

Project **Parks Canada**

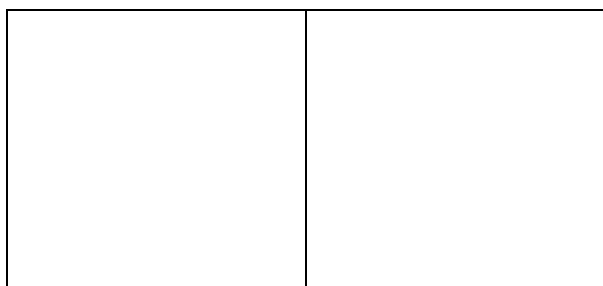
Date: September 1, 2020

Project No.: R.089317.002

---

This document shall be read with and forms an integral part of the Contract Documents. It modifies and clarifies the drawings and the specifications of the above-mentioned project. The modifications described herein come into force immediately.

---

**1. ARCHITECTURAL****1.1. MODIFICATIONS TO ARCHITECTURAL SPECIFICATIONS****1.1.1. SECTION 07 40 00**

1.1.1.1. Article 2.4.1: Type PMCP/IN.3/FR: Clarification to panel thickness.

**1.1.2. SECTION 10 56 26**

1.1.2.1. Article 1.3.10.1 revised to remove "minimum" capacity.

**1.2. MODIFICATIONS TO ARCHITECTURAL DRAWINGS****1.2.1. A-006: ASSEMBLAGES EXTÉRIEURS / EXTERIOR ASSEMBLIES (Attached)**

1.2.1.1. S1 at A-006 revised to indicate AL.PP.4/Perf.

1.2.1.2. Wall type EC60, PMCP/IN.3/FR thickness revised to 152mm

**1.2.2. A-111: PLAN - NIVEAU RDC - ZONE 1 / FLOOR PLANS - LEVEL 1 - ZONE 1 (Attached)**

1.2.2.1. Dimensions added for clarity.

**1.2.3. A-212: ÉLÉVATIONS DU BÂTIMENT - AGRANDIES / BUILDING ELEVATIONS - ENLARGED (Attached)**

1.2.3.1. Question marks removed from drawings for clarity.

**1.2.4. A-302: COUPES DE BÂTIMENT / BUILDING SECTIONS (Attached)**

1.2.4.1. Detail 1/A-302: wall section indicator for detail 3/A-312 revised to identify only the exterior wall above the low roof and to indicate "SIM".

**1.2.5. A-311: COUPES DE MUR EXTÉRIEUR / EXTERIOR WALL SECTIONS (Attached)**

1.2.5.1. Wall type EC60, PMCP/IN.3/FR thickness revised to 152mm

**1.2.6. A-512: DÉTAILS EN PLAN - EXTÉRIEUR / EXTERIOR PLAN DETAILS (Attached)**

1.2.6.1. Wall type EC60, PMCP/IN.3/FR thickness revised to 152mm. Detail adjusted.

**1.2.7. A-555: DÉTAILS EN COUPE - EXTÉRIEUR / EXTERIOR SECTION DETAILS (Attached)**

1.2.7.1. Wall type EC60, PMCP/IN.3/FR thickness revised to 152mm. Detail adjusted.

**1.2.8. A-811: PLAN DE PLAFOND RÉFLÉCHI - RDC - ZONE 1 / REFLECTED CEILING PLAN - LEVEL 1 - ZONE 1 (Attached)**

1.2.8.1. RCP A-811 revised to indicate S1 soffit.

END OF ADDENDUM No. A06

## 1.0 GENERAL

### 1.1 Related Sections

- .1 Division 01 – General Requirements shall be read in conjunction with and shall govern this Section.
- .2 Sections or Divisions for coordination, or for reference to related products:
  - .1 **Structure**
  - .2 **Section 05 05 00** Basic Metal Materials and Finishes
  - .3 **Section 05 50 00** Metal Fabrications
  - .4 **Section 07 10 00** Air Moisture / Water Protection
  - .5 **Section 07 20 00** Thermal Insulation
  - .6 **Section 07 92 00** Joint Sealants

### 1.2 References

- .1 Comply with all standards mentioned in this specification, unless more stringent requirements are given herein.
- .2 Aluminum Association
  - .1 AA ASD-2017 Aluminum Standards and Data
  - .2 Specifications and Guidelines for Aluminum Structures
- .3 American Architectural Manufacturer Association
  - .1 AAMA 501-15, Methods of Test for Exterior Walls
  - .2 AAMA 501.1-17, Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure
  - .3 AAMA 501.5-07, Test Method for Thermal Cycling of Exterior Walls
  - .4 AAMA 800-16, Voluntary Specifications and Test Methods for Sealants
  - .5 AAMA 605.2 Voluntary Specification for High Performance Organic Coatings on Aluminum Extrusions and Panels.
  - .6 AAMA TIR Metal Curtain Wall Fasteners
  - .7 AAMA 2605-98 Superior Performing Organic Coatings on Aluminum Extrusions and Panels
- .4 American Society for Testing and Materials (ASTM)
  - .1 ASTM A653/A653M-19, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - .2 ASTM A792/A792M-10(2015), Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
  - .3 ASTM A924/A924M-19, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
  - .4 ASTM B209-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
  - .5 ASTM B211/B211M-14, Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire
  - .6 ASTM B221M-13, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
  - .7 ASTM C645 - 18, Standard Specification for Nonstructural Steel Framing Members
  - .8 ASTM C67 / C67M – 19, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
  - .9 ASTM C 126-18, Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick and Solid Masonry Units.

- .10 ASTM C484-99(2014), Standard Test Method for Thermal Shock Resistance of Glazed Ceramic Tile
- .11 ASTM D1056 – 14, Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
- .12 ASTM E72-15, Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
- .13 ASTM E283/E283M-19, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
- .14 ASTM E330 / E330M – 14, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
- .15 ASTM E331 - 00(2016), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
- .5 American Society of Mechanical Engineers [ASME]
  - .1 ASME B18.6.4-1998 (R2005), Thread Forming And Thread Cutting Tapping Screws And Metallic Drive Screws - Inch
- .6 CSA Group
  - .1 CSAS136 -16, North American specification for the design of cold-formed steel structural members
  - .2 CSA W47.1-09(R2014), Certification of Companies for Fusion Welding of Steel
  - .3 CSA W47.2-11(R2015), Certification of Companies for Fusion Welding of Aluminum
- .7 Canadian Council of Canada
  - .1 CAN/CGSB-93.5-92, Installation of Metal Residential Siding, Soffits and Fascia
- .8 Health Canada - Workplace Hazardous Materials Information System (WHMIS 2015)
  - .1 Safety Data Sheets (SFS).
- .9 UL-Underwriters' Laboratories/ULC-Underwriters' Laboratories of Canada (UL/ULC)
  - .1 CAN/ULC-S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials
  - .2 CAN/ULC-S102-18 rev.1, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
  - .3 CAN/ULC-S115-18, Standard Method of Fire Tests of Firestop Systems
  - .4 CAN/ULC-S126-14-R2019, Standard Method of Test for Fire Spread Under Roof-Deck Assemblies
- .10 Acronym:
  - .1 CSMBI : Canadian Sheet Metal Building Institute
  - .2 AERMQ: L'association des entrepreneurs en revêtements muraux du Québec

### 1.3 Design Criteria

- .1 Wall cladding:
  - .1 Completed claddings must resist positive and negative wind pressures of 1.25 kPa or more, as per project requirements, with a maximum deflection of in accordance with NBC 2015 requirements and local by-laws.
  - .2 The walls shall be detailed using "Rain Screen" principles as per recommendations of NRCC.

- .3 Design cladding to take air circulation between the exterior environment and inside of metal cladding into account. The installation must comply to ASTM E283, ASTM E331 AAMA 501 requirement.
  - .4 The wall assembly shall permit expansion and contraction without losing its weather tightness from -35°C to 75°C.
  - .5 Acceptable differences in relation to horizontal or vertical planes or at an indicated location on shop drawings shall be 10 mm in 10 m (1/1000) and a maximum cumulative difference of 19 mm in 100 m. Deviations of alignment between two adjacent panels end to end shall not be more than 0.75 mm.
  - .6 The steel frame structure to support the insulated wall panels shall be installed with the following tolerances:
    - .1  $\pm 3$  mm in 1525 mm in any direction in the plane of the frame.
    - .2  $\pm 6$  mm cumulative in 6.1 m in any direction in the plane of the frame.
    - .3  $\pm 12.7$  mm of the frame plane on any elevation.
    - .4 Plumb and level to 3 mm near any direction change in prefabricated corner applications.
  - .7 The cladding system must conform to the tolerances of the structural framework of the building.
  - .8 The construction shall be such that the flexion is equal to or less than 1/240 of the span of the unsupported acoustic panel at a design differential pressure of 2.5 kPa.
- .2 Louvres:
- .1 Louvres shall resist positive and negative wind pressures of min. 1.25 kPa with a deflection of less than 1/180th of the span and be designed in accordance with NBC requirements and local by-laws.
  - .2 Louvers manufacturers shall confirm that louvers comply to the air movement performance and water penetration requirements in accordance to AMCA and meet specified free area.
  - .3 Louvres must be installed in such a manner as to prevent forced entry through them.
- .3 Flashings and copings:
- .1 The flashings and copings shall withstand all applicable positive or negative wind forces, 223 kg/m<sup>2</sup> minimum.
- .4 Other criteria: see **below** for other criteria included in the description of the claddings, if applicable.

#### 1.4 Performance Requirements

- .1 Metal, aluminium and other cladding must contribute to water, humidity, vapour and air tightness and to the thermal insulation, complete (100%) and uninterrupted, of the whole envelope.

#### 1.5 Sustainability Criteria

- .1 Comply with all requirements of **Section 01 47 15 SUSTAINABLE REQUIREMENTS: CONSTRUCTION**, as well as the following.
- .2 Submit Product information to identify life cycle impact (EPD), reduced environmental impact through Leadership Extraction Practices, as well as report on material ingredients and compliance with Red List criteria. Refer to table below for specific requirements.

PRODUCT	EPD	Leadership Extraction Practices	HPD	LBC Red List Free/ Compliant
<b>Type PMCP/IN.3/FR</b> – Prefabricated metal composite panels, insulated, Type 3, fire resistant		√	√	
<b>Type TC.T</b> – Terracotta clay tiles	√		√	

## 1.6 Submittals for Review

- .1 Submit the documents and elements as per **Section 01 33 00** and the following requirements:
  - .1 Shop drawings (S.D.):
    - .1 Shop drawings shall be signed and sealed by a member of the Ordre des ingénieurs du Québec in good standing.
    - .2 Shop drawings shall indicate dimensions, profiles and details of fabrication of claddings, and methods of their fastening, wall elevations, details of trims, edges, expansion joints if required, details at corners, at wall junctions, at special conditions, of metal furrings, different types of fasteners and their location, as well as related work and finishes.
    - .3 Shop drawings shall show the number of cladding panels required, with dimensions and location, and all pertinent details.
    - .4 Provide also structural calculations for panels and support systems
    - .5 Indicate codes and standards used, as well as design parameters.
  - .2 Sustainable development documentation (D.D.): see **Sustainability Criteria**, above.
  - .3 Product samples (P.S.):
    - .1 For each type of terracotta component provide three samples and support structure components.
  - .4 Mock-up (M.U.):
    - .1 For the terracotta work, build mockup in size and location as directed by the Departmental Representative. Show details of terracotta tile assembly. Demonstrate methods and details of installation. Show details of horizontal and vertical joints, attachments to the backing structure.
    - .2 See also **Section 01 45 00**.
  - .5 Test reports (T.R.):
    - .1 Provide the manufacturer's test results for structural deflection and design.
    - .2 Submit manufacturer's test results certifying that the louvers conform to requirements of AMCA standards for resistance to air and rain infiltration.
  - .6 Field reports (F.R.): see **Field Quality Control** below.

## 1.7 Closeout Submittals

- .1 Submit the documents and elements as per **Section 01 33 00**, **Section 01 78 00** and the following requirements:
  - .1 Certificates of conformity (C.C.):
    - .1 Submit at the end of work a certificate of conformity with AERMQ prescriptions.
    - .2 Submit at the end of work a certificate of conformity by the same engineer who has signed and sealed the shop drawings that the installation is in compliance with shop drawings.

- .2 Operation and maintenance data (O.D.): submit instructions for the maintenance of pre-finished panels and the instructions for taking apart the elements.

