How to Estimate the Cost of Fire Damper Upgrades within a Hospital

CPE Candidate No. 0115830

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Autobiographical Sketch

Jenna Swiecki was born and raised in central Illinois. She earned a B.S. in General Engineering, with a secondary concentration in Construction, from the University of Illinois at Urbana-Champaign. During summer breaks from college, she worked as a quality control technician testing concrete on a major highway reconstruction project. After graduation, Jenna moved to Chicago, Illinois, to work as a Project Engineer, and later a Project Manager, for Novak Construction. During her tenure at Novak, she built Costco Wholesale warehouses and gas stations throughout the East Coast and Midwest, and was involved with various hospital upgrades and assisted-living facility renovations. At the end of 2014, after stepping away from construction for three years to raise two small children, Jenna relocated to San Diego, California, to work as a Cost Manager for the Healthcare Division at Cumming Corporation, an international project management and cost consulting firm.

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SECTION 1 - INTRODUCTION:

This paper will discuss how to estimate the cost of fire damper upgrades within a hospital, which requires much more consideration than a simple quantity takeoff multiplied by standard unit rates. The primary focus will include the architectural and HVAC elements. Fire suppression, fire alarm, and electrical aspects of fire life safety upgrades will not be discussed in any detail in order to maintain brevity and clarity.

MAIN CSI DIVISIONS (MasterFormat 2014)

Division 01 – General Requirements

Division 02 – Existing Conditions

Division 07 – Thermal and Moisture Protection

Division 08 – Openings

Division 09 – Finishes

Division 23 – Heating, Ventilating, and Air Conditioning (HVAC)

CSI SUB-DIVISIONS (MasterFormat 2014)

Sub-Division 013500 – Special Procedures

Sub-Division 024100 – Demolition and Structure Moving

Sub-Division 078000 – Fire and Smoke Protection

Sub-Division 083100 – Access Doors and Panels

Sub-Division 092000 – Plaster and Gypsum Board

Sub-Division 092900 – Gypsum Board

Sub-Division 095000 – Ceilings

Sub-Division 098000 – Acoustic Treatment

Sub-Division 099000 – Painting and Coating

Sub-Division 230000 – Heating Ventilating, and Air-Conditioning (HVAC)

Sub-Division 230700 – HVAC Insulation

Sub-Division 233100 – HVAC Ducts and Casings

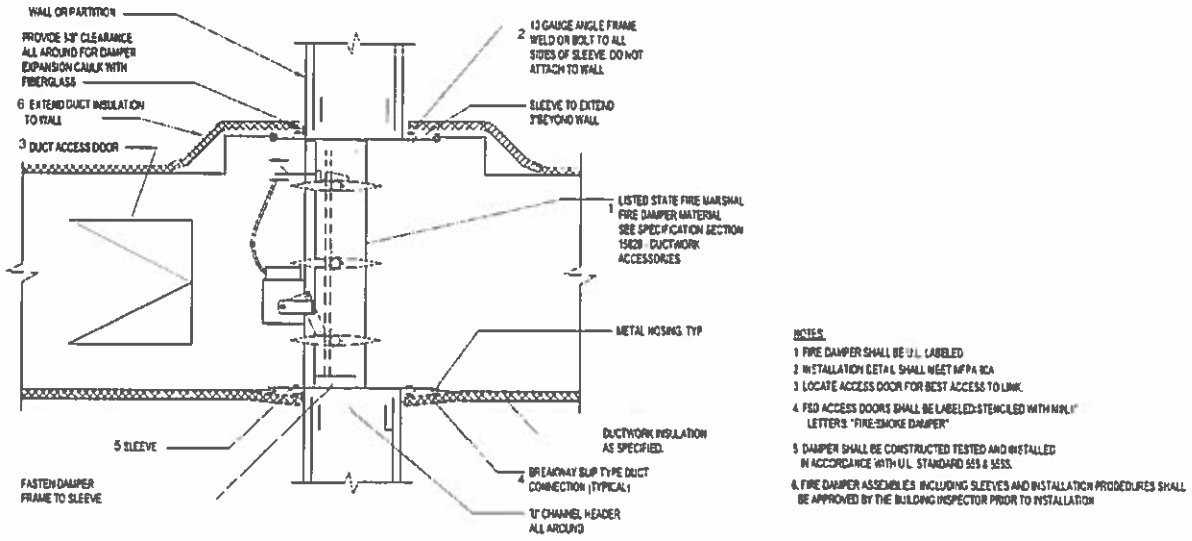
Sub-Division 233000 – HVAC Air Distribution

