**PART 1 – GENERAL**

**1.00 SUMMARY**

 A. Section Includes:

 1. Carrier Body

 2. Ceiling Umbilical Assembly

 3. Intersection and End Assemblies

 4. Utility Outlet Assemblies

 B. Related sections:

 1. Section 11610 - Laboratory Fume Hoods are a part of the work of this section.

 2. Section ‑ : Furnishing and installation of plumbing utilities and final connections.

 3. Section ‑ : Furnishing and installation of exhaust ductwork and equipment, and final connection to fume hood(s).

 4. Section ‑ : Furnishing and installation of electrical utilities and final connections.

**1.01 ALTERNATE PROPOSALS**

 Proposals are invited from alternate manufacturers only if they comply with the minimum design requirements and the minimum performance requirements. A notarized letter stating full compliance must be included in alternate proposals signed by an officer of the manufacturer to ensure compliance.

**1.02 SYSTEM DESIGN REQUIREMENTS**

 A. Horizontal service chase ties into the ceiling deck and is suspended below the ceiling deck or ceiling suspended t-grid system.

1. Heavy-Duty Umbilical Uprights: Support structures for umbilical service chase and structural member between carrier bodies the ceiling plenum.

1. Umbilical chase shall incorporate support members that utilize standard pipe and conduit supports. Umbilicals uprights shall ship separately from the carrier body and mechanically fastened at the jobsite.

2. Height: [36”] [48”] [60”] [72”] [84”]
Vertical Inside Clearance: [3.375” X 4.375”] [6.375” X 7.375”] [7.875” X 8.875”]

3. Umbilical side and end panels shall be fastened by a keyhole slot with mechanical fasteners. Umbilical panels can be easily removed without tools.

1. Carrier body shall serve as a service chase for all cabling, plumbing, electrical conduit, light fixtures and localized exhaust ductwork.

 1. Modular units shall be suitable for floor-mounted cabinets, freestanding tables and mobile equipment racks.

 2. Modular carrier bodies can be ganged side-to-side in a continuous run. Carrier bodies shall be supplied with a splice joint assembly.

 3. Carrier body shall incorporate an integral 14 gauge internal support member that electrical/data junction boxes and service outlets shall be mounted internally.

1. Equipped with easy to remove entry covers for ease of utility access, visual inspection and utility shut-offs.
2. Carrier underside shall be configurable to accommodate electrical outlets, service fixtures, data/voice outlets, localized exhaust units and task lighting.
3. Carrier bodies shall incorporate T5HQ down task lighting within the 21” wide carrier body and T5HQ down and up task lighting within the 24” wide carrier body.

D. The Overhead Carrier system shall incorporate an integral intersection assembly.

1. Intersection assembly shall be vacuum formed from chemically resistant acrylic/PVC thermoplastic sheets. Assembly will be molded to follow the radiused profile of the carrier body.

2. Intersection assembly shall act as a structural support and a utility chase connecting adjacent carrier bodies.

3. Equipped with easy to remove entry covers for ease of utility access, visual inspection and utility shut-offs.

4. Universal intersection assembly shall accommodate 2 way, 3 way and 4 way connections with same module.

1. System requirements:

 1. Independently supported overhead storage components.

1. Modules shall be designed to distribute utilities, communications, exhaust, electrical data/voice and lighting as shown on drawings.
2. Modular units can be linked in tandem for a continuous service run.
3. Horizontal chase can be supplied with quick connects and disconnects for mobile bench and/or equipment rack applications. Quick connects fixtures shall utilize a keyed, color-coded lock system to prevent wrongful connections.
4. Service carrier can be suspended at any height above specified work surface to free workspace of service fixtures, electrical and teledata outlets.
5. Support structure design shall utilize standard strut components and hardware. All mechanical connects and bridging from the carrier umbilical to the ceiling structure and/or deck will be by others.

**1.03 SUBMITTALS**

Include number of each type of submittal required if this information is not covered in Division 1 or elsewhere.

 A. Shop Drawings: Provide 3/4" = 1'-0" scale elevations of all components, cross sections, rough‑in and anchor placements, tolerances and clearances. Provide 1/4" = 1'-0" rough-in plan drawings for coordination with trades. Rough in shall show free area.