## 1.8 Qualifications (P.Q.)

- .1 The work described in this Section shall be carried out by a competent labour force.
- .2 Welders to be accredited from the Canadian Welding Bureau, in accordance to CSA W47.1/W47.1 for steel work and CSA W47.2 for aluminum work.

## 1.9 Delivery and Storage

- .1 Order material with a long lead time because of profile or colour well in advance, so as not to delay progress of work.
- .2 Handle and store panels in such a way to avoid damage to material and installation.
- .3 Store in strict accordance with the manufacturer's instructions. Material shall be stacked piled on wood rails and slightly sloped to shed water.
- .4 Do not use material damaged from exposure to humidity, collision or any other cause.
- .5 Unless otherwise indicated, store material in original packaging with the manufacturer's name and seal unbroken.
- .6 Protect stored materials from elements in temporary enclosures or in shipping containers.

## 1.10 Waste Management and Disposal

- .1 Waste management and disposal to be performed as per **Section 01 74 21**.

## 2.0 PRODUCTS

### 2.1 General

- .1 Certain related products required for the work of this section are specified elsewhere as indicated below.
- .2 See **Section 05 05 00** for description of basic metal materials and finishes, and welding procedures.

### 2.2 Exterior Metal Siding Panels and Backer Boards

- .1 General: metal cladding must be as per ASTM A653/A653M (finish Type GV.F.2) or ASTM A792/A792M (finish Type GV.F.3). The core is of grade 230 (33) steel, with elastic limit of minimum 230 MPa and accepting a maximum permissible stress of 144 MPa. This core is coated on each face with hot-dip zinc layer designated as Z-275 (G-90) (finish Type GV.F.2), or coated with a layer of hot aluminum-zinc designated as galvalume AZ180 or AZ150 (finish Type GV.F.3). These two coatings cover steel complying with ASTM A924/A924M.

- .2 Type MCP.E.1/PP – Exterior metal siding panels, fluted, prepainted: installed vertically, in Type ST.PL/GV.PP galvanized prepainted steel sheet, with smooth surface and interlocking edges, and having the following characteristics:
- .1 Thickness of base metal: 0.76 mm.
  - .2 Size and profile: 300 mm wide, 38 mm deep, with flutes at 100 mm o.c.
  - .3 Physical properties: as per CSA S136.
  - .4 Galvanization: Type GV.F.2.
  - .5 Finish: Type PP.F.1.
  - .6 Colour: as selected by the Departmental Representative, from the standard colour chart of the manufacturer.

Rev.02

### 2.3 Terracotta Cladding System

- .1 Type TC.T – Terracotta clay tiles: double-leaf, back ventilated, extruded through-body-colour terracotta clay tile elements, with self-draining open joint system, in double fired glaze finish, manufactured from high quality clays. Factory drilled according to installation needs
- .1 Dimensions: see **drawings**.
  - .2 Thickness: 40 mm or more as required.
  - .3 Weight: 65 kg/m<sup>2</sup> approximately.
  - .4 Profiles: Provide the profiles as indicated in the drawings.
  - .5 Texture: Natural and Wirestruck finish, location per drawing.
  - .6 Colour: custom, to the choice of the Departmental Representative.
  - .7 Tolerances:
    - .1 Width: deviation of the tile length from nominal dimensions (cuts) shall not exceed +/- 1.0 mm.
    - .2 Height: deviation of the tile height up to 200 mm shall not exceed 2.0 mm, up to 400 mm shall not exceed +/- 2.5 mm, and up to 600 mm +/- 3.0 mm.
    - .3 Thickness: deviation of tile thickness shall not exceed +/- 1.5 mm.
    - .4 Diagonal flatness: deviation of the tile flatness shall not exceed 0.25% of diagonal measurement.
    - .5 Straightness: deviation shall not exceed 0.25% of total module size.
- .2 Performances:
- .1 Water absorption: test according to ASTM C67 using 24-hour submersion and 5-hour boiling (separate sets of specimens, minimum 5 specimens each).
    - .1 Absorption by submersion shall not exceed 5 % average, 6 % for individual specimen.
    - .2 Absorption by boiling shall not exceed: 7 % average, 8 % for individual specimen.
  - .2 Freezing and thawing: test according to ASTM C67 for 100 cycles requiring minimum of 100 days (minimum 5 specimens). No specimen shall lose more than 0.5 % of its original dry weight. No specimen shall crack, crumble or fracture. Specimens shall conform to approved colour range samples before and after testing.
  - .3 Breaking load: test according to ASTM C67 (minimum 5 specimens). Supports shall be actual hardware used for this project. Apply load at mid-point between supports. Report shall include breaking load, calculated section modulus at mid-span and calculated breaking stress. Modulus of rupture in average shall not be lower than 17.237 MPa. Minimum 5 specimens.
  - .4 Thermal shock resistance: test according to ASTM C484 for glazed tiles. Minimum of 5 specimens. Specimens shall pass two cycles.
  - .5 Efflorescence: test according to ASTM C67. Minimum 10 specimens. Specimens to be rated "Not effervesced".

Rev.01

Rev.01



- .3 Type AL.GRT/TC/W – Aluminum girt system for terracotta walls: aluminum girt system, carrier tracks with gaskets, and tile clips to support terracotta clay tiles and drain rainwater. Designed to accommodate thermal movement and allow to remove the tiles individually, without breakage, notching, glue fixing or disruption to adjacent tiles. Tile clips must be concealed. Wet sealants are not permitted. Fasteners are stainless steel. Aluminum framing members are anodized (class II). Aluminium frame member shall be black anodized aluminum from ground level to a height of 2440 mm.
- .4 Sub-girt system: Type S.GRT/GV/W, as indicated – See **below**.

## 2.4 Insulated Metal Panel Cladding

- .1 Type PMCP/IN.3/FR – Prefabricated metal composite panels, insulated, Type 3, fire resistant:
  - .1 Insulated wall panels made of two pre-painted galvanized steel sheets Type ST.PL/GV.PP, chemically laminated to semi-rigid mineral fibre Type ISOL.12/VHC, with nested and offset joints (in one direction, horizontally or vertically) and free in the other direction, with a Type CLKG.3B butyl caulking chord inside factory-applied cavities, forming a waterproof rain screen, with concealed fasteners.
  - .2 As per NBC requirements (article 3.1.7 and others), CAN/ULC-S101, -S102 and -S126, ASTM E72, E283, E331 and E330, and AAMA 501.1 and 501.5.
  - .3 Application:
    - .1 Vertical: "L" series.
  - .4 Face thickness: exterior 0.483 mm and interior 0.483 mm.
  - .5 Panel width: ±1080 mm
  - .6 Panel thickness: see **drawings**.
  - .7 Thermal resistance:  $\pm$  RSI = 0.70.
  - .8 Bending: maximum permissible deflection of L/180 or 15 mm for wall panels under maximum design loads.
  - .9 All sealing components, and system of robust adjustable fasteners.
  - .10 All other required accessories, including special flashings and moldings.
  - .11 Finish:
    - .1 Galvanization: Type GV.F.2.
    - .2 Paint: Type PP.F.3.
    - .3 Texture: micro-ribbed on the inside and silkline on the outside.
  - .12 Colour: at the choice of Departmental Representative, from the standard range of the manufacturer.

Rev.03

## 2.5 Decorative Screens and Panels

- .1 Type DEC.SC/AL.PP – Decorative screens in aluminium, prepainted: In type AL.PP.4 aluminium sheets, corrugated panels, perforated, prepainted and having the following characteristics:
  - .1 Thickness of base metal: 1.27 mm
  - .2 Size and profile: 915 mm wide, 38 mm deep, with flute at 152 mm o.c.
  - .3 Perforations : 40%
  - .4 Size of holes: 3.2 mm diameter
  - .5 Distance between holes centers in line: 4.8 mm
  - .6 Distance between rows: 4 mm
  - .7 Finition : Type F.PP.3
  - .8 Colour : to Departmental Representative's choice

## 2.6 Louvres and Screens in Louvres

- .1 Coordination:
  - .1 Coordinate with **Mechanical** the dimensions and location of louvres, the percentage of opening, the model as well as the extent of open and obstructed surfaces.
- .2 Type LOUV/AL.PP.1/V – Vertical louvres in prepainted aluminum
  - .1 Aluminum extrusions: AA-6063-T52 alloy and temper.
  - .2 blades: +/- 1.6 mm thick; spaced at 127 mm approximately on centre, 50 mm deep
  - .3 Continuous blade units, no horizontal joints in sections less than 6000 mm mechanically secured to continuous extruded aluminum horizontal supports. Fixed directly to the sub-girt galvanized steel system with extruded aluminum clip angles. All fasteners to be stainless steel. Aluminum supports to be in mill finish.
  - .4 Free surface area: 50% or more.
  - .5 Finish and colour: Type PP.F.3A, colour at Departmental Representative choice.
  - .6 Obturating panels: Type AL.PP.4/IN, with Type PP.F.3A finish in black colour, as required.
  - .7 Bird-screens and insect screens: Type SC.B/SST.

## 2.7 Sub-Girt Systems

- .1 Type S.GRT/GV/W – Galvanized steel sub-girt system for walls, and Type S.GRT/GV/S – Galvanized steel sub-girt system for soffits:
  - .1 In Type ST.PL/GV steel sheet, finish Type GV.F.2, of appropriate thickness according to prescribed loads, minimum 1.2 mm in general and 1.8 mm for insulated panels, compliant with ASTM A653/A653M, category A.
  - .2 Single, double, triple systems, profiles "Z" or adjustable "L", and "U" profiles, continuous or discontinuous, installed horizontally or vertically, maximum 1220 mm c.c., as indicated.
  - .3 Exterior and interior surfaces of each layer of sub-girts isolated with a thermal break consisting of Type JOIN.4A/SA insulating strip, See **below**.
- .2 Type THERM.CLIP.1 – Thermal clips:
  - .1 System of strong clips in galvanized steel, finish Type GV.F.2 (Z-275), for installation of horizontal or vertical sub-girts with precision, having adjustments of  $\pm 12.7$  mm and integral thermal break in plastics, for insulation thicknesses of 102 mm, 127 mm and 152 mm, with self-drilling screws.

## 2.8 Fasteners

- .1 Type FAST.7 – Fasteners for sheet metal:
  - .1 All fasteners for aluminum work shall be stainless steel, in zinc or weathered steel and as per manufacturer's recommendations, complying with ASME B18.6.4.
  - .2 All fasteners for metal work shall be galvanized steel, with Type F.GV.1 finish, or as per manufacturer's recommendations, complying with ASME B18-6.4,
  - .3 Fasteners for acoustical screens shall be stainless steel screws with hexagonal heads, # 12-14 x 19 mm LG. at 102 mm c.c.
  - .4 Fasteners for sub-girt shall be no. 14, Type B, galvanized hex head screws.
  - .5 Fasteners to be self-tapping and have a conical neoprene washer.
  - .6 Paint exposed screw heads the same colour as the cladding.
  - .7 Exposed fasteners shall be anti-vandalism type.

- .2 Type FAST.3– Fasteners for metal: see **Section 05 05 00**.
- .3 Type FAST.9 – Fasteners for aluminium work: see **Section 05 05 00**.
- .4 Fasteners for insulation: see **Section 07 20 00**.

## 2.9 Accessories

- .1 All accessories such as alignment bars, brackets, clips, inserts, shims, trims, flashings, fillers, sills, rib closures, etc., as required, of the same material as the flashings and copings, or as indicated.
- .2 Type AL.PP.4/IN – Insulated sandwich panels in aluminum, prepainted: two aluminum sheets Type AL.PP.4, in AA-5005-H14 alloy and temper, 1.6 mm or as indicated, filled with Type INSUL.2/W polystyrene insulation, laminated and finished in plant Type PP.F.3A or Type F.PP.3D, with sealed edges; colour selected by the Departmental Representative.
- .3 Type SC.B/SST – Bird-screens, stainless steel: 1.3 mm diameter crimped steel wire cloth 19 mm x 19 mm mesh, with 75% free area, secured to 2.2 mm thick stainless steel frame, mitered at corners and secured with corner locks.
- .4 Type ISOL.12/VHC – Mineral fibre semi-rigid board insulation for metal sandwich cladding panels, very high compressive strength: As per ASTM C612 Type IVA, made from volcanic rock and steel slag, RSI = 0.71/ 25 mm, 13.5 kg/m<sup>3</sup> density, 45.8 kPa compressive strength at 10% deformation, ULC approved, applied between two sheets of metal.
- .5 Type JOIN.4A/SA – Closed cell neoprene joint filler, self-adhesive: neoprene/EPDM/SBR composition, as per ASTM D1056, class SCE41/2A1.
- .6 Type JOIN.4F/SA – Sealing tape in expansible foam, self-adhesive: open cell polyurethane foam tape, impregnated with a polymer modified asphalt, water-based, with adhesive on both faces.
- .7 Type JOIN.9 – Preformed sealant: of 100% solids, cross-linked polyisobutylene.
- .8 Type JOIN.12 – Polyethylene foam EVA closure blocking: in cross-linked waterproof polyethylene, matching rib profile to fill.
- .9 Type CLKG.3A – Synthetic rubber based industrial sealant: non-skinning, non-hardening, non-removable, non-marking, high solid content, having a penetration of 290-310, to seal joints between overlapping panels and where indicated (concealed).
- .10 Type CLKG.3B – Intermediate butyl rubber sealant: non hardening, for concealed joints at mullion junctions, etc.

