SECTION 08 33 00

**VisionAire®**

**ROLLING GRILLES – OPEN DESIGN**

**GENERAL NOTES TO SPECIFIER:**

This specification section has been prepared to assist design professionals in the preparation of project or office master specifications. It follows guidelines established by the construction specifications institute, and therefore may be used with most master specification systems with minor editing.

Edit carefully to suit project requirements. Modify as necessary and delete items that are not applicable. Verify that referenced section numbers and titles are correct. (Numbers and titles referenced are based on MasterFormat™, 2004 edition).

This section assumes the project manual will contain complete division 01 documents including sections 01 33 00 submittal procedures, 01 62 00 product options, 01 25 13 product substitution procedures, 01 66 00 product storage and handling requirements, 01 77 00 closeout procedures, and 01 78 00 closeout submittals. If the project manual does not contain these sections, additional information should be included under the appropriate articles.

This is an open proprietary specification allowing users the option of approving other manufacturers which comply with the criteria specified herein.

**\*\* NOTES TO THE SPECIFIER\*\*** are contained in boxes and should be deleted from final copy.

Optional items requiring selection by the specifier are enclosed within brackets, e.g.: [35] [40] [45]. In cases where one of the optional items is a standard feature of the grille model, it is listed in the first position. Make appropriate selection and delete others.

Items requiring additional information are underlined, e.g.: \_\_\_\_\_\_\_\_\_\_\_.

**PART 1 GENERAL**

1.1 SUMMARY

A. **Section Includes:** [Manual] [and] [electric operated] overhead rolling grilles.

B. **Related Sections:**

1. 05 50 00 Metal Fabrications. Door opening jamb and head members.

2. 06 10 00 Rough Carpentry. Door opening jamb and head members.

3. 08 31 00 Access Doors and Panels. Access doors.

4. 08 70 00 Hardware. Masterkeyed cylinders.

5. Division 26. Electrical wiring and conduit, fuses, disconnect switches, connection of operator to power supply, and installation of control station and wiring.

C. **Products That May Be Supplied, But Are Not Installed Under This Section:**

1. Control station.

2. Manual release pull handle.

\*\* **NOTE TO SPECIFIER \*\***  Include appropriate language below, including a reference to section 01 23 00 alternates, if rolling grilles are included in any alternates, add section 01 23 00 to 1.1 B. Delete if no alternates.

1.2 SYSTEM DESCRIPTION

A. **Design Requirements:**

1. **Cycle Life:**

a. Design grilles of standard construction for normal use of up to 5 cycles per day maximum, and an overall maximum of 50,000 operating cycles for the life of the grille.

a. Design grilles of special construction for high cycle use. Expected cycles of up to \_\_\_\_ per day.

2. **Safety:**

a.Chain operated doors shall be designed so that the door immediately stops upward or downward travel and is maintained in a stationary position when the hand chain is released by user.

\*\*NOTE TO SPECIFIER\*\* If your project does not involve a custom layout or custom product modifications, please delete 3 and 4. If you are unsure, please contact Architectural Design Support at 833-958-1273.

3. Custom Layout

a. Product has been reconfigured for a custom layout, refer to drawings by CornellCookson.

4. Customized Product

a. This product has custom modifications designed by CornellCookson. Contact Manufacturer for details.

1.3 SUBMITTALS

A. **Reference Section 01 33 00 Submittal Procedures; submit the following items:**

1. **Product Data.**

2. **Shop Drawings:** Include special conditions not detailed in Product Data. Show interface with adjacent work.

3. **Quality Assurance/Control Submittals:**

a. Provide proof of manufacturer ISO 9001:2015 registration.

b. Provide proof of manufacturer and installer qualifications - see 1.3 below.

c. Provide manufacturer's installation instructions.

4. **Closeout Submittals:**

a. Operation and Maintenance Manual.

b. Certificate stating that installed materials comply with this specification.

1.4 QUALITY ASSURANCE

A. **Qualifications:**

1. **Manufacturer Qualifications:** ISO 9001:2015 registered and a minimum of five years experience in producing grilles of the type specified.

2. **Installer Qualifications:** Manufacturer's approval.