**1.04 QUALITY ASSURANCE**

 A. Single source responsibility: Laboratory furniture system, casework, work surfaces, laboratory equipment, chemical fume hoods and accessories shall be manufactured or furnished by a single laboratory furniture company.

1. All casework construction and performance characteristics shall be in full compliance with SEFA 8 – 1999 standards. At the owner’s request, independent, third part testing must be submitted validating compliance and adheres to the architectural specifications**.**

 C. Manufacturer's qualifications: Modern plant with proper tools, dies, fixtures and skilled workmen to produced high quality laboratory horizontal service chase and equipment, and shall meet the following minimum requirements:

 1. Five years or more experience in manufacture of laboratory equipment of type specified.

 2. Five installations of equal or larger size and requirements.

**1.05 REFERENCE STANDARDS**

1. All casework, work surface and service fixture construction and performance characteristics shall be in full compliance with SEFA (Scientific Equipment and Furniture Association) standards. At the owner’s request, independent, third party testing must be submitted validating compliance and adheres to the architectural specifications.
	1. SEFA 2.3 – Installation of Scientific Laboratory Furniture and Equipment.
	2. SEFA 3 – Work Surfaces
	3. SEFA 7 – Laboratory and Hospital Fixtures
	4. SEFA 8 – Laboratory Furniture

**1.06 DELIVERY, STORAGE AND HANDLING**

 A. Schedule delivery of laboratory furniture system so that spaces are sufficiently complete that material can be installed immediately following delivery.

1. Protect finished surfaces from soiling or damage during handling and installation.

**1.07 PROJECT CONDITIONS**

 A. Do not deliver or install equipment until the following conditions have been met:

 1. Windows and doors are installed and the building is secure and weather tight.

 2. Ceiling, overhead ductwork and lighting are installed.

 3. All painting is completed and floor tile is installed.

 **PART 2 – PRODUCTS**

**2.01 MANUFACTURER**

 A. Design, materials, construction and finish of product specified are the minimum acceptable standard of quality for the Nautilus Radiused Overhead Service Carrier. The basis of this specification is Hamilton Laboratory Solutions, 825 East Albert Drive, Manitowoc, WI 54220.

**2.02 OVERHEAD SERVICE CARRIER**

1. General requirements for carriers:

1. Carrier body and inside/outside access covers shall be fabricated from 16-gauge cold rolled steel.

1. Carrier body shall incorporate UL approved, factory installed junction boxes for electrical and teledata outlets. Junction boxes shall be inset and flush to the exterior of the carrier body. Electrical and teledata outlets to be field installed.
2. Carrier body shall also incorporate factory punched and plugged service ports. Service fixtures to be field installed.
3. Exhaust system to be constructed of 3” PVC duct collar that fasteners to the carrier body to accept specified local extraction device.
4. Finish: Chemical resistant powder paint finish in manufacturer's standard color to be selected.

 B. Carrier body:

1. Nominal dimensions:

 a. Length: [24”] [30”] [36"] [42”] [48"] [60"] [72”]

 b. Width: [18”] [21”] [24”]

 c. Height: [5.25”] [6.35”] [7.5"]

1. Carrier body shall incorporate a slim-line eclipse radiused carrier body.
2. Interior service bracket: Utility support bracket of 11-gauge cold rolled steel that can accept attachment brackets for copper and conduit service lines.
3. Carrier body end covers shall include a set of two end covers to enclose exposed ends of the carrier body.
4. Configurable assemblies shall include lamp assembly, exhaust panels for localized exhaust and junction boxes and ports for electrical, data, voice outlets and extractor units.
5. Lamp assemblies shall include one T5HQ bulb, prismatic lens and replaceable ballasts.
6. Lamp assemblies can be rebulbed by a bottom removal of the lens cover. Accessibility from the body interior is not acceptable.
7. Carriers can intersect to form “L”, “T” and “X” shaped configurations.
8. Load bearing capabilities:
	1. Total overhead service carrier plus 400 pounds (evenly distributed) per unit.