## 2.10 Fabrication of Metal and Aluminum Panels

- .1 Fabricate and finish in accordance with CSMBI requirements, manufacturer's standard procedures and the performance requirements specified herein.
- .2 Respect structural dimensions and requirements
- .3 Panels, trims, and flashings shall be pre-cut in factory.

- .4 Form elements square, plumb and level, with precision and in strict conformity to profiles, levels, and dimensions shown on the architectural drawings, and reviewed shop drawings, and free of all distortions and other defects that may alter, appearance or performance. Double check against take-off dimensions from site.
- .5 Deburr, smooth and round off raw edges of plates and sheet material prior to forming during fabrication.
- .6 Fabricate panels for control of condensation, including proper inclusion of seals and provisions for venting, weeping and draining.
- .7 Do all drilling (for weep-holes, etc.) in shop, not on site.
- .8 Provide for expansion of the various materials.
- .9 All exposed aluminum panels on the same facade must be supplied from the same production lot, including painting, and unless otherwise specified, be installed with the grain in the same direction.

#### **2.11 Fabrication of Insulated Metal Panels**

- .1 Fabricate panels with joints according to the principle of the balanced pressure rain screen.
- .2 Fabricate panels in the factory and provide a tolerance on minimum thickness of plus or minus 1.6 mm.
- .3 Form sections of appropriate shape and correct dimension, square and without deformation or defect.
- .4 Form pieces of the longest practical length.
- .5 Laminate insulating strips to steel.
- .6 Apply butyl sealant inside and outside nesting joints during fabrication to have a continuous, uniform sealant seam and to maintain air tightness.
- .7 Sheets to be factory painted as per manufacturer's standard.

#### **2.12 Fabrication of Terracotta Cladding System**

- .1 Manufacture aluminum support system for terracotta clay tiles, baguette/fin elements and hardware in conformity with approved shop drawings so that tolerances are not exceeded.
- .2 Fabricate aluminum components and terracotta clay tiles to the sizes, profiles, colours-and textures as per manufacturer's standards.
- .3 Aluminum support system and tile clips must be designed so that terracotta elements can be removed independent of other elements.

#### **2.13 Fabrication of Louvres**

- .1 Assemble louvres according to manufacturer's recommendations.

- .2 Arc weld the louvers and the frames in plant. All fastening in the field to be mechanical. Any other method of fixation should be mentioned with tenders.
- .3 Install concealed vertical stiffeners to provide adequate rigidity of the blades.
- .4 At locations where openings are not required for ventilation, provide obturating panels prepainted black, insulated or as indicated, factory-installed for individual louvres, site-installed for continuous louvers; coordinate with **Mechanical**.

### 3.0 EXECUTION

#### 3.1 General

- .1 Perform work as per CSA, CSMBI and AERMQ standards and the manufacturer's instructions.
- .2 Verify all dimensions on site before commencing fabrication and installation and report all discrepancies to Departmental Representative.
- .3 Examine other work upon which the work of this Section depends and report all errors and discrepancies to Departmental Representative. The work of this Section shall not commence before all defects are corrected.
- .4 Commencement of work shall imply acceptance of surfaces and conditions.
- .5 Where required, neatly cut, reinforce, adjust and render work adequate in such a way as to ensure a perfect fit of all components.
- .6 Ensure exposed raw edges of plates and sheet material are deburred, smoothed and rounded off prior to installation.
- .7 Where required, repair or replace new panels and louvers, damaged during installation work, with identical products.
- .8 See **Section 07 20 00** for wall cavity compartmentalization.
- .9 Plan work and coordinate with other trades.
- .10 Carry out work in such a way that the work is square, plumb and level and conforms to the geometry shown in the drawings and shop drawings.
- .11 Align the joints of contiguous panels vertically or horizontally, unless otherwise indicated.
- .12 Observe tolerances prescribed by the manufacturer.
- .13 Attach panels to the support frame without restricting movement caused by design loads and expansion and contraction of the assembly.
- .14 Provide expansion or control joints when indicated or required, with locations to the satisfaction of the Departmental Representative.

- .15 Coordinate the weather tightness of caulking at roof, floor and junctions with other wall assemblies. Ensure continuity of the air barrier, vapour barrier, insulation and rain screen of the building envelope.
- .16 Coat incompatible metals with an isolating bituminous coating Type BPT to prevent electrolytic reaction.

### 3.2 Coordination

- .1 Coordinate the work with related work, specifically those of the building envelope, and with **Mechanical** for connection to conduits and fire-proof shutters, as well as for installation of obturating panels and air/vapour barriers, if applicable, to achieve uninterrupted air/vapour/water weather tightness.
- .2 Coordinate with **Section 07 52 00** for the proper installation of flashing and copings.
- .3 Ensure all items necessary to complete the work are included in related work.

### 3.3 Installation of Metal and Aluminum Panels

- .1 Install panels as indicated on drawings, in accordance with CAN/CGSB-93.5, the AERMQ recommendations, and the manufacturer's written instructions.
- .2 Install metal sub-girts square and level to the structure, respecting panel dimensions as shown on drawings.
- .3 Install siding panels on sub-girt system or wall framing system, or directly on the structural members, concrete walls or concrete block walls, as indicated.
- .4 Install continuous starter and edge strips, inside and outside corners, as well as flashings and other trims as indicated.
- .5 Form accessories in recommended lengths, make allowance for expansion at joints.
- .6 Neatly finish and deburr all on-site saw cutting.
- .7 Make joints in flashings and caulk according to manufacturer's recommendations, to ensure watertight installation.
- .8 Carefully install outside corners, fillers and closure strips so that finished work matches profiles indicated on **drawings**.
- .9 Provide preformed metal top closures and joint covers, or Type JOIN.12 foam closures to stop direct water penetration at vertical profiles for exterior siding. Ensure continuity of "pressure equalization" per rain screen principle.
- .10 Anchor panels and other components securely in place, with provision for thermal/structural movement.
- .11 Locate end laps, at least 100 mm wide, directly on structural supports. No open joints shall be accepted.
- .12 Maintain tight fitting, hairline joints in exterior cladding, true to line.

- .13 Install panels using type of fasteners recommended by the manufacturer and comply to the maximum vertical and horizontal tolerances.
- .14 Align screws in a rectilinear pattern, regularly spacing according to manufacturer's recommendations.
- .15 Visible screw caps must be same colour as the siding panels.
- .16 Install shims to obtain square, straight and level work to allowed tolerances.
- .17 Install thermal breaks Type JOIN.4A/SA uninterrupted by girt, on interior and exterior faces of the sub-girt system.
- .18 Avoid metal-to-metal contact to reduce the noise from by the internal movements within the panel system; use Type CLKG.3A sealant between overlapping panels.
- .19 Ensure all horizontal and vertical joints between interior metal liner panels are entirely caulked with Type CLKG.3A sealant or Type JOIN.9 preformed sealant, and that vertical joints are mechanically fastened at max. 610 mm spacing. Seal the joint at each fastener.
- .20 Install prefabricated gaskets, membrane flashing and caulking to both exterior cladding and interior liner panels, as indicated and as required in order to seal the wall assembly, especially around ducts and pipes through the walls. Ensure complete air and water tightness.
- .21 Caulk junctions with adjoining work, around openings and where required, with a sealant Type CLKG.2/AP, in accordance with **Section 07 92 00**, where required.
- .22 Install cladding panels with own supporting system as indicated and as per manufacturer's instructions.
- .23 Install all accessories as indicated and as recommended by the manufacturer.

### 3.4 Installation of Insulated Metal Panels

- .1 Install panels directly on structural girt system or other structural members as indicated on **drawings**, in accordance with the manufacturer's instructions.
- .2 Install continuous starter and edge strips, inside and outside corners, as well as flashings and other trims as indicated.
- .3 Form accessories in recommended lengths and make allowance for expansion at joints.
- .4 Neatly finish with knife all on-site saw cutting.
- .5 Protect the edges of the cuts with paint matching the colour of the panel. The cuts made on the site must be of the same quality as those made at the factory.
- .6 Steel sheet parts shall not be left unwrapped or exposed. Minimize cutting on site.
- .7 Ensure exposed edges of sheet or plate materials are deburred, smoothed and rounded before installation.

- .8 Minimize thermal bridges with insulation and other elements to avoid direct conduction through the envelope.
- .9 Provide weep holes and vents at each panel joint to drain water that has infiltrated the system to the outside of the building.
- .10 Provide exposed and concealed flashings with an exterior positive slope of 1:12 minimum; no water should stagnate on surfaces.
- .11 Make joints in flashings and caulk according to manufacturer's recommendations, to ensure watertight installation.
- .12 Install outside corners, fillers and closure strips with carefully formed and profiled work, as indicated.
- .13 Install adjacent panels with tight fitting joints of consistent minimum dimension, to limit water penetration at vertical profiles. Ensure continuity of "pressure equalization" of rain screen principle.
- .14 Anchor panels and other components securely in place, with provision for thermal/structural movement.
- .15 Install panels using type of fasteners recommended by the manufacturer and comply to the maximum vertical and horizontal tolerances.
- .16 Install screws aligned, rectilinear, square, spaced regularly and according to manufacturer's recommendations.
- .17 Install shims to obtain square, straight and level work to allowed tolerances.
- .18 Ensure the continuity of pressure balancing, in accordance with the rain screen principle.
- .19 Ensure all concealed joints between panels, horizontally and vertically, are entirely caulked with Type CLKG.3A sealant, or as recommended by panel manufacturer, with weeping joints to the exterior at the bottom of each panel to guide rainwater to the outside of the wall.
- .20 Ensure that all vertical joints between horizontally installed panels are treated entirely with a compressible insulation element on the inside and a 12.7 mm panel rubber cover, as per instructions by the panel manufacturer.
- .21 Apply a sealant between the panels and steel supports to ensure the continuity of the vapour barrier at all points where panels are perforated.
- .22 Install prefabricated seals, connecting membranes and caulking as indicated and as required, in order to completely seal the wall assembly, particularly around ducts and pipes crossing walls, and ensure complete air, vapour and water tightness.
- .23 Caulk exposed junctions with adjoining work with a sealant Type CLKG.2/AP, in accordance with **Section 07 92 00**, where required.
- .24 Install all accessories as indicated and as recommended by the manufacturer.



**3.5 Installation of Terracotta Cladding**

- .1 Install aluminum support system and terracotta clay tiles in accordance with manufacturer's instructions and satisfactorily reviewed shop drawings, within specified erection tolerances.
- .2 Establish level lines for tile coursing and positioning of support rails.
- .3 Attach aluminum support framing with engineered fasteners and anchors to accomplish performance requirements at spacing recommended by manufacturer in accordance with lateral loads and system dead load requirements.
- .4 Coordinate flashing and sheet metal work to provide weather tight conditions at wall terminations.
- .5 Starting at bottom of wall, attach terracotta clay tiles to aluminum carrier tracks with tile clips in accordance with manufacturer's instructions.
- .6 Provide for temperature expansion/contraction movement of terracotta clay tiles at wall penetrations and wall mounted equipment, in accordance with system manufacturer's product data and design calculations.
- .7 Install components so that in their final location and position they are not twisted, out of plane, or exceed manufacturer's specified tolerances. Terracotta clay tile elements must be individually removable without damage or tile and system modification. Provide manufacturer's standard procedure as part of the submittal package.
- .8 Remove damaged work and replace with new, undamaged components.

**3.6 Installation of Air/Moisture/Water protection membranes**

- .1 By this Section – See **Section 07 10 00**.

**3.7 Installation of Insulation**

- .1 By this Section – See **Section 07 20 00**.