1.5 DELIVERY STORAGE AND HANDLING

A. Reference Section 01 66 00 Product Storage and Handling Requirements.

B. Follow manufacturer's instructions.

1.6 WARRANTY

A. **Standard Warranty:** Two years from date of shipment against defects in material and workmanship.

B. **Maintenance:** Submit for owner’s consideration and acceptance of a maintenance service agreement for installed products.

**PART 2 PRODUCTS**

2.1 MANUFACTURER

1. **Manufacturer:**
2. Cornell - 24 Elmwood Ave. Mountain Top, PA 18707. Telephone: (800) 233-8366. Underwriters Laboratories, Inc. (UL), ISO 9001:2008 Registered.
3. Cookson
4. Clopay

\*\* **NOTE TO SPECIFIER \*\*** Select model ESG10 for straight pattern grilles or model ESG12 for grilles that will be routinely cycled more than 5 times per day or when a brick pattern curtain configuration is desired.

B. **Model:** [ESG10] [ESG12]

C. **Approved Equal:** Cookson - 1901 South Litchfield Rd, Goodyear, AZ, 85338. Telephone: (800) 294-4358.

D. **Substitutions:** Reference Section 01 25 13 Product Substitution Procedures.

2.2 MATERIALS

A. **Curtain:**

1. **ESG10 Straight Pattern**

a. **Horizontal Rods:** Solid [5/16 inch (8 mm) diameter, 5056 H32 aluminum alloy] [5/16 inch (8 mm) diameter, AISI 300 series stainless steel] [5/16 inch (8 mm) diameter galvanized steel].

1. **Vertical Spacing:** 2 inches (50.8 mm) on center.

\*\* **NOTE TO SPECIFIER \*\*** Select aluminum chain links below for aluminum and galvanized rods are stainless steel links for stainless steel rods.

b. **Vertical Chains:** Grommetted [aluminum] [stainless steel] links, 3/4 inch (19 mm) wide, positioned by E-rings on [9 inch (228.6 mm)] [6 inch (152.4 mm)] [3 inch (76.2 mm)] centers. Provide double E-rings on horizontal bars on both sides of end chains to retain curtain in guides.

1. **ESG12 Brick Pattern**

a. **Horizontal Rods:** Solid 5/16 inch (8 mm) diameter, 5056 H32 aluminum alloy sleeved with horizontal aluminum tube spacers to separate vertical links.

1. Vertical Spacing 2 inches (50.8 mm)

b. **Vertical Links:**  Heavy duty aluminum links, ¾ inch (19mm) wide, positioned by tube spacers on 9 inch (228.6 mm) staggered centers. End links to be held in place by self-locking retaining rings.

\*\* **NOTE TO SPECIFIER \*\*** Include reinforcing angles noted below on grilles over 27’-4” (8.33 M) wide.

2. **Bottom Bar:** 2 x 3-1/2 inch (50.8 x 88.9 mm) extruded aluminum tubular section reinforced with 3 x2 x 3/16 inch (76.2 x 50.8 x 4.76 mm) aluminum angle(s).

\*\* **NOTE TO SPECIFIER \*\*** Select aluminum curtain and bottom bar below for model ESG12 brick pattern grilles. Stainless and galvanized finishes are not available with brick pattern curtains.

3. **Finish:**

a. **Aluminum Curtain and Bottom Bar:**

1. **Curtain:** [Mill finish] [Clear anodized] [Medium bronze anodized] [Dark bronze anodized] [Black anodized].

2. **Bottom Bar:** [Mill finish] [Clear anodized] [Medium bronze anodized] [Dark bronze anodized] [Black anodized].

a. **Stainless Steel Curtain with Aluminum Bottom Bar:**

1. **Curtain:** Factory polished.

2. **Bottom Bar:** [Clear anodized] [Mill finish].

a. **Stainless Steel Curtain with Stainless Steel Bottom Bar:** Factory polished.

a. **Galvanized Steel Rods with Aluminum Chains and Bottom Bar:**

1. **Rods:** Galvanized steel, unpainted.

2. **Chains and Bottom Bar:** [Mill finish] [Clear anodized].

B. **Guides, Wall Mounted:** Heavy duty extruded aluminum sections with snap-on cover to conceal fasteners and polypropylene pile runners on both sides of curtain. Provide [steel] [aluminum] mounting angle as required for face of wall installation.