**2.03 CEILING UMBILICAL ASSEMBLIES**

 A. General requirements for ceiling umbilical assemblies, extension assemblies’ structures:

1. Vertical structural support: 16-gauge cold rolled vertical shall integrate removable end and side panels.
2. Nominal height options: [36”][48”][60”] [72”] [84”]
3. Umbilical chase shall incorporate support members that utilize standard pipe and conduit supports.
4. Umbilicals uprights shall ship separately from the carrier body and mechanically fastened at the jobsite.
5. Height: [36”] [48”] [60”] [72”] [84”]
Vertical Inside Clearance: [3.375” X 4.375”] [6.375” X 7.375”] [7.875” X 8.875”]

**2.04 FINISHES**

A. Metal finish:

 1. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pre-treat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.

 2. Application: Electrostatically apply urethane powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thickness: **Liquid, dipped, solvent based finishes are not and will not be acceptable.**

 a. Exterior and interior exposed surfaces: 1.5 mil average and 1.2 mil min.

 b. Backs of cabinets and other surfaces not exposed to view: 1.2 mil average.

B. Cabinet Surface Finish Tests:

 **All casework construction and performance characteristics shall be in full compliance with SEFA 8 – 1999 standards.** At the owner’s request, independent, third party performance testing must be submitted validating compliance and adheres to the finish specifications.

##  1. Chemical Spot Test

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###  1.1 Purpose of Test

 The purpose of the chemical spot test is to evaluate the resistance a finish has to chemical spills.

 **Note:** Many organic solvents are suspected carcinogens, toxic and/or flammable. Great care should be exercised to protect personnel and the environment from exposure to harmful levels of these materials.

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###  1.2 Test Procedure

 Obtain one sample panel measuring 14" x 24" (355.6mm x 609.6mm). The received sample to be tested for chemical resistance as described herein.

 Place panel on a flat surface, clean with soap and water and blot dry. Condition the panel for 48-hours at 73+ 3F (23(+ 2(C) and 50+ 5% relative humidity. Test the panel for chemical resistance using forty-nine different chemical reagents by one of the following methods:

 **Method A –** Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a one-ounce (29.574cc) bottle and inverting the bottle on the surface of the panel.

 **Method B –** Test volatile chemicals by placing five drops of the reagent on the surface of the panel and covering with a 24mm watch glass, convex side down.

 For both of the above methods, leave the reagents on the panel for a period of **one hour.** Wash off the panel with water, clean with detergent and naphtha, and rinse with deionized water. Dry with a towel and evaluate after 24-hours at 73±3°F (23°±2°C) and 50±5% relative humidity using the following rating system:

 **Level 0 –** No detectable change.

 **Level 1 –** Slight change in color or gloss.

 **Level 2 –** Slight surface etching or severe staining.

 **Level 3 –** Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.

 **Test No. Chemical Reagent Test Method**

 1. Acetate, Amyl A

 2. Acetate, Ethyl A

 3. Acetic Acid, 98% B

 4. Acetone A

 5. Acid Dichromate, 5% B

 6. Alcohol, Butyl A

 7. Alcohol, Ethyl A

 8. Alcohol, Methyl A

 9. Ammonium Hydroxide, 28% B

 10. Benzene A

 11. Carbon Tetrachloride A

 12. Chloroform A

 13. Chromic Acid, 60% B

 14. Cresol A

 15. Dichlor Acetic Acid A

 16. Dimethylformanide A

 17. Dioxane A

 18. Ethyl Ether A

 19. Formaldehyde, 37% A

 20. Formic Acid, 90% B

 21. Furfural A

 22. Gasoline A

 23. Hydrochloric Acid, 37% B

 24. Hydrochloric Acid, 48% B

 25. Hydrogen Peroxide, 3% B

 26. Iodine, Tincture of B

 27. Methyl Ethyl Ketone A

 28. Methylene Chloride A

 29. Mono Chlorobenzene A

 30. Naphthalene A

 31. Nitric Acid, 20% B

 32. Nitric Acid, 30% B

 33. Nitric Acid, 70% B

 34. Phenol, 90% A

 35. Phosphoric Acid, 85% B

 36. Silver Nitrate, Saturated B

 37. Sodium Hydroxide, 10% B

 38. Sodium Hydroxide, 20% B

 39. Sodium Hydroxide, 40% B

 40. Sodium Hydroxide, Flake B

 41. Sodium Hydroxide, Saturated B

 42. Sulfuric Acid, 33% B

 43. Sulfuric Acid, 77% B

 44. Sulfuric Acid, 96% B

 45. Sulfuric Acid, 77% and Nitric

 Acid, 70%, equal parts B

 46. Toluene A

 47. Trichloroethylene A

 48. Xylene A

 49. Zinc Chloride, Saturated B

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###  1.3 Acceptance Level

###  Results will vary from manufacturer to manufacturer. Laboratory grade finishes should result in no more than four Level 3 conditions. Suitability for a given application is dependent upon the chemicals used in a given laboratory.