**3.8 Installation of Louvres**

- .1 Install louvres in accordance with the details, the shop drawings and manufacturer's printed instructions.
- .2 Install units plumb, level and true to line, as shown on drawings.
- .3 Reinforce openings as required.
- .4 To prevent intrusions, ensure most fixations are done from the interior side.
- .5 At openings, install bird-screens on the inside face of the louvres where ventilation ducts are attached to the louvres.
- .6 Close the unused portions of the continuous louvres, if any, with insulated finished panels.

- .7 Connect louvre frames with Type MEMB.11 to the building air/vapour barrier system – See **Section 07 10 00**.
- .8 Use aluminum or prepainted metal sheet flashing, according to the material of the louvres, to finish properly junctions with other surfaces.
- .9 Caulk and seal around the louvre frames with a sealant – See **Section 07 92 00**.
- .10 Fill the space between the louvre frames and adjacent surfaces with flexible insulation.

### **3.9 Field Quality Control (F.R.)**

- .1 Inspection and testing of siding installation may be carried out by testing laboratory designated by the Departmental Representative.
- .2 The Departmental Representative shall pay for tests as specified in **Section 01 45 00**.
- .3 The Departmental Representative may also retain the services of a specialized firm to carry out thermography tests on samples of mock-ups and the completed work, as prescribed in **Section 01 45 00**.

### **3.10 Cleaning and Protection**

- .1 Perform cleaning as per **Section 01 74 11**.
- .2 As the work progresses and at completion, all foreign substances shall be removed from the work and it shall be cleaned of all stains, paint marks, dirt and mastic smudges, drops of sealant, etc. to the satisfaction of the Departmental Representative.
- .3 Replace damaged panels or accessories, that cannot be repaired by touch-ups or other minor interventions in a manner to Departmental Representative's satisfaction.
- .4 Remove protective film coating (if applicable) as work progresses. Clean with a mild detergent at the end of work, using clean and soft rags.
- .5 If necessary, wash exposed exterior surfaces using warm water and domestic mild soap, with clean soft cloths.
- .6 Wash the exposed exterior surfaces with detergent, by a specialized firm.
- .7 Remove from site all surplus materials, debris, excess of sealants and broom clean the work area.
- .8 Protect completed work from damage, which could result from other work, until end of construction.

**End of Section**

## 1.0 GENERAL

### 1.1 Related Sections

- .1 Division 01 – General Requirements shall be read in conjunction with and shall govern this Section.
- .2 Sections or Divisions for coordination, or for reference to related products:
  - .1 **Section 03 30 00** – Cast in Place Concrete
  - .2 **Section 03 53 00** – Concrete Topping
  - .3 **Section 05 05 00** – Basic Metal Materials and Finishes
  - .4 **Section 09 61 00** – Floor Preparation
  - .5 **Section 09 65 00** – Resilient Flooring
  - .6 **Section 09 67 00** – Special Flooring
  - .7 **Section 21 13 13** – Wet Pipe Sprinklers System

### 1.2 References

- .1 Comply with all standards mentioned in this specification, unless more stringent requirements are given herein.
- .2 American Architectural Manufacturers Association
  - Rev.01 .1 AAMA 2603-2017a, Voluntary specification, performance requirements and test procedures for pigmented organic coatings on aluminum extrusions and panels (with coil coating appendix)
- .3 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength
  - .2 ASTM A325-14, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength (Withdrawn 2016)
  - .3 ASTM A490M-14a, Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints.
  - .4 ASTM A500 / A500M – 18, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
  - .5 ASTM A653/A653M-19a, Standard Specification for Steel Sheet, Zinc-Coated,(Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .4 Canadian Institute of Steel Construction
  - .1 CISC Guide for Specifying Architecturally Exposed Structural Steel, 2nd Edition
- .5 Canadian Standards Association (CSA International)
  - .1 CSA-S16-19, Design of Steel Structures
  - .2 CSA-S136-16, North American Specification for the design of Cold-formed Steel Structural Members.
  - .3 CSA A344.1/A344.2, User Guide for Steel Storage Racks/Standard for design and Construction of Steel Storage Racks.
  - .4 CSA-G40.20-13/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .5 CSAW48-18, Filler metals and allied materials for metal arc welding
  - .6 CSA W59-18, Welded Steel Construction.

- .6 National Fire Protection Association (Agency) (NFPA):
  - .1 NFPA 13-2016 Standard for the Installation of Sprinkler Systems.

### 1.3 Design Criteria and Performance Requirements

- .1 Systems shall be designed, manufactured and installed to meet the requirements of the seismic zone relevant to the project, as determined according to NBC 2015.
- .2 Ensure that the structural floor system is capable of supporting live and dead loads required by prevailing building codes, including loads of storage units to be installed and that the structural floor deflection is the least possible under the requirements of the specified loads of the shelving systems.
- .3 Ensure provision is made by **Structure** for a 50 mm thick concrete topping where track/rail system is to be installed.
- .4 Bolted or welded connections must not sag or slip under normal conditions of use.
- .5 All shelving systems shall meet the requirements of NFPA 13-2016 – 16.2.3.1. As such, their design shall meet the following:
  - .1 All racks shall be designed as open rack as defined by NFPA 13-2016 – 3.9.3.7.4. Shelving in racks that are fixed in place and loads put in racks shall have a shelf area or a solid surface equal to or less than 1.858 m<sup>2</sup>.
  - .2 Shelving shall be protected by wet pipe sprinklers system (see **Section 21 13 13**).
  - .3 A nominal 150 mm transverse flue space shall be maintained between loads or shelves at rack uprights
  - .4 A nominal 150 mm longitudinal flue space shall be maintained at all time between mobile racks and fixed obstacles.
  - .5 Maximum storage height shall be 7 620 mm and maximum ceiling height 9 144 mm.
- .6 All storage racking systems shall also respect the following requirements:
  - .1 Deflections: at maximum working load, the deflection of rack beams must not exceed 1/180<sup>th</sup> of the span of the beam.
  - .2 Base plate design: a base plate must provide for anchorage and be designed to support the entire profile of the column placed on it. The base plate must transfer the column load in a uniform manner to the supporting floor.
  - .3 Beam connection: in addition to the design loads, beams must have support connections that are capable of withstanding an upwards force of 4.5 kN per connection, without failure.
  - .4 Design details and connections in accordance with requirements of CSA-S16 and CSA-S136 to resist forces, moments and shears, as required by the design loads.
- .7 Support structure for the trolleys shall not deviate more than 6 mm from a straight line.
- .8 Maximum variation rail levelness:
  - .1 9.5 mm on 6.1 m variation from true level within any system.
  - .2 12.7 mm in height on 6.1 m length of rail for any rail.
  - .3 1.6 mm with the adjacent rails, perpendicular to rail direction.
- .9 Maximum variation of floor level: level within 9.5 mm in 6.1 m with respect to the actual level within the whole system – by **Structure**.

Rev.01

Rev.04

- .10 Shelving capacity:

- .1 Each shelf shall have a capacity of ~~minimum~~ 227 kg, unless otherwise indicated.
- .2 For ~~minimum~~ weight capacity of pallet racking refer to **2.0 PRODUCTS**.

- Rev.01
- .11 Drawer capacity:
    - .1 Each drawer shall have a capacity of 22.7 kg, unless otherwise indicated.
  - .12 Finish:
    - .1 All exposed steel must meet the criteria of AESS 3 as in the CISC-AESS Guide.

#### 1.4 Submittals for Review

- Rev.01
- .1 Submit the documents and elements as per **Section 01 33 00** and the following requirements:
    - .1 Shop drawings (S.D.):
      - .1 Submit complete drawings including plans and elevations and engineering calculations (to meet design criteria and performance requirements as prescribed above) signed and sealed by a member of the Ordre des ingénieurs du Québec in good standing.
      - .2 Indicate dimensions and spacings of depressions for mounting rails to be provided in floor slab by Structure, allowing a tolerance of 50 mm in all directions.
      - .3 Indicate dimensions and spacings of all elements, including all base plates and anchor bolts.
      - .4 Exact dimensions to be coordinated prior to pouring the floor slab.
      - .5 Provide engineering calculations showing capability of carriage motion and control mechanisms to move specialized loads and to meet performance criteria.
      - .6 Base plate reaction loads must be provided on the plans to allow for a verification of the supporting floor capacity by the Departmental Representative.
    - .2 Product samples (P.S.):
      - .1 Provide a minimum of 3 colour selections.
      - .2 Provide sample for each exposed product and for each colour required.
      - .3 Submit manufacturer's colour charts consisting of actual product sample, showing full range of colours and textures available.
    - .3 Mock-ups (M.U.):
      - .1 Install in the manufacturer's facility full-size mock-ups of each shelving type, including variations, accessories and inserted modules.
      - .2 In the presence of the grout manufacturer's representative, install sample length (typical rail length) of rail complete with anchors, rail and grout bed, in accordance with manufacturer's certified procedures to demonstrate adherence and consistency of grout interface with concrete and rail.
      - .3 After the above mock-ups are reviewed by the Departmental Representative, install at their final location on site full-size mock-ups of each shelving type, not necessarily including variations and accessories but including the inserted modules, if applicable.
      - .4 See also **Section 01 45 00**.
    - .4 Field reports (F.R.): submit manufacturer's written reports within **5 days** of review, verifying compliance of work – See **Field Quality Control** below.
    - .5 Manufacturer's instructions (M.I.): submit installation instructions and special handling criteria, installation sequence, cleaning procedures.

#### 1.5 Closeout Submittals

- .1 Submit the documents and elements as per **Section 01 33 00**, **Section 01 78 00** and the following requirements:

- .1 Extra materials, special tools and spare parts (E.M.): supply 2 complete sets of special tools required for maintenance, assembly and disassembly of washroom accessories, if applicable.

#### 1.6 Qualifications (P.Q.)

Rev.03

- .1 The storage shelving installer shall be manufacturer's authorized contractor, with experience in installing system of comparable size and complexity, employing a skilled workforce.
- .2 The manufacturer must be certified ISO 9001-2015 and ISO 14001-2015. In lieu of the latter, submission of corporate environmental policy is acceptable, provided it clearly shows that an environmental management system has been implemented in line with ISO 14001 requirements. Submit written proof of qualification.
- .4 Provide support for **24-hour** service call.

#### 1.7 Delivery, Storage and Handling

- .1 All materials and accessories must be carefully packed and protected from the weather while in transit, while stored and during installation on site.
- .2 Do not deliver products to site until installation spaces are ready to receive them.
- .3 Follow manufacturer's instructions and recommendations for delivery, storage and handling requirements.
- .4 Take necessary precautions to avoid damaging members and their painted surfaces during handling and transportation.
- .5 Ensure that painted surfaces are not placed face to face but rather separated by wooden blocks, styrofoam spacers, or other suitable materials.
- .6 Use nylon straps to raise materials, and if necessary, use cradles or crates.
- .7 Firmly secure steel using chains and protective cushions to transportation vehicles to avoid horizontal motion. Protect metal edges with rubber, burlap or wood. Do not load small sections within 'U' channels or beams.
- .8 Unload in location as indicated. Provide equipment and labour to unload without causing damage and place on wooden blocks.
- .9 Choose suitably sized wooden blocks and space them correctly to avoid steel from coming into contact with ground.

#### 1.8 Job Conditions

- .1 Verify location and dimensions of storage system by taking on-site measurements prior to manufacturing.
- .2 Coordinate installation of storage system with other work to reduce risk of dirt or damage to system.
- .3 Conduct a shop visit and a start-up meeting at the manufacturer's facility in the presence of Departmental Representative.

- .4 Conduct pre-installation meeting on site in the presence of Departmental Representatives, as well as the manufacturer's representative. Review methods and procedures for installing storage units.

## 1.9 Waste Management and Disposal

- .1 Waste management and disposal to be done as per **Section 01 74 21**

## 2.0 PRODUCTS

### 2.1 General

- .1 See **Section 05 05 00** for description of basic metal materials and finishes, and welding procedures.
- .2 Provide permanent labels, or other permanent identifying method, indicating the maximum load capacity for each unit. Locate the load identification in the same location on each unit.
- .3 See **drawings** for types and location of products included, as well as details not specified herein.