B. **Guides, Tube Mounted:** Heavy duty extruded aluminum sections with snap-on cover to conceal fasteners and polypropylene pile runners on both sides of curtain. Provide [steel] [aluminum] tubes, floor saddles and hardware as recommended by manufacturer to support grille.

1. **Finish, Aluminum Guide Components:**

a. [Mill finish] [Clear anodized] [Medium bronze anodized] [Dark bronze anodized] [Black anodized].

\*\* **NOTE TO SPECIFIER \*\*** Delete (2.) below when not using any steel components in section 2.2 B above.

2. **Finish, Steel** [Mounting Angles] [Tubes]:

\*\* **NOTE TO SPECIFIER \*\*** Use powder coat finish for exposed steel guide components and unpainted when steel guide components are recessed in the wall.

a. Unpainted.

a. Zirconium treatment followed by a light gray baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness.

a. Zirconium treatment followed by a corrosion inhibitive baked-on zinc-rich gray polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness.

C. **Counterbalance Shaft Assembly:**

1. **Barrel:** Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width.

2. **Spring Balance:** Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of grille to ensure that maximum effort to operate will not exceed 25 lbs (110 N). Provide wheel for applying and adjusting spring torque.

D. **Brackets:** Fabricate from minimum 3/16 inch (4.76 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.

1.  **Finish:**

a. Zirconium treatment followed by a light gray baked-on polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness.

a. Zirconium treatment followed by a corrosion inhibitive baked-on zinc-rich gray polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness.

a. ASTM A 123, Grade 85 zinc coating, hot-dip galvanized after fabrication.

\*\* **NOTE TO SPECIFIER \*\*** Hoods are not normally provided for coil above ceiling application, delete hood below if not desired.

E. **Hood and Fascia:** [24 gauge galvanized steel] [24 gauge stainless steel] [0.040 inch (1.016 mm) aluminum] with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets as required to prevent excessive sag.

1. **Finish:**

a. **GalvaNex Coating System** to include an ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation of a chemical bonding, light gray baked-on polyester base coat and a light gray baked-on polyester enamel finish coat. The scientific organic material composition and chemical bonding process of GalvaNex produces a superior finish against corrosion and abrasion. GalvaNex components include a limited two year finish warranty.

a. **Stainless Steel:** No. 4 finish.

a. **Aluminum:** [Mill finish] [Clear anodized] [Medium bronze anodized] [Dark bronze anodized] [Black anodized].

2.3 ACCESSORIES

\*\* **NOTE TO SPECIFIER \*\*** To provide security a locking mechanism is required on all grilles. Most common locking methods are listed below; consult Architectural Design Support (800) 233-8366 Ext. 4551 for other options. Emergency egress lock must be used with emergency egress system.

A. **Locking:**

1. **Manual Push-Up:** Keyed cylinder locking into both jambs operable from both sides of curtain.

1. **Manual Crank Hoist:** Keyed cylinder locking into both jambs operable from coil side of curtain.

1. **Motor Operated:** Keyed cylinder locking into both jambs operable from both sides of curtain with motor interlock cutout switches.

1. **Emergency Egress Lock:** Key cylinder locking from public side, thumbturn cylinder locking from tenant side, locking into both jambs. Provide an additional security panel in curtain. Provide motor interlock cutout switches on motorized units.

\*\* **NOTE TO SPECIFIER \*\*** Following emergency egress system can be used with MG motor operators.

B. **Emergency Egress System:** Provide wall mounted manual release system pull handle to disengage motor operator and automatically open grille for emergency egress without the use of electrical power. Release of pull handle will reset grille to normal motor operation.

\*\* **NOTE TO SPECIFIER \*\*** Exposed moving operator components lower than 8 feet above floor level that create possible pinch points are required to be covered per UL 325. Specify an operator cover whenever this field condition exists.

1. **Operator and Bracket Mechanism Cover:** Provide [24 gauge galvanized steel] [24 gauge stainless steel] [0.040 inch (1.016 mm) aluminum] sheet metal cover [to provide weather resistance] [to enclose exposed moving operating components] at coil area of unit. Finish to match door hood.
2. **Fixed Panel**: Static grille curtain with frame assembly to fill adjacent space(s) around coiling grille.  Finish and pattern to match coiling grille.

