM JUNCTION BOX TO TRANSFER HINGE OF PANIC BAR RELEASE DEVICE.
- 17 SEPERATE 24VAC POWER SUPPLY REQUIRED IF DOOR USES ELECTRIC LATCH RELEASE. LOCATED NEAR DOOR. (BY DOOR HARDWARE CONTRACTOR).

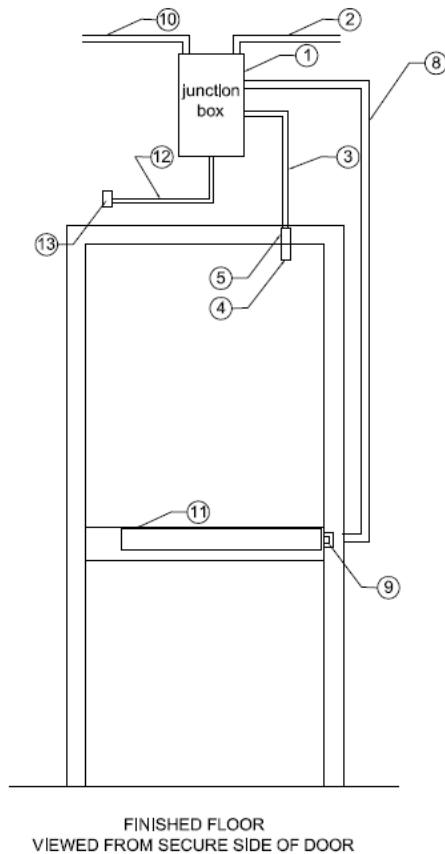


**TYPICAL ACCESS CONTROL DOOR - A**

**CARD ACCESS - DOUBLE DOOR - MAGNETIC LOCK - AUTODOOR OPERATOR**

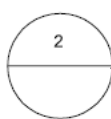
SCALE NTS





#### NOTES:

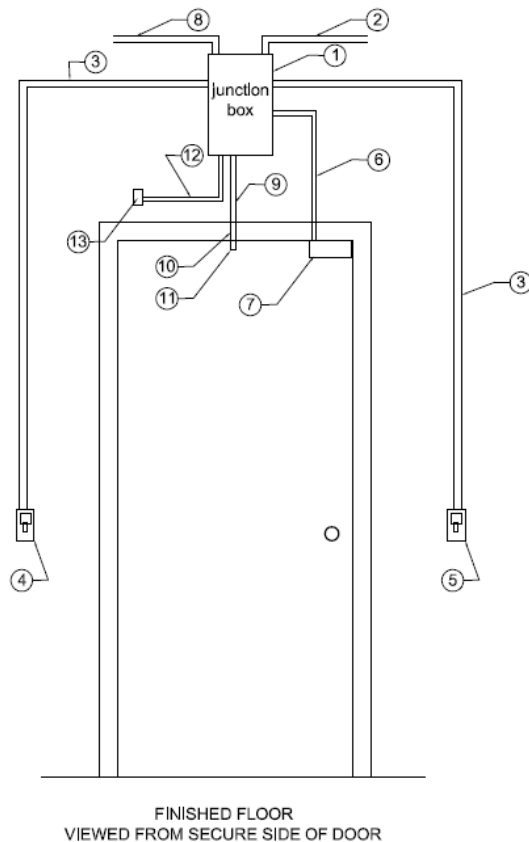
- 1 JUNCTION BOX (6" X 6" min.) MOUNTED ABOVE DOOR IN VOID ABOVE FINISHED CEILING ON SECURE SIDE OF DOOR.
- 2 25mm. CONDUIT RUN FROM FIRST DOOR TO SECOND DOOR (AS NEEDED). RUN WIRING FROM DOOR DEVICES TO CONTROLLER AS NEEDED.
- 3 13mm. CONDUIT FROM JUNCTION BOX TO DOOR CONTACT IN DOOR FRAME. OBSERVING DOOR CLOSURE HARDWARE SO THAT IT DOES NOT INTERFERE WITH THE INSTALLATION OF THE DOOR MAGNETIC IN THE TOP OF THE DOOR.
- 4 DOOR POSITION MAGNET.
- 5 N/C RECESSED CIRCULAR DOOR CONTACT.
- 6 13mm. CONDUIT FROM JUNCTION BOX TO SIREN.
- 7 MULTI-TONE ADJUSTABLE VOLUME SIREN.
- 8 13mm. CONDUIT FROM JUNCTION BOX TO DOOR STRIKE.
- 9 ELECTRIC STRIKE (BY DOOR HARDWARE CONTRACTOR).
- 10 37mm. CONDUIT RUN FROM CONTROL PANEL OR 25mm. FROM FIRST DOOR. RUN WIRING CONTINUOUSLY FROM DEVICES TO CONTROL PANEL AS NEEDED.
- 11 PANIC BAR (BY DOOR HARDWARE CONTRACTOR).
- 12 13mm. CONDUIT FROM JUNCTION BOX TO MOTION REX.
- 13 MOTION REQUEST OT EXIT SENSOR.