### 2.2 Materials and Finishes

- .1 Steel: unless otherwise indicated, Type ST.PL/PP cold formed steel shapes, prepainted with manufacturer's electrostatically applied Type PP.F.5 epoxy-polyester hybrid powder coating finish for all exposed metal surfaces, 35-65% glossy, minimum 38 microns (1.5 mil) thick, high adhesion (Cross Hatch Adhesion 100 %), pencil hardness 2H, resisting methyl ethyl ketone (passing the MEK test), salt spray, impacts, abrasion, printing and all normal usage wear; colour to be confirmed by Departmental Representative.
- .2 Laminated or welded channels, plates and bars: to CSA-G40.20 and CSA-G40.21. Grade 350W, except angles ("L") and channels ("C") and plates that may be Grade 300W.
- .3 Tubular steel channels: in compliance with specifications of CSA-G40.20 and CSA-G40.21 or ASTM A500. Use Grade 350W, Class C, unless otherwise indicated on drawings.
- .4 Anchor bolts: to ASTM A307 minimum.
- .5 Bolts, nuts and washers: to ASTM A325 or ASTM A490.
- .6 Welding materials: to CSA W48 Series, CSA W59 and certified by Canadian Welding Bureau.

### 2.3 Type SHELF.1 – High Density Mobile Shelving, Manual (Mechanical Assist)

- .1 Variants:
  - .1 Type SHELF.1A – For large historical collections.
  - .2 Type SHELF.1B – For domestic collections.
  - .3 Type SHELF.1C – For domestic collections.
  - .4 Type SHELF.1D – For indigenous collections.
  - .5 Type SHELF.1E – For bankers' boxes.
  - .6 Type SHELF.1F – For bankers' boxes.
  - .7 Type SHELF.1G – For domestic collections.
- .2 General:

- .1 The system shall be of the mechanical assisted manual type.
  - .2 The system consists of manufactured high-density mobile storage units mounted on manufacturer's track-guided carriages to form a compact storage system. System design permits access to any single aisle by manually moving units until the desired aisle is opened. The carriage/rail system provides uniform carriage movement along the total length of travel, even with unbalanced loads.
  - .3 The carriage system to consist of a formed structural steel frame with hardened steel wheel riding on steel rails recessed into the floor.
  - .4 Face and back panels, as well as carriage faces shall provide a smooth, clean appearance without any assembly holes or protruding hardware (except for the movement control system) and assembled without cutting edges.
  - .5 High bay, with flues, tops as indicated, low-height lateral panel.
  - .6 See **drawings** for particularities of variants.
  - .7 Supply insertion modules of drawers or casework as shown on **drawings** and specified below in the article **Accessories**.
- .3 Rails:
- .1 Rails shall be machined to ensure smooth operation and self-centering of mobile storage units during travel without end play or binding, designed to disperse concentrated wheel point load.
  - .2 Rails shall be designed and manufactured with a form and dimensions to carry loads applied on each carriage. They shall be made of cold rolled steel (CRS), mill finish. The steel rail shall be replaceable.
  - .3 Rails shall be recessed and designed to be anchored in a structural concrete floor, with provision for leveling of rails to compensate for variations in floor surface level. Rails shall provide smooth transition for material handling equipment. See depth of concrete topping shown on **drawings**.
  - .4 Main rail section shall be a maximum of 1.22 m each with shorter sections of 305 mm minimum used to complete each individual rail assembly.
  - .5 Rail joints shall be designed to provide as minimal of a gap as possible and prevent twisting or slippage.
  - .6 Rail connections shall have interlock steel rail connectors. All rail connections shall be designed to provide horizontal and vertical continuity between rail sections, to gradually transfer the concentrated wheel point load to and from adjoining sections. To insure vertical and horizontal stability, tongue-and-groove joints connections are not permitted.
  - .7 Built-in anti-tip device shall be provided to meet local building code and high height-to-width ratio.
  - .8 Anchor bolts: Type SST.1 stainless steel, Type MF.SS (mill finish), when anchoring into concrete.
- .4 Floor / Ramp:
- .1 No floor ramp shall be required – install mobile shelving units in depressions provided in floor slab.
  - .2 Install rails at exact height such that floor level between units is level with surrounding floor.
- .5 Carriages:
- .1 Design of the carriage is such that the weight-bearing of the upright rests directly over the wheel channels, thus transmitting the load directly to the rail.
  - .2 All carriages shall be riveted-bonding construction for flexibility and potential reconfiguration. Welded carriages or carriages with formed lips are unacceptable.



- .3 Carriages and stationary platforms shall be constructed of a full "C" shape profiles 38 mm deep x 79.4 mm high, in 50W steel, minimum 3 mm thick.
- .4 Wheel support sections shall be in 50W steel, minimum 4.7 mm thick and must measure 82.6 mm deep x 95.3 mm high. They must be welded and support a load of up to 3 632 kg and in tandem configuration up to 7 264 kg.
- .5 Wheel support sections shall be riveted between the main support face sections, one per aisle assembly. Support sections shall be embossed to eliminate the need of filler plates between the shelving/cabinet and the "C" shape supports.
- .6 Necessary carriage splices shall be bolted type designed to maintain proper unit alignment and weight load distribution.
- .7 Carriage straightness shall have no more than 12.7 mm deviation from a true straight line. There shall be no permanent set or slippage in any spliced or welded joint when exposed to forces encountered in normal operating circumstances.
- .8 Carriage construction shall be designed to allow the shelving uprights to be secured to the carriage frame with vibration-proof graded bolts, nut, and clamp anchor assemblies and so that there is no visible hardware on carriage face. Recess design carriages are not permitted. Self-drilling screw attachment is not acceptable method of attachment shelving units to the carriage. No shelving or cabinet attachment hardware shall be visible on exterior face of carriages.
- .9 Carriages must:
  - .1 Not have deflection exceeding  $L/320$  between the wheels with their own weight plus weight of drive mechanisms plus the applied live load specified above.
  - .2 Be free of distortion for any loading configuration.
- .10 Locked (immobilized) carriages at the middle or at the ends of movable row modules must have exactly the same design and construction as movable rows, with wheels/carriage assembly locked to rails.
- .11 Joints or connections, spliced or welded, must be free of permanent slippage when exposed to forces encountered during normal operation.
- .12 Straightness of carriages must have a maximum deviation of  $L/1200$  over the length of the carriage.
- .13 Each carriage shall have at least two wheels per rail.
- .6 Carriage bumpers:
  - .1 In an inert material, provided to avoid metal-to-metal contact between rows, dissipate energy and assure reasonably smooth stops.
- .7 Drive/guide system:
  - .1 The system shall be designed to provide a quiet and reliable operation, with a direct drive system which minimizes end play, ensures there is no play in the drive handle, and that carriages will stop without drifting. All system components shall be selected to ensure a smooth, even movement along the entire carriage length, without jerky movements.
  - .2 All wheels shall include a chain sprocket direct drive system connected to a full-length drive shaft on one side of each movable carriage, at each rail location, to ensure that carriages are always perpendicular to rails, preventing whipping, binding and excessive wheel/rail wear under normal operation and also to ensure that carriages move uniformly along the total length of travel, even with unbalanced loads. The chain and sprocket shall be minimum ANSI # 35.
  - .3 Torque-resistant tubular drive shaft: minimum of 33.4 mm outside diameter by maximum 26.5 mm inside diameter. Solid steel rod is not acceptable.
  - .4 Drive system gearing shall be designed to permit 454 g of force applied to the drive handle to move a minimum of 1814.4 kg of load (maximum 45N to operate one carriage).
  - ~~.5 Must be able to push 5 fully loaded carriages with 1 fully loaded carriage.~~

Rev.02

- ~~.6 Must be able to push 2 fully loaded map carriages with 1 fully loaded map carriage.~~
  - .7 A tensioning device shall be provided on each chain drive with provision for adjusting tension without removing end pane.
  - .8 All bearings used in the drive mechanism shall be permanently shielded and lubricated.
  - .9 Allow access to drive system components through readily removable base shelf assemblies and protection case (required) for maintenance purposes.
- .8 Wheels:
- .1 Materials: cold rolled steel (CRS) SAE 1010/1020, precision machined, same material and hardness as track with two permanently shielded and lubricated self-aligning flanged bearings.
  - .2 Drive wheels shall have a minimum 90.5 mm outside diameter. They shall be dual-flanged and sloped to insure efficient guidance. Single center flanged wheels are not acceptable.
  - .3 Due to carriage length and shelving/racking heights, guide wheels shall be at all wheel locations.
- .9 Mechanical column:
- .1 All exposed components of the face column shall be made of steel. Mechanical columns (stanchions) shall be located at all operating ends as shown on drawings.
  - .2 The front drive unit shall be a mechanical column made from 1.9 mm galvanized steel covered by a 1.2 mm Type ST.PL/PP prepainted steel box. The column dimensions shall correspond to the full width of mobile units by the manufacturer's standard height.
  - .3 The mechanical column shall be assembled at the factory including the drive mechanism and the chain for a fast installation.
- .10 Movement controls:
- .1 Operating handles, located on the mechanical columns, shall be three-spoke type (swivel type) transmitting power through a chain drive to the drive wheels. Provide operating handles on drive end of carriages as noted on drawings. Each mechanical device shall come with a chain-tensioner. Handle must be mounted at  $\pm 1\ 003$  mm from the bottom of the carriage.
- .11 Safety features:
- .1 Colour-coded visual indicators shall provide verification that carriages are in a locked or unlocked mode.
  - .2 A safety lock button will permit moving a carriage in either direction to create a new access aisle unlocking the carriage when pulled out or locking when pushed in. This lock shall prevent carriages from being moved while personnel access open aisle.
  - .3 Aisle safety push-button lock (for single access) shall be located at the center of the handle. The user shall press the aisle safety push-button, which will lock the respective carriage. After being pressed, the aisle safety push-button shall protrude from the handle face to display a red band visible to users. After being re-pressed, the aisle safety push-button shall return to its unlocked state. Pull-out pins are unacceptable. Both carriages on either side of the aisle must be secured. In case of rows accessible from both sides, a similar warning device must indicate the presence of someone in the aisle.
  - ~~.4 Toe level safety sweep (for single or dual access) for all mobile units: consisting of hinged aluminum safety bar running full length of the mobile carriages, flush with bottom of carriage frame and on both sides of carriage. Upon activation of the sweep, an internal device shall interlock with drive train resulting in positive stop anywhere in the module. A 0.68 kg (1½ lb) pressure applied on the safety bar will activate the safety. The safety shall automatically reset upon removal of the obstruction or if carriage is backed away from the obstruction. This active safety shall not require any electricity or battery to be activated (mandatory).~~

Rev.02

- Rev.01
- .5 Lever arm for dual access, of 900 mm length, for all mobile units accessible from both sides: once engaged after a 90° rotation, this device will lock the mechanism, preventing movement of the carriage. Carriages on both sides of the aisle must be secured. A full-length shaft will connect devices at both ends of carriage.
  - .6 Lever Arm for single access, of 900 mm length, for all mobile units accessible from one side.
  - ~~.7 Mechanical ratchet backup override to be on each carriage, connected to the full length shaft, in order to move carriage manually too, where indicated.~~
  - .8 Provide a safety feature that will prevent any movement of the carriages on their own (no creep) after the carriage has been moved to the desired location and stopped.
  - .9 Rails shall be flush to finished floor level, and designed to reduce tripping hazard, facilitate the passage of carts, and for ease of cleaning.
  - .10 Install on each face panel of mobile units, with the operating handle, a sign for instructions of the use of the safety devices.
  - .11 Additional safety devices, active or passive, may be proposed by the supplier.
- .12 Upright frame:
- Rev.01
- .1 Made of posts, cross-members, braces and a footplate welded together, as per **drawings**. The dimensions indicated below must be validated or modified according to structural (capacity) requirements and may also vary according to manufacturer's standards.
  - .2 Each post shall be a 51 mm or 76 mm by 51 mm tube made of 1.90 mm or 2.28 mm cold roll steel on all four faces, or according to the manufacturer's standards, corresponding to the loads prescribed. The post shall be slotted at every 25.4 mm on lateral faces. The side perforations are 4.7 mm wide x 16 mm long and shall be designed to accommodate full shelves or any kind of cantilever or four-post accessory.
  - .3 Cross members and braces shall be 25.4 mm or 35 mm by 25.4 mm or 35 mm "U"-shaped channel made of 1.90 mm steel. Cross members shall be the horizontal link between two posts. Braces are placed in diagonal, between two cross members to reinforce the upright frame. Each brace shall be placed in alternating directions.
  - .4 The footplate shall be formed of a 6.4 mm thick steel base plate, 64 mm or 89 mm wide by 114 mm long, factory welded to the post.
  - .5 The upright frames shall act as ventilation flues where indicated on **drawings**.
- .13 Shelving:
- Rev.01
- .1 The full shelf kit shall be made of 1 plain shelf supported by 2 lateral shelf supports. reinforcements can be added under the shelf to reach higher loading requirements. The full shelf height can be adjusted on 25.4 mm increments and does not require any tools.
  - .2 Shelves Types SHELF.1A, -1B, -1C, -1D: shall be 25.4 mm thick and constructed of 1.6 mm Type ST.PL/PP cold formed perforated steel sheet, prepainted (powder coated), with edges having four bends. To be used with shelf supports.
- Rev.03
- .3 Shelves Types SHELF.1E, -1F, -1G: shall be wire mesh in Type ST.PP/BR steel bars with manufacturer's electrostatically applied Type PP.F.5 epoxy-polyester hybrid powder coating finish similar as the rest of the shelving unit, with a diameter of 1.27 mm or more to bear the loading prescribed, with a square grid of 25.4 mm x 25.4 mm formed with two sets of bars, top ones running perpendicular to side of shelving unit to facilitate handling of loaded articles, with edges bent over the shelf supports.
  - .4 Finish: see **above**.
  - .5 Roofs (top shelves) shall not be perforated, unless otherwise indicated.
  - .6 Shelf supports shall be as per manufacturer's standards, designed to safely support the required loads. The shelf clips must secure the shelf in place once installed.
  - .7 Provide braces and all other standard devices to maintain stability of shelving units.