BRIEF DESCRIPTION

Fire dampers are a mechanical component installed within an HVAC duct at the point where the duct penetrates a fire-rated assembly. In the event of a fire or smoke alarm, the damper will infill the duct opening. A fire damper typically consists of an accordion-style, metal curtain or rotating metal blades, equal in size and shape to the duct in which it is installed. Dampers are categorized as "dynamic" or "static". Dynamic dampers utilize a motorized or spring-loaded curtain, capable of fully deploying despite resistance from forced air within the duct. Static dampers rely on gravity to pull the curtain into place. They may only be used within ductwork serving a unit that will automatically be shut down when a fire alarm or smoke detector is activated. Round dampers utilize a butterfly valve that is normally held parallel to the flow of air, but will rotate perpendicular to cut off air flow when activated. Each damper uses a fusible link that restrains the curtain or blade until it reaches a specified temperature. Upon reaching the design temperature, the link will fail; the curtain will deploy, closing off the duct and completing the fire-rated assembly. This link can also be manually disengaged to facilitate testing and inspections. Each damper is manufactured with a unique serial number, or control number, which should be recorded for governmental reporting and inspection records. The primary types of rated dampers include smoke, combination fire/smoke, motorized, and modulating fire dampers rated for one-, two-, three-, or four-hours. The dampers can be installed within the plane of a floor or wall, or just outside of the plane given adequate provisions. Regardless of the type of damper, the primary components of a complete assembly will include:

1. Fire/Smoke Damper with Fusible Link (not pictured)
2. Retaining Angles – attached to the damper sleeve in order to hold the damper securely within the fire-rated assembly
3. Access panels – these allow access to the damper mechanism for testing, inspections, and maintenance.

4. Breakaway Connection – allow the ductwork to disengage from the damper sleeve. This will prevent a fire-rated assembly from being pulled down by collapsing ductwork.
5. Sleeve – an extension of the damper assembly to facilitate connections without jeopardizing the function of the damper.
6. Duct Insulation – where applicable, duct insulation should extend to the partition.



2 FIRE / SMOKE DAMPER DETAIL
1" = 1'-0"

***(Figure 1)**: Typical Fire/Smoke Damper Detail*

Fire dampers must be inspected periodically for proper operation. Current NFPA codes will dictate the frequency of testing required based on the building classification. Aside from the predictable life-cycle issues related to the damper mechanisms, hospitals may elect to, and/or be required to, audit the complete installation of each damper, often due to building occupancy changes or other fire life safety upgrades. For a number of reasons, incorrect or inadequate fire-rated assemblies can slip by unnoticed for years. The primary reason these errors go unnoticed is the concealed nature of ductwork; but also a simple lack of awareness from facilities engineers and contractors alike. Due to the complex code requirements surrounding these assemblies, they are often misunderstood.

In order to facilitate inspections, the damper should be clearly labeled with all information as required by the authority having jurisdiction. This labeling will typically be mounted on the nearest ductwork facing the wall or ceiling access panel. The architectural access panel frame should also be discreetly yet clearly marked with the damper identification number as assigned by the facility or architect of record.

SECTION 2 – TYPES AND METHODS OF MEASUREMENT:

Quantity surveys typically include a count of each (EA), measurement of length in linear feet (LF), and measurement of area in square feet (SF). Typical derived units of measure include weight, in pounds (LBS) or tons (TN), and volume, in cubic feet or cubic yards (CF or CY). Square foot measurements are also often derived from linear foot measurements. Early-level estimates will use a measure of the overall gross square foot (GSF) area of work to assign allowances for undefined work items.

Typical Units of Measure

Each (EA)	Linear Foot (LF)	Square Foot (SF)	Pounds (LBS)
Fire Damper	Retaining Angles	Metal Studs	Ductwork
Breakaway Connection	Firestop Sealant	Drywall	
Access Panels (Arch.)	Acoustic Caulk	Shaft Liner	
Access Panels (Duct)	Mineral Wool	Batt Insulation	

Items such as drywall and metal studs, that go hand-in-hand, can often be derived from the same takeoff. For example, the linear foot of new wall will be taken off directly from the plans. To calculate the metal studs, the linear foot of wall will be multiplied by the height of the studs. For a typical partition with drywall on both sides, the drywall can be calculated using the same linear footage multiplied by two times the installed height of drywall. Using MasterFormat, it is assumed that elements such as fasteners, taping, and finishing the drywall are included within the unit cost and do not need to be taken off individually.