### TYPICAL ACCESS CONTROL DOOR - B

**CARD ACCESS - SINGLE - ELECTRIC STRIKE - PANIC - SIREN**

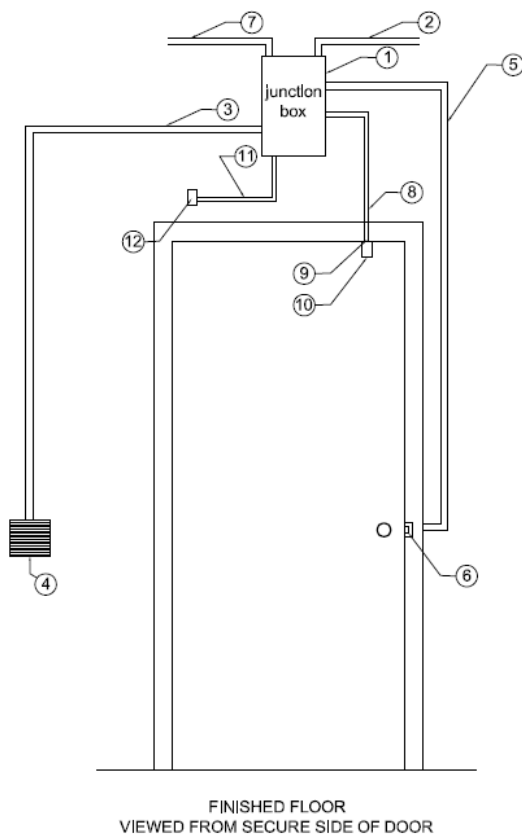
SCALE NTS



#### NOTES:

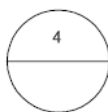
- 1 JUNCTION BOX (6" X 6" min.) MOUNTED ABOVE DOOR IN VOID ABOVE FINISHED CEILING ON SECURE SIDE OF DOOR.
- 2 25mm, CONDUIT RUN FROM FIRST DOOR TO SECOND DOOR (AS NEEDED). RUN ALL WIRING CONTINUOUSLY FROM DEVICES BACK TO DOOR CONTROLLER.
- 3 13mm. CONDUIT FROM JUNCTION BOX TO BLUE PULL STATION.
- 4 EMERGENCY BLUE PULL STATION MOUNTED ON NON - SECURE SIDE OF DOOR (BY OWNER).
- 5 EMERGENCY BLUE PULL STATION MOUNTED ON SECURE SIDE OF DOOR (BY OWNER).
- 6 13mm. CONDUIT FROM JUNCTION BOX TO MAGNETIC LOCK.
- 7 MAGNETIC LOCK (SUPPLIED BY DOOR HARDWARE CONTRACTOR).
- 8 37mm. CONDUIT RUN FROM CONTROL PANEL OR 25mm. FROM FIRST DOOR. RUN WIRING CONTINUOUSLY FROM DEVICES TO CONTROL PANEL AS NEEDED.
- 9 13mm. CONDUIT FROM JUNCTION BOX TO DOOR CONTACT IN DOOR FRAME. DOOR CLOSURE HARDWARE MUST NOT INTERFERE WITH THE INSTALLATION OF THE DOOR MAGNETIC IN THE TOP OF THE DOOR.
- 10 DOOR POSITION MAGNET (BY OWNER).
- 11 N/C RECESSED CIRCULAR DOOR CONTACT (BY OWNER).
- 12 13mm, CONDUIT FROM JUNCTION BOX TO MOTION REX,
- 13 MOTION REQUEST OT EXIT SENSOR.

