SECTION 23 33 13
DAMPERS

PART 1 – GENERAL

1.01 WORK INCLUDED

A. The work of this Section shall include, but is not limited to the following:

1. Static and dynamic fire dampers
2. Smoke dampers and combination fire/smoke dampers
3. Balancing dampers
4. Backdraft dampers
5. Installation of automatic control dampers
6. Remote operators for balancing dampers

1.02 RELATED DOCUMENTS

A. Section 23 05 01 – HVAC General Provisions

B. Section 23 05 93 – Testing, Adjusting and Balancing for HVAC

C. Section 23 09 23 – Building Management System (BMS)

D. Section 23 31 00 – HVAC Ducts and Casings

E. Section 23 37 00 – Air Outlets and Inlets

F. Division 26 – Electrical Specifications

1.03 REFERENCE STANDARDS

Published specifications standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this Section where cited below:

A. ANSI/AMCA – American National Standards Institute/Air Movement Control Association: ANSI/AMCA 500-L-07 Laboratory Methods of Testing Louvers for Rating

B. Utah Fire Marshal: Listing for Fire Damper and Smoke Damper

C. NFPA – National Fire Protection Association

1. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems
2. NFPA 92A Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences

D. UL – Underwriters Laboratories Inc.

1. UL 555 Standard for Fire Dampers
2. UL 555C Standard for Ceiling Dampers
3. UL 555S Standard for Smoke Dampers

1.04 QUALITY ASSURANCE

A. Manufacturer: Test and qualify with UL a complete range of damper sizes covering dampers specified. Testing one size only is not acceptable.

B. Fire dampers shall open and close under HVAC system operating conditions in accordance with UL 555.

C. Smoke dampers and combination fire/smoke dampers shall open and close under HVAC system operating conditions in accordance with UL 555S.

D. Pressure drop ratings of dampers shall be based on tests and procedures performed in accordance with AMCA 500-L-07.

E. Air Flow Rating: UL approved for dual directional airflow.

F. Actuator shall have a minimum five-year manufacturer's warranty.

1.05 SUBMITTALS

A. Dynamic fire damper submittal shall include performance data developed for UL 555 standard tests. Maximum allowed air flow rate and static pressure for duct- and non-duct mounted installations shall be documented.

B. Submit smoke damper and combination fire/smoke damper schedule indicating size, service, location, designator identification, number of actuators, and air velocity through the damper.

C. Submit construction details, hardware details, gauges and certified dimensioned shop drawings for all damper types.

D. Manufacturer's product data:

1. Include leakage, pressure drop, and maximum pressure data.
2. Indicate materials, construction, dimensions, and installation details.
3. Verify conformance to NFPA 90A, NFPA 92A, UL 555, UL 555S, CSFM, AMCA and applicable building codes.
4. Verify damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500-L-07.
5. End switches, wiring diagrams, firefighters relays and override components.
6. Provide actuator electrical power requirements for both running and holding states and quantities per damper.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Static and dynamic fire dampers: Ruskin DIBD2 Style B, IBD2 Style B, or approved equal by Air Balance, AWV, Pottorff, Greenheck.

B. Smoke dampers: Ruskin SD60, SD37, SDRS25 (round) or approved equal by Air Balance or Pottorff.

C. Combination fire/smoke dampers: Ruskin FSD60, FSD60-3 (3-hour), FSD 37, FSDR25 (round) or approved equal by Air Balance or Pottorff.

D. Grille Access Fire Smoke Dampers: Ruskin FSD60GA or equal by Air Balance or Pottorff.

E. Actuators: Belimo FSNF120, Honeywell ML4115 or equal.

F. Remotely adjustable operators with balancing dampers:

1. Remote adjustable operator shall be Young Regulator Model Number 270-896 with 'C' bracket.
2. Rectangular Balancing Damper shall be Young Regulator Model Number 830ACC for external control or Model Number 830ACC-2 for internally controlled applications.
3. Round Balancing Damper shall be Young Regulator Model Number 5020CC for external control or Model Number 5020CC-2 for internally controlled applications.