**\*\* NOTE TO SPECIFIER \*\*** Vibration isolators not available for units requiring wind load or seismic validation. Delete below if not required.

1. **Vibration Isolators:**
   1. Include continuous vibration isolators pre-installed on both guides to reduce vibration transferred from the door to the structure. Vibration isolators should be expected to reduce vibration by up to 14%. Dampening pads are to be manufactured from nitrile oil-resistant rubber, durometer 50A.

**\*\* NOTE TO SPECIFIER \*\*** LED-illuminated light kit is a guide mounted LED light strip to provide an additional visible color coded notification on the door opening status. Delete below if not required.

1. **LED Light Kit :**
   1. Include LED Light Kit in [5ft] [10ft] [15ft] length. IP68 rated LED light kit to include guide mounting channel, power supply, controller and signal wire. LED lights to be solid red when door is closed, flash red when door is in motion and solid green when door is fully open.

2.4 OPERATION

A. **Manual Push-Up:** Provide pole with hook. Suitable for model ESG10 aluminum grilles up to 16’ (4.88 M) wide and up to 10’ (3.05 M) high and model ESG12 aluminum grilles up to 14’ (4.27 M) wide and up to 10’ (3.05 M) high.

\*\* **NOTE TO SPECIFIER \*\*** EZ lift construction package extends the width range of all standard construction push-up grilles by approximately 33%. Use for push-up grilles that exceed the size limits for standard push-up construction listed above. Although possible to build, Cornell does not recommend push-up operation for units taller than 10’ (3.05 M) high. Consult Architectural Design Services (800) 233-8366 Ext. 4551 for EZ lift limitations on galvanized and stainless steel grilles.

A. **Manual Push-Up with EZ Lift Construction Package:** Provide pole with hook. Suitable for aluminum grilles up to 22’ (6.70 M) wide and up to 10’ (3.05 M) high.

A.  **Manual Crank Hoist:** Provide crank hoist operator including crank gear box, steel crank drive shaft and geared reduction unit. Fabricate gear box to completely enclose operating mechanism and be oil-tight.

A. **Manual ControlGard Chain Hoist:** Provide chain hoist operator with endless steel chain, chain pocket wheel and guard, geared reduction unit, and chain keeper secured to guide. Chain hoist to include integral brake mechanism that will immediately stop upward or downward travel and maintain the door in a stationary position when the hand chain is released by the user.

\*\* **NOTE TO SPECIFIER \*\*** Select model MG operators for units that will routinely cycle less than 20 times per day and require no more than ¾ HP. Select SG operators for units that will cycle more than 20 times per day and for large size units that will require greater than ¾ HP.

A. **Supply Model MG Electric Motor Operator, industrial duty** - rated for a maximum of 20 cycles per hour, cULus listed, Totally Enclosed Non Ventilated gear head operator(s) rated (1/3) (1/2) or (3/4) hp as recommended by door manufacture for size and type of door, \_\_\_\_Volts, \_\_\_\_Phase. Provide complete with electric motor and factory pre-wired motor control terminals, maintenance free solenoid actuated brake, [emergency manual chain hoist] [provisions for auxiliary push-up operation] and control station(s). Motor shall be high starting torque, industrial type, protected against overload with an auto-reset thermal sensing device. Primary speed reduction shall be heavy-duty, lubricated gears with mechanical braking to hold the door in any position. Operator shall be equipped with [an emergency manual chain hoist assembly that safely cuts operator power when engaged. A disconnect chain shall not be required to engage or release the manual chain hoist.] [a disconnect cable for auxiliary push-up operation.] Operator drive and door driven sprockets shall be provided with #50 roller chain. Provide an integral Motor Mounted Interlock system to prevent damage to door and operator when mechanical door locking devices are provided. Operator drive and door driven sprockets shall be provided with minimum #50 roller chain. Operator shall be capable of driving the door at a speed of up to 9” per second or as recommended for door size. Fully adjustable, driven linear screw type cam limit switch mechanism shall synchronize the operator with the door. The electrical contractor shall mount the control station(s) and supply the appropriate disconnect switch, all conduit and wiring per the overhead door wiring instructions.