3 **TYPICAL ACCESS CONTROL DOOR - C**  
**ACCESS CONTROL - SINGLE DOOR - MAGNETIC LOCK**  
SCALE: NTS



#### NOTES:

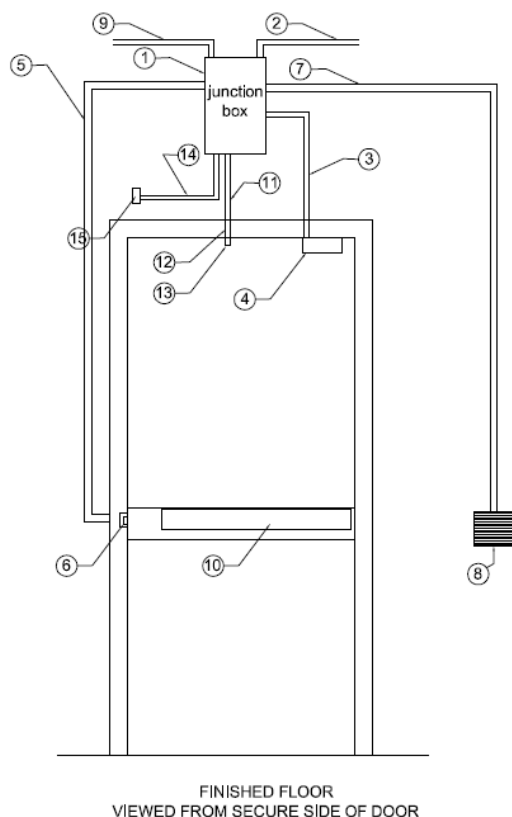
- 1 JUNCTION BOX (6" X 6" min.) MOUNTED ABOVE DOOR IN VOID ABOVE FINISHED CEILING ON SECURE SIDE OF DOOR.
- 2 25mm. CONDUIT RUN FROM FIRST DOOR TO SECOND DOOR (AS NEEDED). RUN WIRING FROM DOOR DEVICES TO CONTROLLER AS NEEDED.
- 3 13mm. CONDUIT FROM JUNCTION BOX PROXIMITY READER.
- 4 CARD READER MOUNTED ON NON-SECURE SIDE OF DOOR.
- 5 13mm. CONDUIT FROM JUNCTION BOX TO DOOR STRIKE.
- 6 ELECTRIC STRIKE.
- 7 37mm. CONDUIT RUN FROM CONTROL PANEL OR 19mm. FROM FIRST DOOR. RUN WIRING FROM DEVICES TO CONTROL PANEL AS NEEDED.
- 8 13mm. CONDUIT FROM JUNCTION BOX TO DOOR CONTACT IN DOOR FRAME. DOOR CLOSURE HARDWARE MUST NOT INTERFERE WITH THE INSTALLATION OF THE DOOR MAGNETIC IN THE TOP OF THE DOOR.
- 9 DOOR POSITION MAGNET (BY OWNER).
- 10 N/C RECESSED CIRCULAR DOOR CONTACT (BY OWNER).
- 11 13mm. CONDUIT FROM JUNCTION BOX TO MOTION REX.
- 12 MOTION REQUEST OR EXIT SENSOR.