G. Backdraft dampers: Ruskin CBD4 counterbalanced, Ruskin BD2 non-counterbalanced or equal by Air Balance, AWV, Arrow.

H. Heavy duty backdraft dampers: Ruskin CBS92 counterbalanced, or equal by Air Balance, AWV, Arrow.

I. Manual balancing damper: Ruskin MD35, MD25, MDRS25.

2.02 FIRE DAMPERS

A. Provide static and dynamic fire dampers in ducts penetrating fire-rated walls, floors, and ceilings as required by NFPA, local codes and authorities regardless if shown or not shown on the Drawings. Dampers shall be factory-marked for static or dynamic use.

B. Provide conveniently located access doors, of ample size for resetting the dampers. Duct-mounted grilles, registers or diffusers can be used for access as long as such access is readily available as determined by the Architect or Authority Having Jurisdiction.

C. Integral sleeve frame shall be minimum 20-gauge roll formed, galvanized **stainless F0.2 Shower Exhaust Ducks** steel. Comply with manufacturer's installation instructions and Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Details.

D. Dampers shall be spring-loaded with shutter stored out of the airstream to provide minimum 95 percent free area.

E. Dynamic rated fire dampers shall be labeled in accordance with UL 555. Static fire dampers shall be labeled in accord with UL 555.

F. Dampers shall be actuated by UL-approved fusible link. Upon operation of the link, the dampers shall close automatically and remain tightly closed. Fusible links shall operate approximately 50 degrees F above the maximum temperature the duct system will encounter under normal operation, but not less than 165 degrees F.

G. Dampers shall be of types acceptable to the local authorities, Owner and Architect.

2.03 SMOKE DAMPERS, COMBINATION FIRE / SMOKE DAMPERS

A. Provide dampers of size and location as indicated on the Drawings and as specified.

B. Frame shall be a minimum of 16 gauge galvanized **stainless shower** steel formed into a structural hat channel shape with tabbed corners for reinforcement.

C. For air velocities up to 1,500 feet per minute, the blades shall be single skin 16-gauge minimum galvanized steel with three longitudinal grooves for increased stiffness and reinforcement. For air velocities up to 4,000 feet per minute, the blades shall be double skin 14-gauge minimum galvanized steel. Bearings shall be a self-lubricating stainless steel sleeve turning in an extruded hole in the frame. Blade edge seals shall be silicone rubber designed to withstand 450 degrees F. Jamb seal shall be silicone impregnated fiberglass with stainless steel flexible metal compression type cover. Maximum blade width shall be 6 inches.

D. Each damper shall be classified by Underwriters Laboratories as a Leakage Rated Damper for use in smoke control systems under the latest version of UL 555S, and bear a UL label attesting to same. The damper leakage rating under UL 555S shall be leakage Class I (4 cubic feet per minute per square foot at 1-inch water gauge).

E. In addition to the leakage ratings already specified herein, the dampers and their actuators shall be qualified under UL 555S to an elevated temperature of 350 or 450 degrees F depending upon the actuator. Appropriately listed electric actuators shall be installed by the damper manufacturer at time of damper fabrication. Damper and actuator(s) shall be supplied as a single entity that meets applicable UL 555S qualifications for both dampers and actuators. Provide wiring and conduit materials required to interconnect the actuator(s).

F. Each damper shall be equipped with indication/position switches consisting of two-position indicator switches linked directly to the damper blade to provide the capability of remotely indicating damper blade position.

G. Heat-actuated temperature release device:

1. Control close and lock damper during test, smoke detection, power failure, or fire conditions through actuator closure spring. At no time shall actuator disengage from damper blades.
2. Allow damper to be automatically and remotely resettable after test, smoke detection, or power failure conditions. After exposure to high temperature or fire, inspect damper before reset to ensure proper operation.
3. Controlled closure and locking of damper shall occur in 5 to 15 seconds to allow duct pressure to equalize. Instantaneous closure is not acceptable.
4. Electric fuse link (EFL) with electric actuators.
5. Release temperatures: 165 degrees F.

H. Actuator shall be electric, 120-volt, 60-hertz. Controlled closure and locking of damper shall occur within 5 to 15 seconds to allow duct pressure to equalize. Instantaneous closure is not acceptable.