A. **Supply Model SG Electric Motor Operator, continuous duty**, cULus listed, Totally Enclosed Fan Cooled gear head operator(s) rated (1/2) to (7 1/2) hp as recommended by door manufacture for size and type of door, \_\_\_\_Volts, \_\_\_\_Phase. Provide complete with electric motor and factory pre-wired motor control terminals, maintenance free solenoid actuated brake, emergency manual chain hoist provided up to 2 hp and control station(s). Motor shall be high starting torque, industrial type, with overload protection. Primary speed reduction shall be heavy-duty gears running in grease or oil bath with mechanical braking to hold the door in any position. When equipped, the emergency manual chain hoist assembly is automatically disengaged when motor is energized. A disconnect chain shall not be required to engage or release the manual chain hoist. Operator drive and door driven sprockets shall be provided with minimum #50 roller chain. Operator drive and door driven sprockets shall be provided with minimum #50 roller chain. Operator shall be capable of driving the door at a speed of up to 9” per second or as recommended for door size. Fully adjustable, driven linear screw type cam limit switch mechanism shall synchronize the operator with the door. The motor shall be removable without affecting the limit switch settings. The electrical contractor shall mount the control station(s) and supply the appropriate disconnect switch, all conduit and wiring per the overhead door wiring instructions.

A. **Supply Model EverGard Electric Motor Operator with back-up power control box**, Limited Duty (up to 10 cycles per hour), cULus listed, TENV gear head operator, 24DVC. Horsepower as recommended by manufacturer. Provide complete with electric motor and factory pre-wired motor control terminals, maintenance free solenoid actuated brake, emergency manual chain hoist and control station(s). Motor shall be high starting torque, industrial type, with overload protection. Primary speed reduction shall be heavy-duty gears running in maintenance free, sealed gear box with mechanical braking to hold the door in any position. The emergency manual chain hoist assembly is automatically disengaged when motor is energized. A disconnect chain shall not be required to engage or release the manual chain hoist. Operator drive and door driven sprockets shall be provided with minimum #50 roller chain. Operator shall be capable of driving the door at a speed of up to 9” per second or as recommended for door size. Fully adjustable, driven linear screw type cam limit switch mechanism shall synchronize the operator with the door. The motor shall be removable without affecting the limit switch settings. The electrical contractor shall mount the control stations and supply the appropriate disconnect switch, all conduit and wiring per the overhead door wiring instructions.

1. **Supply model EverGard with programmable logic board and back-up power supply**. 120v AC input power with auto switch to 24v DC back-up power. Back-up power to provide minimum 10 open/close cycles and 48 hr stand-by.

a. (2) 12v rechargeable lead sealed batteries.

b. Programmable battery load testing

c. Monitoring points for open/close position, AC power loss and battery low voltage

d. 12’-0” (standard) wiring whip to connect control box and motor

(up to 120’-0” available)

e. Emergency Push Button (EPB): Flush mounted, single red push button station wired for emergency OPEN function only. If grille is at full open (normal business hours), depressing EPB will not affect the grille’s position.

f. Door power indicator: Flush mounted voltage monitor for battery back-up system. Flashing red light indicates low battery power and maintenance check-up. Can be located up to 150 ft. away from motor control box.

g. Non-resettable cycle counter

h. UL325 & UL864 compliant system.

\*\* **NOTE TO SPECIFIER \*\*** Most common control stations are listed below; consult Architectural Design Services (800) 233-8366 Ext. 4551 for other options. Grilles without a bottom sensing edge must be wired for constant pressure on the “close” button.

1. **Control Station:** Flush mounted, "Open/Close/Stop" push buttons; NEMA 1B.

1. **Control Station:** Flush mounted, "Open/Close" key switch with "Stop" push button; NEMA 1B.

1. **Flush mounted:** "Open/Close" key switch with ["Stop" push button and] [small format Best type 7-pin cylinder] [Schlage 6-pin cylinder] [#5 U-Change cylinder]; NEMA 1B

\*\* **NOTE TO SPECIFIER \*\*** Constant pressure close operation is recommended for motor operated grille units. Select the operator function below when constant pressure close operation is acceptable. The motor control station(s) must be mounted within visible sight of the entire door opening and pressure must be maintained on “close” for the duration of each close cycle.