### TYPICAL ACCESS CONTROL DOOR - D

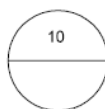
#### CARD ACCESS - SINGLE DOOR - ELECTRIC STRIKE

SCALE: NTS



#### NOTES:

- 1 JUNCTION BOX (6" X 6" min.) MOUNTED ABOVE DOOR IN VOID ABOVE FINISHED CEILING ON SECURE SIDE OF DOOR.
- 2 25mm. CONDUIT RUN FROM DOOR TO SECOND LOCATION (AS NEEDED). RUN WIRING CONTINUOUS FROM DOOR DEVICES TO CONTROLLER AS NEEDED.
- 3 13mm. CONDUIT FROM JUNCTION BOX TO MAGLOCK.
- 4 MAGLOCK (BY DOOR HARDWARE CONTRACTOR).
- 5 13mm. CONDUIT FROM JUNCTION BOX TO TRANSFER HINGE.
- 6 TRANSFER HINGE (BY DOOR HARDWARE CONTRACTOR).
- 7 13mm. CONDUIT FROM JUNCTION BOX TO CARDREADER.
- 8 CARDREADER (BY OWNER).
- 9 37mm. CONDUIT RUN FROM CONTROL PANEL OR 25mm. FROM FIRST DOOR. RUN WIRING CONTINUOUSLY FROM DEVICES TO CONTROL PANEL AS NEEDED.
- 10 PANIC BAR EQUIPPED WITH ULC MAGLOCK RELEASE DPDT RELAY (BY DOOR HARDWARE CONTRACTOR).
- 11 13mm. CONDUIT FROM JUNCTION BOX TO DOOR CONTACT IN DOOR FRAME. OBSERVING DOOR CLOSURE HARDWARE SO THAT IT DOES NOT INTERFERE WITH THE INSTALLATION OF THE DOOR MAGNETIC IN THE TOP OF THE DOOR.
- 12 DOOR POSITION MAGNET (BY OWNER).
- 13 N/C RECESSED CIRCULAR DOOR CONTACT (BY OWNER).
- 14 13mm. CONDUIT FROM JUNCTION BOX TO MOTION REX.
- 15 MOTION REQUEST OR EXIT SENSOR.



### TYPICAL ACCESS CONTROL DOOR - E

ACCESS CONTROL • SINGLE DOOR • MAGLOCK • PANIC

SCALE: NTS

## 28 20 00 Electronic Surveillance

### 28 23 00 Video Surveillance

- .1 At each camera location provide 2-Cat5E cable drops. Terminate in box, at location indicated by owner. Connect camera mount to box. Connect cable to nearest data closet. Cameras supplied and installed by owner.

## 28 30 00 Electronic Detection and Alarm

### 28 31 00 Fire Detection and Alarm

- .1 All system design must conform to latest Fire Alarm, Electrical and Alberta Building codes.
- .2 Fire alarm shall be fully addressable and communicate with the existing system.

- .3 Fire alarm system shall be connected to the normal and emergency power and battery backup power shall be provided in the fire alarm control panel in accordance with NFFPA requirements.
- .4 Control panels shall be of modular design for ease of system expansion and shall be protected with adequate built in surge suppression.
- .5 Zoning of each system shall be per building. Do not interconnect buildings with different panels.
- .6 Smoke detectors shall be installed in public areas as required by Code or by the University of Lethbridge.

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## **31 00 00    Earthwork**

### **31 05 00    Common Work Results for Earthwork**

All construction shall employ the services of a Geotechnical Engineer who will perform an analysis of the existing site along with recommendations for possible building foundations.

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## **32 00 00    Exterior Improvements (Update Forthcoming)**

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## **33 00 00    Utilities (Update Forthcoming)**

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## **34 00 00    Transportation (Update Forthcoming)**

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## **44 00 00    Pollution Control Equipment (Update Forthcoming)**