I. Electric damper actuator shall be driven open or closed by the rotating motion of a reversible, overload protected, non-stall synchronous motor. Crank arm shall be connected to the actuator directly with no intermediate linkage.

J. Actuator quantities per damper area shall be as recommended by the manufacturer. Provide additional actuators to meet the damper leakage requirement. Damper actuator shall stroke from fully open to fully closed or vice versa in less than 15 seconds from receipt of control signal.

K. Two-position dampers shall have spring return. Provide UL 555S-listed and -labeled actuators for all dampers.

2.04 ROUND COMBINATION FIRE / SMOKE DAMPERS

A. Provide Class I round combination fire/smoke dampers suitable for application in HVAC systems with velocities up to 4,000 feet per minute.

B. Fire Rating: UL 555-classified and -labeled as a 1.5-hour fire damper.

C. Smoke Rating: UL 555S-classified and -labeled as a Leakage Class I Damper for use in smoke control systems: 4 cubic feet per minute per square foot at 1-inch water gauge and 8 cubic feet per minute per square foot at 4-inch water gauge.

D. Air Flow Rating: UL-approved for dual directional airflow.

E. Frame/Sleeve: Minimum 20-gauge galvanized **stainless** steel with roll formed beads and retaining plate grooves to accept retaining plates for damper mounting.

F. Blade shall be two-piece, minimum 14-gauge equivalent thickness, galvanized **stainless** steel.

G. Bearings: Self-lubricating stainless steel sleeve, turning in extruded hole in frame.

H. Blade Seals: Silicone rubber fully encompassing the blade edge for smoke seal up to 450 degrees F. Mechanically attached to blade edge.

I. Axle: Minimum ½-inch diameter plated steel, mechanically attached to blade.

J. Damper and retaining plates shall be one-piece, minimum 20-gauge galvanized steel with factory matched and shipped with individual damper.

K. Heat-Actuated Temperature Release Device:

1. Control close and lock damper during test, smoke detection, power failure, or fire conditions through actuator closure spring. At no time shall actuator disengage from damper blades.
2. Allow damper to be automatically and remotely resettable after test, smoke detection, or power failure conditions. After exposure to high temperature or fire, inspect damper before reset to ensure proper operation.
3. Controlled closure and locking of damper shall occur in 5 to 15 seconds to allow duct pressure to equalize. Instantaneous closure is not acceptable.
4. Electric fuse link (EFL) with electric actuators.
5. Release Temperatures: 165 degrees F.

L. Actuator shall be electric, **[**120-volt, 60-hertz.

M. Factory-assemble damper, actuator, sleeve, and accessories and furnish as a single unit

conforming to UL 555 and UL 555S.

N. Performance Data:

1. Elevated Temperature Qualified: Damper and actuator assembly qualified in accordance with UL 555S to elevated temperature of 350 degrees F.
2. Leakage Class I, when applied in systems with maximum pressure of 4-inch water gauge.

2.05 ACTUATORS

A. Actuator motor shall be silent microprocessor-controlled providing electronic cut-off.

B. Motor shall be direct-coupled and incapable of burning out if stalled before full rotation is reached.

C. Housing, gears and toothed cold-weld clamp shall be steel.

D. Operation time: 5 to 15 seconds at 32 to 350 degrees F.

2.06 ACCESSORIES FOR DAMPERS

A. switch: electrically and mechanically lock damper in closed position when duct temperatures exceed 165 degrees F and still allow appropriate authority to override interlock switch and operate damper as may be required for smoke management functions. Allow damper to remain operable while temperature is below 350 degrees F. Switch shall comply with NFPA 92A and be UL classified.

B. Interface with smoke detectors, building fire alarm systems or remote indicating and control stations.

C. High-limit temperature sensor:

1. Returns damper to fire protection mode when temperatures reach operational limit of damper and actuator assembly of 350 degrees F.
2. Conform to NFPA 92A.
3. Replaces controlled closure devices on standard dampers.

D. Blade position indicator switches: Two position-indicator switches linked directly to damper blade to remotely indicate damper blade position.