B. Provide operator to function with constant pressure close operation to meet UL325-2010 listing standard requirements.

\*\* **NOTE TO SPECIFIER \*\*** Per UL325-2010, grilles without a connected and properly functioning primary entrapment protection device will only function by constant pressure close operation. Select a primary entrapment protection device from 2.4-B-1 below to enable momentary contact close operation, including the connection of radio controls, induction loops, timer to close, etc.

B. **Entrapment Protection:** Provide the following primary entrapment protection device to enable momentary contact close operation.

\*\* **NOTE TO SPECIFIER** \*\* If momentary contact to close is desired, one of the following safety devices must be selected. For a non-contact solution that provides the most coverage in the opening, SafetyGard UL325 Light Curtain with Dynamic Sequential Blanking must be selected. The following options are available individually or in conjunction; please select as desired.

1. **SafetyGard UL325 Light Curtain with Dynamic Sequential Blanking:** Provide monitored, non-contact light curtain consisting of a transmitter and a receiver to be mounted to the guide assembly of the door in the provided mounting channel, projecting a thru beam across the width of the door for the height of the light curtain (3ft or 6ft depending on opening size of the door). Interruption of beam before door fully closes shall cause door to immediately stop downward travel and reverse direction to the fully opened position

1. **Smartsync Wireless Edge Kit –** continuously monitored, wireless sensing/weather edge seal extending full width of door bottom bar. Contact before door fully closes shall cause door to immediately stop downward travel and reverse direction to the fully opened position. Wireless edge kit will use Zigbee wireless technology. Radio band wireless sensing edges will not be permitted.

1. **Provide a 2-wire, E.L.R. electric sensing/weather edge seal** extending full width of grille bottom bar. Contact before grille fully closes shall cause grille to immediately stop downward travel and reverse direction to the fully opened position. Provide a [retracting safety cord and reel] [self-coiling cable] connection to control circuit.

1. **Provide NEMA 4X photo eye sensors** consisting of a transmitter and receiver that are to be mounted within 6” (152.4 mm) of the floor, projecting an IR beam across the entire width of the grille. Interruption of beam before grille fully closes shall cause grille to immediately stop downward travel and reverse direction to the fully opened position. Electrical contractor to provide low voltage wiring from the transmitter and receiver to the door operator.

1. **Provide NEMA 1 photo eye sensors** consisting of a transmitter and receiver that are to be mounted within 6” (152.4 mm) of the floor, projecting an IR beam across the entire width of the grille. Interruption of beam before grille fully closes shall cause door to immediately stop downward travel and reverse direction to the fully opened position. Electrical contractor to provide low voltage wiring from the transmitter and receiver to the door operator.

\*\* **NOTE TO SPECIFIER \*\*** The item listed below is an optional secondary entrapment protection device, and may be used in conjunction with a set of primary entrapment protection photo eyes or with constant pressure close operation. Delete if not desired.

C. **Sensing/Weather Edge:** Provide automatic reversing control by an automatic sensing switch within neoprene or rubber astragal extending full width of grille bottom bar.

1. Provide an electric sensing edge device. Contact before grille fully closes shall cause door to immediately stop downward travel and reverse direction to the fully opened position. Provide a wireless sensing edge connection to motor operator eliminating the need for a physical traveling electric cord connection between bottom bar sensing edge device and motor operator.

**PART 3 EXECUTION**

3.1 EXAMINATION

A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.

B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.

C. Commencement of work by installer is acceptance of substrate.

3.2 INSTALLATION

A. General: Install grille and operating equipment with necessary hardware, anchors, inserts, hangers and supports.

B. Follow manufacturer's installation instructions.

3.3 ADJUSTING

A. Following completion of installation, including related work by others, lubricate, test, and adjust grilles for ease of operation, free from warp, twist, or distortion.

3.4 CLEANING

A. Clean surfaces soiled by work as recommended by manufacturer.

B. Remove surplus materials and debris from the site.

3.5 DEMONSTRATION

A. Demonstrate proper operation to Owner's Representative.

B. Instruct Owner's Representative in maintenance procedures.

END OF SECTION