- Rev.01
- .8 Provide anchors according to capacities of elements to fix the units to the floor where required.
  - .9 For weight capacity requirements see design criteria and performance requirements prescribed **above**.
  - .10 For dimensions and shelving configurations: see **drawings**.
- .14 Face panels:
- .1 Materials: Type ST.PL/PP cold formed steel sheet, prepainted (powder coated), perforated where indicated on **drawings**.
  - .2 Finish: see **above**.
  - .3 Face panels shall be located on all operating ends of ranges (with the operating handles) and as end panels on the opposite extremities as shown on **drawings**.
  - .4 Face panels must cover partially or entirely the full height and the width of shelving, as shown on **drawings**.
  - .5 Face panels: of 1.2 mm thick steel using a 2-bend structural design that forms a 19 mm thick edge channel that runs the full length of each vertical edge; a minimum of three 1.2 mm structural hat channel supports shall be welded into the back of the panel at the top, base and centre to provide unit rigidity; free of any exposed assembly holes or protruding hardware, and assembled without any exposed sharp edges.
  - .6 Two 78 mm x 127 mm card holders shall be provided per aisle entry location and attached to the end panels with centres located 1 524 mm above the finished floor.
- .15 Hooks:
- .1 Hooks shall be "S"-shaped, in stainless steel, with a special security device at top and bottom of the hook to hold hangings in place in case of earthquakes, with 5 mm diameter; supply 50 hooks 180 mm high and 50 hooks 130 mm high.
  - ~~.1 MuSE NT RH 180S and MuSE NT RH 130KS by Takiya.~~

Rev.01

## 2.4 Type SHELF.3 – Shelving for Documentation Centre

- .1 General:
- .1 The system shall be of the mechanical assisted manual type.
  - .2 The system consists of manufactured high-density mobile storage units mounted on manufacturer's track-guided carriages to form a compact storage system. System design permits access to any single aisle by manually moving units until the desired aisle is opened. The carriage/rail system provides uniform carriage movement along the total length of travel, even with unbalanced loads.
  - .3 The carriage system to consist of a formed structural steel frame with hardened steel wheels riding on steel rails recessed into the floor.
  - .4 Face and back panels, as well as carriage faces shall provide a smooth, clean appearance without any assembly holes or protruding hardware (except for the movement control system) and assembled without cutting edges.
  - .5 Low-height, without flues, solid top, full-height lateral panel.
- .2 Rails:
- .1 Rails shall be machined to ensure smooth operation and self-centering of mobile storage units during travel without end play or binding, designed to disperse concentrated wheel point load.
  - .2 Rails shall be designed and manufactured with a form and dimensions to carry loads applied on each carriage. They shall be made of cold rolled steel (CRS), mill finish. The steel rail shall be replaceable.

- .3 Rails shall be recessed and designed to be anchored in a structural concrete floor, with provision for leveling of rails to compensate for variations in floor surface level. Rails shall provide smooth transition for material handling equipment. See depth of concrete topping on **drawings**.
  - .4 Main rail section shall be a maximum of 1.22 m each with shorter sections of 305 mm minimum used to complete each individual rail assembly.
  - .5 Rail joints shall be designed to provide as minimal of a gap as possible and prevent twisting or slippage.
  - .6 Rail connections shall have interlock steel rail connectors. All track connections shall be designed to provide horizontal and vertical continuity between rail sections, to gradually transfer the concentrated wheel point load to and from adjoining sections. To insure vertical and horizontal stability, tongue-and-groove joints connections are not permitted.
  - .7 Built-in anti-tip device shall be provided to meet local building code and high height-to-width ratio.
  - .8 Anchor bolts: Type SST.1 stainless steel, Type MF.SS (mill finish), when anchoring into concrete.
- .3 Floor / Ramp:
- .1 No floor ramp shall be required – install mobile shelving units in depressions provided in floor slab.
  - .2 Install rails at exact height such that floor level between units is level with surrounding floor.
- .4 Carriages:
- .1 Design of the carriage is such that the weight-bearing of the upright rests directly over the wheel channels, thus transmitting the load directly to the rail.
  - .2 All carriages shall be riveted-bonding construction for flexibility and potential reconfiguration. Welded carriages or carriages with formed lips are unacceptable.
  - .3 Carriages and stationary platforms shall be constructed of a full "C" shape profiles 38 mm deep x 127 mm high, minimum 2.66 mm steel, with 1 488 kg/m maximum capacity.
  - .4 Wheel support sections shall be minimum 2.66 mm steel and shall be riveted between the main support face sections, one per aisle assembly. Support sections shall be embossed to eliminate the need of filler plates between the shelving/cabinet and the "C" shape supports.
  - .5 Necessary carriage splices shall be bolted type designed to maintain proper unit alignment and weight load distribution.
  - .6 Carriage straightness shall have no more than 6.35 mm maximum deviation from a true straight line. There shall be no permanent set or slippage in any spliced or welded joint when exposed to forces encountered in normal operating circumstances.
  - .7 Carriage construction shall be designed to allow the shelving uprights to be secured to the carriage frame with vibration-proof graded bolts, nut, and clamp anchor assemblies and so that there is no visible hardware on carriage face. Recess design carriages are not permitted. Self-drilling screw attachment is not acceptable method of attachment shelving units to the carriage. No shelving or cabinet attachment hardware shall be visible on exterior face of carriages.
  - .8 Carriages must:
    - .1 Support as a minimum the load capacities indicated herein or on **drawings**.
    - .2 Not have deflection exceeding  $L/320$  between the wheels with their own weight plus weight of drive mechanisms plus the applied live load specified above.
    - .3 Be free of distortion for any loading configuration.
  - .9 Locked (immobilized) carriages at the middle or at the ends of movable row modules must have exactly the same design and construction as movable rows, with wheels/carriage assembly locked to rails.

- .10 Joints or connections, spliced or welded, must be free of permanent slippage when exposed to forces encountered during normal operation.
- .11 Straightness of carriages must have a maximum deviation of L/1200 over the length of the carriage.
- .12 Each carriage shall have at least two wheels per rail.

.5 Carriage bumpers:

- .1 In an inert material, provided to avoid metal-to-metal contact between rows, dissipate energy and assure reasonably smooth stops.

.6 Drive/guide system:

- .1 The direct drive system shall be designed to provide a quiet and reliable operation, which minimizes end play, ensures there is no play in the drive handle, and that carriages will stop without drifting. All system components shall be selected to ensure a smooth, even movement along the entire carriage length, without jerky movements.
- .2 All wheels shall include a chain sprocket direct drive system connected to a full-length drive shaft on one side of each movable carriage, at each rail location, to ensure that carriages are always perpendicular to rails, preventing whipping, binding and excessive wheel/rail wear under normal operation and also to ensure that carriages move uniformly along the total length of travel, even with unbalanced loads., with drive wheels at every rail location on one side of the carriage. The chain and sprocket shall be minimum ANSI # 35.
- .3 All bearings used in the drive mechanism shall be permanently shielded and lubricated.
- .4 Carriage deviation (racking): maximum L/600 from a true line perpendicular to rails (where "L" is the length of the carriage).
- .5 Torque-resistant tubular drive shaft: minimum of 33 mm outside diameter by maximum 29 mm inside diameter. Solid steel rod is not acceptable.
- .6 Drive system gearing shall be designed to permit 454 g of force applied to the drive handle to move a minimum of 1 814.4 kg of load (maximum 45N to operate one carriage).
- ~~.7 Must be able to push 5 fully loaded carriages with 1 fully loaded carriage.~~
- ~~.8 Must be able to push 2 fully loaded map carriages with 1 fully loaded map carriage.~~
- .9 A tensioning device shall be provided on each chain drive with provision for adjusting tension without removing end pane.
- .10 Allow access to drive system components through readily removable base shelf assemblies and protection case (required) for maintenance purposes.
- .11 Shaft connections: secured couplings ("key" type).
- .12 Dual-flange wheels: provide positive guidance and tracking. Guidance requiring cam followers and ball bearings running on either side of the rail is unacceptable.
- .13 Narrow guidance channels: provide a maximum 9.5 mm between sub-rail and rail sections to reduce tripping hazards, allow carts to easily roll over, prevent debris accumulation, and facilitate cleaning.

.7 Wheels:

- .1 Materials: minimum type 1045 cold rolled steel (CRS) SAE 1010/1020, precision machined, same material and hardness as track with two permanently shielded and lubricated self-aligning flanged bearings.
- .2 Minimum load capacity per wheel: 1452 kg.
- .3 Drive wheels shall have a minimum 127 mm outside diameter. They shall be dual-flanged and sloped to insure efficient guidance. Single center flanged wheels are not acceptable.
- .4 Due to carriage length and shelving/racking heights, guide wheels shall be at all wheel locations.

Rév.02

Rév.02

.8 Mechanical columns:

- .1 All exposed components of the face column shall be made of steel. Mechanical columns (stanchions) shall be located at all operating ends as shown on drawings.
- .2 The front drive unit shall be a mechanical column made from 1.9 mm galvanized steel covered by a 1.2 mm Type ST.PL/PP prepainted steel box. The column dimensions shall correspond to the full width of mobile units by the manufacturer's standard height.
- .3 The mechanical column shall be assembled at the factory including the drive mechanism and the chain for a fast installation.

.9 Movement controls:

- .1 Operating handles, located on the mechanical columns, shall be three-spoke type (swivel type) transmitting power through a chain drive to the drive wheels. Provide operating handles on drive end of carriages as noted on drawings. Each mechanical device shall come with a chain-tensioner. Handle must be mounted at  $\pm 1\ 003$  mm from the bottom of the carriage.

.10 Safety features:

- .1 Colour-coded visual indicators shall provide verification that carriages are in a locked or unlocked mode.
- .2 A safety lock button, will permit moving a carriage in either direction to create a new access aisle unlocking the carriage when pulled out or locking when pushed in. This lock shall prevent carriages from being moved while personnel access open aisle.
- .3 Aisle safety push-button lock (for single access) shall be located at the center of the handle. The user shall press the aisle safety push-button, which will lock the respective carriage. After being pressed, the aisle safety push-button shall protrude from the handle face to display a red band visible to users. After being re-pressed, the aisle safety push-button shall return to its unlocked state. Pull-out pins are unacceptable. Both carriages on either side of the aisle must be secured. In case of rows accessible from both sides, a similar warning device must indicate the presence of someone in the aisle.
- ~~.4 Toe level safety sweep (for single or dual access) for all mobile units: consisting of hinged aluminum safety bar running full length of the mobile carriages, flush with bottom of carriage frame and on both sides of carriage. Upon activation of the sweep, an internal device shall interlock with drive train resulting in positive stop anywhere in the module. A 0.68 kg (1½ lb) pressure applied on the safety bar will activate the safety. The safety shall automatically reset upon removal of the obstruction or if carriage is backed away from the obstruction. This active safety shall not require any electricity or battery to be activated (mandatory).~~
- .5 Lever arm for dual access, of 900 mm length, for all mobile units accessible from both sides: once engaged after a 90° rotation, this device will lock the mechanism, preventing movement of the carriage. Carriages on both sides of the aisle must be secured. A full-length shaft will connect devices at both ends of carriage.
- .6 Lever Arm for single access, of 900 mm length, for all mobile units accessible from one side.
- .7 Mechanical ratchet backup override to be on each carriage, connected to the full-length shaft, in order to move carriage manually too, where indicated.
- .8 Provide a safety feature that will prevent any movement of the carriages on their own (no creep) after the carriage has been moved to the desired location and stopped.
- .9 Rails shall be flush to finished floor level, and designed to reduce tripping hazard, facilitate the passage of carts, and for ease of cleaning.
- .10 Additional safety devices, active or passive, may be considered as proposed by the supplier.