E. Picture frame mounting angles:

1. One-piece, roll formed retaining angles, 1½ by 1½ inches. Requires factory sleeve.
2. Factory-matched and -shipped on individual damper with factory-prepunched screw holes.

F. Steel mullions: For dampers in oversized masonry wall openings.

G. Provide breakaway connection: Drivemate, Ductmate or equal.

2.07 BALANCING DAMPERS – SINGLE BLADE

A. Provide volume dampers as specified or shown on the Drawings for proper balancing and distribution of air, in the various branches of the ductwork for use in testing and balancing the system. Dampers shall be installed separate and independent from the damper specified to be set behind supply, return and exhaust air grilles. Provide single-blade dampers in ducts 24 inches in width or less, or 12 inches in height or less. Provide multiple-blade dampers for all other duct sizes. Coordinate with the air-balancing contractor and provide additional dampers required for proper air balance.

B. Provide single-blade and quadrant type volume dampers of minimum 20-gauge round or 22-gauge rectangular galvanized steel construction, pivoted to turn easily. Provide operating handles and Ventlok 641 or equal locking devices mounted on outside of the duct in an accessible location. Blade shall have 4 full-length brakes for increased stiffness and rigidity.

C. Damper component penetration shall be closed and sealed consistent with the specified duct sealing class. End bearings are required for 3-inch water gauge class.

2.08 BALANCING DAMPERS – MULTIPLE BLADES

A. Manual dampers shall have a minimum 16-gauge galvanized steel channel frame with mounting flanges and axles set in molded polycarbonate or oil-impregnated bronze bearings. Axles shall be minimum of ½-inch in diameter and shall be interlocked with blades to positively eliminated slippage.

B. Blades shall be minimum of 16-gauge galvanized steel. Manual dampers shall have a minimum of four breaks running the entire length of the damper to assure rigidity and tight close-off. Blades shall be on centers no greater than 9 inches and no blade shall exceed 48 inches in length. All blades shall be interconnected to act in unison for opposed blade operation.

C. When installed, damper frame shall be gasketed or caulked to eliminate leakage between duct or plenum and damper frame. Head and sill shall have stops. Damper shafts shall be marked to indicate blade position.

D. Dampers shall be provided with Ventline 560 or approved equal, locking quadrants of sufficient size and design to securely hold the damper sections and blade linkage hardware.

2.09 BACKDRAFT DAMPERS – COUNTERBALANCED TYPE

A. Provide counterbalanced backdraft dampers as specified and where indicated on the Drawings. Each damper shall be sized as indicated on the Drawings, and shall be suitable for installation in the mounting arrangement shown.

B. Backdraft damper shall be the heavy-duty pressure relief counter-balanced shutter type similar to Ruskin type CBD4, or approved equal.

C. Damper frame shall be minimum 16-gauge galvanized steel or 16-gauge aluminum. Damper frame shall be of channel construction for ductwork mounting or have a front flange when installed in a wall.

D. Damper blades shall be minimum 16-gauge galvanized steel or 16-gauge aluminum. Provide individual adjustable counterweights on each blade. The damper shall be capable of maintaining static pressures of 0.05 to 0.20 inches water gauge. Furnish tie bars constructed of minimum 16-gauge galvanized steel or 16-gauge aluminum on damper sections over 24 inches wide. After damper has been installed, counterweights shall be adjusted to balance the system static pressure as directed by the test and balancing contractor.

E. Damper blades shall have polyurethane foam, neoprene, or vinyl gaskets glued, riveted or rolled into blade edges.

F. Damper bearings shall be molded polycarbonate, bronze oilite, nylon, or cycoloy.

G. Furnish counter-balanced backdraft dampers with No. 1.5 mesh aluminum bird screen for rear mounting where counter-balanced backdraft dampers are mounted in outside walls.

2.10 BACKDRAFT DAMPERS

A. Furnish and install backdraft dampers as specified and where indicated on the Drawings. Each damper shall be sized as indicated on the Drawings and shall be suitable for installation in the mounting arrangement shown. Backdraft dampers mounted in roof curbs shall be secured to galvanized steel support angles fastened to the curb.