## 2. Hot Water Test

### 2.1 Purpose of Test

 The purpose of this test is to insure the coating is resistant to hot water.

###  2.2 Test Procedure

Hot water, 190°F to 205°F (88°C to 96°C), shall be allowed to trickle (with a steady stream and at a rate of not less than 6 ounces (177.44cc) per minute on the surface, which shall be set at an angle of 45-degrees, for a period of five minutes.

###  2.3 Acceptance Level

After cooling and wiping dry, the finish shall show no visible effect from the hot water.

##  3. Impact Test

###  3.1 Purpose of Test

 The purpose of this test is to evaluate the ductility of the coating.

###  3.2 Test Procedure

###  A one-pound ball approximately 2" (50.8mm) in diameter shall be dropped from a distance of 12" (304.8mm) onto a flat horizontal surface, coated to manufacturer’s standard manufacturing method.

### 3.3 Acceptance Level

There shall be no visible evidence to the naked eye of cracks or checks in the finish due to impact.

##  4. Paint Adhesion on Steel Test

###  4.1 Purpose of Test

The paint adhesion test is used to determine the bond of the coating to steel. This does not apply to non-steel products.

###  4.2 Test Procedure

 This test is based on ASTM D2197-86 “Standard Method of Test for Adhesion of Organic Coating”. Two sets of eleven parallel lines 1/16" (1.587mm) apart shall be cut with a razor blade to intersect at right angles thus forming a grid of 100 squares. The cuts shall be made just deep enough to go through the coating, but not into the substrate. They shall then be brushed lightly with a soft brush for one minute. Examine under 100-foot candles of illumination.

###  4.3 Acceptance Level

 Ninety or more of the squares shall show finish intact.

##  5. Paint Hardness on Steel Test

###  5.1 Purpose of Test

The paint hardness test is used to determine the resistance of the coatings to scratches.

###  5.2 Test Procedure

 Pencils, regardless of their brand, are valued in this way: 8-H is the hardest, and next 11 order of diminishing hardness are 7-H, 6-H, 5-H, 4-H, 3-H, 2-H, H, F, HB, B (soft), 2-B, 3-B, 4-B, 5-B (which are softest).

The pencils shall be sharpened on emery paper to a wide sharp edge. Pencils of increasing hardness shall be pushed across the paint film in a chisel-like manner until one is found that will cut or scratch the film. The pencil used before that one, that is the hardest pencil that will not rupture the film, is then used to express or designate the hardness.

###  5.3 Acceptance Level

The paint shall have a hardness of 4-H minimum.

**PART 3 – EXECUTION**

**3.01 INSTALLATION**

 A. Furniture system installation:

 1. Install system in strict accordance with manufacturer's instructions.

 2. Set system components plumb, square, and straight with no distortion and securely anchored to building structure.

 3. Umbilical supports shall be spaced properly as to provide adequate support to each section.

 4. Carrier shall be installed in the location as shown on drawings.

 B. Install Overhead Service Carrier and accessory items per Section 12345.

**3.02 ADJUSTING**

 A. Repair or remove and replace defective work, as directed by [Architect] [Owner] upon completion of installation.

**3.03 CLEANING**

 A. Clean shop finished laboratory Overhead Service Carrier system and touch up as required.

**3.04 PROTECTION OF FINISHED WORK**

 A. Provide all necessary protective measures to prevent exposure of laboratory Overhead Service Carrier system and attached components from exposure to other construction activity.

 B. Advise contractor of procedures and precautions for protection of material, installed laboratory Overhead Service Carrier system, and fixtures from damage by work of other trades.

 END OF SECTION