.11 Upright frame:

- Rev.01
- .1 Made of posts, cross-members, braces and a footplate welded together, as per **drawings**. The dimensions indicated below must be validated or modified according to structural (capacity) requirements and may also vary according to manufacturer's standards.
  - .2 Each post shall be a 51 mm or 76 mm by 51 mm tube made of 1.90 mm or 2.28 mm cold roll steel on all four faces, or according to the manufacturer's standards, adequate for the loads prescribed. The post shall be slotted at every 25.4 mm on lateral faces. The side perforations are 4.7 mm wide x 16 mm long and shall be designed to accommodate full shelves or any kind of cantilever or four-post accessory.
  - .3 Cross members and braces shall be 25.4 mm or 35 mm by 25.4 mm (1") or 35 mm "U"-shaped channel made of 1.90 mm steel. Cross members shall be the horizontal link between two posts. Braces are placed in diagonal, between two cross members to reinforce the upright frame. Each brace shall be placed in alternating directions.
  - .4 The footplate shall be formed of a 6.4 mm thick steel base plate, 64 mm or 89 mm wide by 114 mm long, factory welded to the post.
- .12 Shelving:
- .1 The full shelf kit shall be made of 1 plain shelf supported by 2 lateral shelf supports. Reinforcements can be added under the shelf to reach higher loading requirements. The full shelf height can be adjusted on 25.4 mm increments and does not require any tools.
  - .2 Shelves shall be 25.4 mm thick and constructed of 1.6 mm Type ST.PL/PP cold formed unperforated steel sheet, prepainted (powder coated), as per required capacities, with edges having four bends. To be used with shelf supports.
  - .3 Finish: see **above**.
  - .4 Canopies (top shelves) shall not be perforated, unless otherwise indicated.
  - .5 Shelf supports shall be as per manufacturer's standards, designed to safely support the required loads. The shelf clips must secure the shelf in place once installed.
  - .6 Provide braces and all other standard devices to maintain stability of shelving units.
  - .7 Provide anchors according to capacities of elements fix the units to the floor where required.
  - Rev.01 .8 Provide **4** adjustable file dividers per shelf, 203 mm x 280 mm, 0.953 mm thick, punched to include two tabs on the base and one on the rear.
  - Rev.01 .9 For weight capacity requirements see design criteria and performance requirements prescribed **above**.
  - .10 For dimensions and shelving configurations: see **drawings**.
- .13 Face panels:
- .1 Materials: Type ST.PL/PP cold formed steel sheet, prepainted (powder coated), unperforated.
  - .2 Finish: see **above**.
  - .3 Face panels shall be located on all operating ends of ranges (with the operating handles) and as end panels on the opposite extremities as shown on **drawings**.
  - .4 Face panels must cover entirely the full height and the width of shelving.
  - .5 Face panels: of 1.2 mm thick steel using a 2-bend structural design that forms a 19 mm thick edge channel that runs the full length of each vertical edge; a minimum of three 1.2 mm structural hat channel supports shall be welded into the back of the panel at the top, base and centre to provide unit rigidity; free of any exposed assembly holes or protruding hardware, and assembled without any exposed sharp edges.
  - .6 Two 78 mm x 127 mm card holders shall be provided per aisle entry location and attached to the end panels with centres located 1 524 mm above the finished floor.
- Rev.01 .14 ~~Provide overhead automatic lighting at each aisle, activated by human presence detector.~~



**2.5 Type SHELF.4 – Shelving for Cooler Storage**

- .1 Similar to SHELF.3, with modifications as indicated **below** and on **drawings**.
- Rev.01 .2 In stainless steel frame, open shelving, mechanism.
- Rev.01 .3 Wire mesh shelves in Type SST.1/BR stainless steel bars, grade 304, with Type SS.F.1 satin finish or Type SS.F.2 polished, with a diameter of 1.27 mm or more to bear the loading prescribed, with a square grid of 25.4 mm x 25.4 mm formed with two sets of bars, top ones running perpendicular to side of shelving unit to facilitate extraction of loaded articles, with edges bent over the shelf supports.
- .4 Low-height, without flues, with top shelf.

**2.6 Type SHELF.5 – High Density Shelving**

- .1 Modular fixed storage for special collection, similar to SHELF.1A, with modifications as indicated **below** and on **drawings**.
- .2 With flues.
- Rev.01 .3 With drawer insertion modules Type DR.03 – See **drawings (8/A-786)**.

**2.7 Type SHELF.7 – Pocket Slide Art Rack**

- .1 General:
  - .1 Pull-out art storage screens, ceiling suspended and floor guided.
  - .2 The trolley assembly that supports the weight of the system shall be located at the top of the screen.
  - .3 This system shall provide a soft displacement without noise or oscillation. Art screens are assembled on site without welding.
- .2 Screens:
  - .1 Mesh assembly: shall be made of 4 pieces metal frame welded to 2 metal grids, which make a double-sided assembly; the pieces of the metal frame are "U"-shaped 32 mm x 30 mm and made of 1.6 mm steel; depending on the size of the mesh assembly one or several 13 mm x 30 mm "U"-shaped reinforcements are added to the main frame. These dimensions and thicknesses may vary as per manufacturer's standards. The grid is made of 1.8 mm thick (or thicker as per manufacturer's standards) Type ST.PL/PP steel sheet with rectangular 51 mm x 25.4 mm openings; the load capacity shall be 36.6 kg/m<sup>2</sup> on each side.
  - .2 Connector and perimeter channels: screen assemblies shall be linked together by means of 1.6 mm connector and perimeter channels; an "H"-shaped 70 mm x 40 mm joint makes the link between two mesh screens; at the top, front and rear extremities 35 mm x 40 mm "U"-shaped steel parts provide a smooth finish. At the top, a 2.66 mm steel "C" shaped channel, 75 mm wide by 28.6 mm high, is fastened to the upper channel of the mesh assembly. At least a pair of trolley supports is welded to it. A trolley support shall be made of 4.7 mm thick steel and shall be 305 mm long by 38 mm high with three holes of 14 mm diameter.
  - .3 Bumpers: in an inert material fixed at both front and rear end of mesh screens to act as shock absorbers.
  - .4 Hooks not in contract.

- .3 Rails:
  - .1 Ceiling suspension channels: the suspension channels shall be 1.9 mm steel, "U"- shaped and be 51 mm high by 76 mm wide. They shall be installed perpendicular to the mesh screens with the opening upward. The channels shall be fastened to ceiling and to beam joint support by means of 12.7 mm diameter adjustable threaded rods and, when possible, secured to the wall with a 3 mm steel angle. Beam joint supports: they shall be designed to carry up to 544 kg. They shall be 100 mm high by 55 mm wide by 41 mm long with one 11 mm hole or 89 mm long with three 11 mm holes and made of 6.4 mm thick stainless steel. Rail: top suspended rails shall be 2.66 mm steel "U"-shaped channels 41 mm or 62 mm high wall by 41 mm wide with 9.5 mm flanges bent toward the interior. Rails shall be supported by beam joint supports and held in place with one to three 9.5 mm diameter bolts, depending on the system configuration. Rails shall be installed parallel to the screens. Carriages:
    - .1 The trolley assembly is composed of 4 wheels and a 6.4 mm stainless steel plate of 86 mm by 79 mm. The plate shall have three 14 mm diameter holes to link with trolley supports on screens. One to three 12.7 mm diameter bolts shall be used, depending on the system configuration. The trolley shall have a load capacity of not less than 272 kg and their quantity depends on the screen dimension and the loading capacity required.
- .5 Drive-guide system:
  - .1 A bottom guiding pin shall prevent sideways movements of the screen. The pin is a 38 mm high by 32 mm diameter nylon block which slides into the bottom "H" shaped perimeter channel of the mesh screen. The nylon block is mounted on a 102 mm x 203 mm, 4.7 mm thick steel plate which is fixed to the floor.
- .6 Wheels:
  - .1 Each trolley shall have four ball bearing loaded wheels. Wheel shall have 29 mm diameter.
- .7 Movement controls:
  - .1 Movement is achieved manually, with minimal effort, by means of pulling/pushing a handle mounted on the end panel of each mobile range or directly on the upright.
  - .2 Each moveable screen shall be equipped with a handle installed on operator's side of screen.

Rev.03    **2.8 Components and Hardware for Racking (Type SHELF.8 and Type SHELF.9)**

- .1 Supply and install the type of hardware shown on **drawings**. All hardware specified or not shall be commercial type and heavy-duty construction.
- .2 Uprights (Type SHELF.8):
  - .1 Cold rolled steel open or closed "U" shapes with slots to accommodate different configurations.
  - .2 Size and thickness of upright determined by manufacturer to support specified loads.
  - .3 Provide extra reinforcement within the rolled shape to allow for additional impact damage protection. Additional reinforcement may be an "I" shape or a box shape tube added inside the "U" shape. Manufacturer shall provide test data to demonstrate the added benefit of the impact protection reinforcement.
- .3 Uprights (Type SHELF.9):
  - .1 Hot rolled structural steel "I" section, with slots to accommodate different configurations.
  - .2 Size and thickness of upright determined by manufacturer to support specified loads.
- .4 Beams (Type SHELF.8):
  - .1 Cold or hot rolled formed steel. Shape according to manufacturer.

- .2 Size and thickness of beams determined by manufacturer to support specified loads.
- .3 Bolted beam to columns connections, designed to resist an uplift force of 4.5 kN.

.5 Beams (Type SHELF.9):

- .1 Cold or hot rolled formed steel. Shape according to manufacturer.
- .2 Size and thickness of beams determined by manufacturer to support specified loads.
- .3 Bolted beam to columns connections, designed to resist an uplift force of 4.5 kN.
- .4 Provide a vertical stopper at cantilever end.

Rev.03

- .6 Shelves (Type SHELF.8): shall be wire mesh in Type ST.PP/BR steel bars with manufacturer's electrostatically applied Type PP.F.5 epoxy-polyester hybrid powder coating finish similar as the rest of the shelving unit, with a diameter of 4.88 mm (6 ga) or more to bear the loading prescribed, with a rectangular grid of 63.5 mm x 104 mm formed with two sets of bars, top ones running perpendicular to side of shelving unit to facilitate handling of loaded articles, with edges bent over the shelf support; with 3 support channels 2.28 mm (13 ga) thick or more.
- .7 Pallet stops: provide wherever pallets are to be stored. See **drawings** for locations.
- .8 Column guards: provide a column guard on each column base exposed to forklift circulation.
- .9 Row-to-wall spacer: provide a row-to-wall spacer at each upright situated near a wall.
- .10 Crossbars: provide the necessary crossbars to the loads and decking option identified on the **drawings**.
- .11 Braces: provide sway braces where necessary.
- .12 Bases: upright base plates bolted to the structural slab with 114.3 mm wedge anchor bolts with expandable shells, inserted into predrilled holes.

## 2.9 Type SHELF.8 – Pallet Rack

.1 Variants:

- .1 Type SHELF.8 (Pallet Rack).
- .2 Type SHELF.8A (Pallet Rack).
- .3 Type SHELF.8B (Pallet Rack).
- .4 Type SHELF.8C (Pallet Rack).
- .5 Type SHELF.8D (Pallet Rack).

.2 Dimensions: refer to **drawings**.

Rev.03

- .3 Shelving capacity: each shelf shall have a capacity of 1135 kg, unless otherwise indicated.
- .4 Provide accessories listed in **Components and Hardware for Racking** above, where required.
- .5 Provide also vertical blocker at the end of the beams.
- .6 Provide slotted uprights to allow for adjustments on a minimum of 100 mm centers. Provide also bolt holes in the uprights.

Rev.01

- .7 Prepainted same colour as Type SHELF.1.