B. Backdraft dampers shall be heavy-duty relief shutter type suitable for wall- and duct-mounting or installation at a centrifugal fan discharge. Backdraft dampers shall be similar to Ruskin Type BD2-A1 for face velocities to 1,500 feet per minute and Ruskin Type BD2-A2 for face velocities to 2,500 feet per minute or approved equal.

C. Damper frame shall be constructed of minimum 0.090-inch thick aluminum or minimum 18 gauge galvanized steel. Damper frame shall be of channel construction when installed in ductwork or have a front flange when installed in a wall.

D. Damper blades shall be constructed of minimum 0.025-inch thick extruded aluminum suitable for face velocities up to 1,500 feet per minute and minimum 0.05-inch thick extruded aluminum for face velocities to 2,500 feet per minute. Damper blades shall have neoprene or vinyl gaskets riveted or rolled into the blade edge. Each backdraft damper section shall be furnished with tie bars constructed of minimum 16-gauge aluminum. Furnish two tie bars on damper sections over 40 inches wide.

E. Damper bearings shall be molded polycarbonate, bronze oilite, nylon, or cycoloy.

F. Furnish backdraft dampers with 1½-inch by 1½-inch 22-gauge wire mesh aluminum bird screen for rear mounting where backdraft dampers are mounted in outside walls.

G. Damper leakage shall not exceed 12 cubic feet per minute per square foot of damper face area at 0.5 inches water gauge differential pressure.

2.11 REMOTE CABLE CONTROLS FOR DAMPERS

A. Manufacturer shall supply all necessary hardware for simple installation of remote cable controls system including the Bowden aluminum angle bracket and the Bowden control hub to accommodate the cable control system mounted on the damper.

B. Cable control system shall consist of Bowden cable 0.054-inch stainless steel control wire encapsulated in $^{3}/_{16}$-inch flexible galvanized spiral wire sheath to insure positive operation for up to 50 feet (can be reduced if there are multiple turns or bends).

C. Control kit shall be designed for use with internally or externally controlled round or rectangular dampers and shall consist of 14 gauge steel rack and pinion gear drive to convert rotary motion to push-pull motion. Control shaft shall be D-style flattened with 265-degree rotation providing graduations for positive locking control and linear travel.

D. Control mounting options include ceiling framework, behind grilles, on or inside plenum slot diffusers and other various types of diffusers or through ceiling via 1-inch diameter inconspicuous access port. Twisting type cables are not acceptable.

E. Manual quadrant shall be commercial quality, locking type for ⅜-inch square shaft. Provide extended base for externally insulated ductwork.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install dampers square and free from twist or racking with blades running horizontally.

B. Do not compress or stretch damper frame into duct or opening.

C. Handle and lift damper using sleeve or frame. Do not lift damper using blades, accessories, actuator, or jackshaft. Handle dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

D. Provide conveniently located access doors, of ample size for resetting the dampers. Duct mounted grilles, registers or diffusers can be used for access as long as such access is readily available as determined by the Architect, Owner or Authority Having Jurisdiction.

E. Install automatic control dampers of louver pattern including smoke dampers and fire/smoke dampers, as indicated on the Drawings or as specified in intake ducts and/or plenums, discharge ducts and plenums from fans, etc. These dampers shall be provided by the automatic control contractor.

F. Provide a 16-gauge elevated platform at least ⅛-inch higher than the insulation thickness for all balancing dampers installed in externally insulated ductwork. Damper shaft bearing shall be mounted on elevated platform.

G. Install remote operators for balancing dampers where damper is located above drywall, plaster or other inaccessible ceiling construction where access panels are not provided.

H. Fire damper operation shall be tested after the installation is complete. Static fire dampers shall be tested with the system fans not operating. Dynamic fire dampers shall be tested with system fans operating at their maximum static pressure ratings. A written certificate shall be issued by the Contractor to the Owner stating:

1. Damper identification
2. Damper location

3. Date tested
4. Names and signatures of witnesses and testing personnel

I. Provide a copy of certification to system balancing agent for inclusion in balancing report.

J. Size and quantity of dynamic fire damper shall be based on the UL listing of the damper manufacturer. Provide intermediate mullions and split duct connections as required.

K. Provide ribbon at each manual damper handle.

END OF SECTION 23 33 13