**Rev.01 2.10 Type SHELF.9 – Structural Cantilever Rack**

- .1 Dimensions: refer to **drawings**.
- .2 Provide shelving options as identified on drawings: for pallets, with steel deck or with wire mesh.
- .3 Capacity of 1800 kg per arm.
- .4 Provide accessories listed in **Components and Hardware for Racking** above, where required.
- .5 Provide slotted uprights to allow for adjustments on a minimum of 100 mm centers.
- .6 Prepainted same colour as Type SHELF.1.

**Rev.01 2.11 Type SHELF.11 – Weapon Storage Shelving**

- .1 Similar as SHELF.3, with modifications as follows:
  - .1 Mobile, with top, no flues, with drawer inserts, as indicated **below** and on **drawings**.
  - .2 Drawers shall have three heights, as indicated.
  - .3 Drawers shall have removable bottoms.
  - .4 Each drawer shall have a capacity of 227 kg.

Rev.01

**2.12 Type SHELF.12 – Packaging Storage Shelving**

- .1 General:
  - .1 The system shall be of the fixed heavy-duty wide-span shelving type.
  - .2 Supply insertion modules of drawers or casework as shown on **drawings** and specified below in the article **Accessories**.
- .2 Upright frame:
  - .1 Made of posts, cross-members, braces and a footplate welded together, as per **drawings**. The dimensions indicated below must be validated or modified according to structural (capacity) requirements and may also vary according to manufacturer's standards.
  - .2 Each post shall be a 51 mm or 76 mm by 51 mm tube made of 1.90 mm or 2.28 mm cold roll steel on all four faces, or according to the manufacturer's standards, adequate for the loads prescribed. The post shall be slotted at every 25.4 mm on lateral faces. The side perforations are 4.7 mm wide x 16 mm long and shall be designed to accommodate full shelves or any kind of cantilever or four-post accessory.
  - .3 Cross members and braces shall be 25.4 mm or 35 mm by 25.4 mm or 35 mm "U"-shaped channel made of 1.90 mm steel. Cross members shall be the horizontal link between two posts. Braces are placed in diagonal, between two cross members to reinforce the upright frame. Each brace shall be placed in alternating directions.
  - .4 The footplate shall be formed of a 6.4 mm thick steel base plate, 64 mm or 89 mm wide by 114 mm long, factory welded to the post.
  - .5 The upright frames shall act as ventilation flues where indicated on **drawings**.
- .3 Shelving:
  - .1 The full shelf kit shall be made of 1 plain shelf supported by 2 lateral shelf supports. reinforcements can be added under the shelf to reach higher loading requirements. The full shelf height can be adjusted on 25.4 mm increments and does not require any tools.

- .2 Shelves shall be 25.4 mm thick and constructed of 1.6 mm Type ST.PL/PP cold formed steel sheet, prepainted (powder coated), with edges having four bends. To be used with shelf supports.
- .3 Finish: see **above**.
- .4 Shelf supports shall be as per manufacturer's standards, designed to safely support the required loads. The shelf clips must secure the shelf in place once installed.
- .5 Provide braces and all other standard devices to maintain stability of shelving units.
- .6 Provide anchors according to capacities of elements to fix the units to the floor where required.
- .7 For weight capacity requirements see design criteria and performance requirements prescribed **above**.
- .8 For dimensions and shelving configurations see **drawings**.

### 2.13 Fabrication

- .1 All materials shall be new.
- .2 All structural elements must be factory manufactured.
- .3 Metal thicknesses, specified as minimums, shall be validated or increased by the manufacturer according the load requirements indicated herein or on the **drawings**.
- .4 Verify mobile carriages and shelving unit location by field measurements before fabrication and indicate measurements on shop drawings.
- .5 Fit and shop-assemble equipment prior to shipping.
- .6 Fabricate work square, true, straight, to suit installation conditions and as indicated.
- .7 Any member in which fabrication tolerances have not been respected or has poorly executed welds may be rejected by the Department Representative.

### 2.14 Shop Finishing

- .1 After fabrication, clean and paint all components according to AAMA 2603, using an electrostatic hot airless process with powder coating.

### 2.15 Accessories

- .1 Type MORT.5D - Hydraulic cement grout: as supplied and installed by the shelving manufacturer, non-shrink, non-staining cement compound, with compressive strength of 31 MPa after 1 hour and 55 MPa after 7 days, when tested as per ASTM standards on a Balding-Southward machine of 27 216 kg capacity.
- .2 Types DR-01a and DR-01b drawer module inserts and Type DR-02 quarter unit inserts:
  - .1 Complete and integral self-supporting cabinets, of rigid construction in Type ST.PL/PP prepainted steel, completely welded, with drawers, doors and trays as indicated on **drawings**, finished top, sides and back panels, reinforced toe space.
  - .2 Metal thicknesses of 1.2 mm for cabinet sides, bottoms, tops, frame elements and 0.91 mm for drawer bodies and cabinet backs.

- .3 Drawers, reinforced and removable, with rigid one piece 19 mm thick front panel, operating on 25 mm diameter nylon wheels with steel ball bearings. One (1) such wheel shall be on each drawer slide and one (1) on each drawer suspension track.
- .4 Drawer tracks to eliminate metal to metal contact and minimize surface to surface contact and side to side play. Drawer slides with built-in stops to prevent inadvertent removal of the drawers, but they shall be removable by an upward and forward motion.
- .5 The closing action of the drawers cushioned by two (2) rubber bumpers, screwed in place.
- .6 Two recessed or surface mounted pulls per drawer.
- .7 Divider holders on four sides, spot welded to drawer body and divider panels, 3 or more per drawer, as indicated, with plastic top and bottom edges.
- Rev.01 .8 Doors: plain or glazed with Type GL.2-6 glazing, as indicated, of double-wall telescoping construction, with front panel and inner liner formed on four sides, completely filled with an acoustical insulation; the outside panel shall lip over the inside panel on the pull side of door and both shall be secured together to form a rigid one piece 19 mm (¾") thick door; door closing to be against grommetted rubber bumpers to prevent rattling; doors shall have two or more hinges, as necessary, and hinge position shall be reinforced with heavy duty concealed tapping plates to ensure a perfect adjustment and avoid any sagging; all corners of outer door panels to be welded and ground smooth; recessed or surface mounted pulls.
- Rev.01 .9 Trays shall be in seamless Type SST.1 stainless steel sheets, grade 304, with finishes Types SS.F.1 or SS.F.2, 1.27 mm thick or thicker as required for the loads to carry, 700 mm x 400 mm, by 25 mm depth, with molded lip.

### 3.0 EXECUTION

#### 3.1 General

- .1 Installation to be performed as per manufacturer's instructions and as indicated on **drawings**.
- .2 Conduct pre-installation conference at project site. Review methods and procedures related to installation of shelving units, the existing conditions and any other consideration to avoid delays or inconveniences.

#### 3.2 Examination

- .1 Examine existing conditions for compliance with requirements for capacity, installation tolerances and other conditions affecting performance of shelving. Notify the Departmental Representative of any adverse or unfavorable condition.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.
- .3 Do not install movable and fixed storage units in place until after concrete topping is in place and fully cured, all wet work in space, including application of paints or special coatings to walls, ceilings and floors, is completed and dry, and overhead mechanical and electrical work is completed so that the risks that the system may subsequently be dirtied or damaged.
- .4 To begin work implies acceptance of job conditions.

#### 3.3 Coordination

- .1 Coordinate installation of the rail system with **Section 03 53 00** and **Structure**.

- .2 Coordinate installation and anchoring to floor with **Structure**, use X-ray to avoid damaging rebars.
- .3 Coordinate also with **Sections 09 61 00, 09 65 00 and 09 67 00**.

### 3.4 Installation of Rails

- .1 Rails are to be verified for integrity of position and levelness, as well as anchored into structural concrete slab, using anchors in sizes and quantities as determined by the manufacturer.
- .2 Embed rail in a grout bed and fill voids around rail with grout Type MORT.5B.
- .3 Install rails into structural concrete slab at intervals that meet the seismic requirement but do not exceed 1200 mm. Use fasteners compatible with structural requirements of carriage loads and configuration of rail design.
- .4 Install rail with the top of rail flush with finished floor datum established in contract documents and as executed, with the rail anchored to the concrete slab located 55 mm below the finished floor surface. See **details**.
- .5 Lay, position and stagger rails properly to ensure a smooth weight transfer from one track to the other.
- .6 Ensure rails are exactly parallel and level.
- .7 Use shorter rail lengths at end of rail-runs.
- .8 Include setting of anchors, placing, adjusting and grouting rails in place (if grout required) and levelling. Use Type MORT.5D grout; allow at least 6 mm for grout under high point; grout to be worked under rail, any voids completely filled and trimmed upsides and flush with rails, to allow proper weight distribution from rail to concrete slab.
- .9 Provide protection for rails during pouring of remainder of topping to fill space left between rails and the pre-poured general topping, using polyethylene or other suitable material. Protect the rails also when floor finishes are installed.

### 3.5 Installation of Shelving

- .1 Install carriages and test for smooth carriage rolling operation.
- .2 Ensure 150 mm gap is provided between rows for bumpers.
- .3 Adjust and align as necessary prior to placement of drive units and shelving units.
- .4 Install and test drive mechanism prior to shelving unit installation.
- .5 Install components in place, plumb, straight and level.
- .6 Make bolted assembly joints between carriages in such a manner as to maintain a good alignment between the units and ensure a uniform distribution of weight.
- .7 Anchor fixed carriages to rails.

- .8 Brace, secure and anchor fixed shelving units to adjacent walls, floor, structure or concrete pads, etc., as required. Use vibration proof fasteners.
- .9 Install shelving at uniform, equal height spacing, unless instructed otherwise.
- .10 Install various types of shelving and other elements as per reviewed shop drawings.

### **3.6 Erection of Racking (Type SHELF.8 and Type SHELF.9)**

- .1 The proposed technique and equipment used to erect the frame are subject to the Department Representative's review. However, such review does not relieve the Contractor of his sole responsibility for selection of technique and equipment mobilization to perform the work quickly and safely.
- .2 Frame shall be erected in strict compliance with the requirements of article 29 of CSA-S16 standard.
- .3 Notify the Department Representative as soon as possible of any defects in the assembly of factory fabricated structural members and comply with Department Representative's decision with regard to corrections to be made.
- .4 It is strictly forbidden to make assembly welds on site unless indicated on shop drawings or previously agreed bthe Department Representative.
- .5 It is strictly forbidden to cut, pierce or modify structural members in any manner on site by flame cutting unless the Department Representative's prior written permission has been obtained.
- .6 After erection is complete, apply a coat of paint to field welds and bolted joints, and touch up surfaces that were burned or scratched during work.

### **3.7 Field Quality Control**

- .1 Verification of proper installation and operation of mobile storage units shall be by the manufacturer's representative, and in the presence of the Departmental Representative.
- .2 The work of this Section shall include for full-time on-site technical assistance for installation of mobile storage units in order to assure that the related concrete topping work is compatible with an optimal operation of the mobile shelving system.
- .3 Verify rails for integrity of position and levelness, as well as anchoring into structural concrete slab, using anchors in sizes and quantities as determined by the manufacturer.
- .4 Verify shelving unit alignment and plumb after installation. Correct if required following manufacturer's instructions.
- .5 Provide manufacturer's field services for racking consisting of product use recommendations and at least one site visit for inspection of product installation in accordance with manufacturer's instructions.
- .6 A site visit report must be submitted to the Departmental Representative to confirm installation.



- .7 Remove components which are chipped, scratched, or otherwise damaged and which do not match adjoining work. Replace with new matching units, installed as specified and in manner to eliminate evidence of replacement
- .8 Make good painted surfaces damaged during shipment or installation.

### **3.8 Adjusting**

- .1 Adjust components and accessories to provide smoothly operating, visually acceptable installation.

### **3.9 Cleaning**

- .1 Immediately upon completion of installation, clean components and surfaces.
- .2 Remove surplus materials, rubbish and debris resulting from installation upon completion of work and leave areas of installation in neat, clean, dust-free condition, as per **Section 01 74 11**.

### **3.10 Demonstration / Training**

- .1 Schedule and conduct demonstration of installed equipment and features with the personnel of the building.
- .2 The manufacturer's representative must demonstrate the functioning of the mobile shelving systems in the presence of the Departmental Representative, to his satisfaction. If need be, proceed with the required adjustments and modifications.
- .3 Schedule and conduct maintenance training with Departmental Representative's maintenance personnel. Training session should include lecture and demonstration of all maintenance and repair procedures that end user personnel would normally perform.
- .4 See also **Section 01 79 00**.

### **3.11 Protection**

- .1 Protect system against all damage during and after installation until time of substantial completion.

**End of Section**