For renovation work, the estimator will determine what unique elements will be present before establishing the takeoff conditions. For instance, if there will be many completely new damper locations, there is no need to take off each component of a new damper individually. It will be understood that the total count of dampers of a given size will be used to derive quantities for breakaway connections, access panels (in-duct), retaining angles, etc. Furthermore, any individual takeoffs for items such as "New Access Panel (In-Duct)" will imply it is for installation at an existing damper that was missing an access panel, and will be counted in addition to the previously derived quantity.

Infection and dust control measures are considered under general requirements and include items such as: temporary barricades and containment cubes, air scrubbers and HEPA filters, negative air pressure monitors, coveralls, and walk-off mats. While these may be covered in the estimate as a gross square foot or percentage of overall project cost (typically based on Owner preference), it is important to have a back-up estimate of these items. This will ensure that the unit rate applied to the established metric is adequately capturing the potential cost exposure.

SECTION 3 – SPECIAL FACTORS – EFFECTS ON TAKEOFF AND PRICING:

As with any renovation project, there are many factors to consider when establishing quantities and unit rates.

Existing Conditions

To begin evaluating the existing conditions, it will be important to survey the type and function of the rooms that will be affected by construction activities. Certain rooms within a hospital may require additional manpower, specialized tools, or more stringent infection control measures. For example, work done within an active mental health ward will have special requirements. Tools will need to be concealed and constantly monitored by a support person while the journeyman completes repairs. Access panels will require a specialized screw driver to operate. If work is to be done in occupied rooms,

the timing will need to be scheduled around the room's availability, which is often difficult to predict. Work within operating suites requires equipment to be wrapped for containment and all workers to wear coveralls and shoe and hair covers. These considerations will reduce productivity and may require premium rates.

Bid Documents & Facility Familiarity

Based on the drawings presented for estimating, it may be evident that the facility has kept accurate as-built drawings on file, in which case, the allowances for unforeseen conditions may be reduced. However, if the drawings have no redlines and are considerably outdated, they will likely require a significant allowance for unforeseen conditions. The estimator's familiarity with a given facility may also help to provide a comfort-level with reduced contingencies. When making assumptions, the notes section of the estimate should carefully explain what factors have been considered to facilitate full understanding of the estimate. It is important to thoroughly evaluate the full extent of work required at each damper location. While most locations may require cursory upgrades, some may require specialized UL-listed[1] repairs. These will take time to document and may require specialized materials.

Schedule

It is important to review the anticipated schedule with the Owner prior to finalizing the estimate. A more detailed schedule may be required to determine if shift-work can be considered based on any applicable union agreements. When work is dependent on many real-time factors, such as waiting for hospital staff to facilitate access, a fast schedule may result in even greater inefficiencies if a crew is waiting for access to a ward. The proposal should be thoroughly evaluated for feasibility, to establish accurate prices and expectations from all parties. The function of the affected HVAC system can also impact the schedule and create other expenses. For instance, clearance would need to be obtained before working on exhaust systems for isolation rooms or IV preparation exhaust hoods. Some hoods also require decontamination if they are shut down for any reason, so it is important to clarify with the owner how those expenses will be handled up-front.

Documentation Requirements

Before estimating the cost of a project, it is important to understand what documentation will be required for inspections and certifications. Some government agencies require significant documentation including original signatures, records for each damper installed, and UL listing documentation for each fire-rated assembly within the building. It is helpful to be familiar with the inspectors having jurisdiction, so that the documentation can be tailored to their preferences and primary areas of focus. Proper documentation can fast-track the inspection process and avoid costly delays associated with re-inspections. General conditions should accurately reflect the amount of office work required to prepare quality documents.

Test and Balance

Another factor that should be clarified is the test and balance inspection of the existing system. A discussion should be had with the owner before submitting an estimate to determine the last time the building HVAC system had been evaluated. It is preferred to run a full test and balance on any system prior to beginning work, to ensure that the existing system is working properly. This will preclude the contractor from being wrongly held liable for test and balance issues at the end of the project. However, if work is limited and does not involve any HVAC units, it should be reasonable to agree with the owner that test and balance should not be required before or after construction.

Small Quantities vs. Large Quantities

As a general rule of thumb in construction, small quantities are more expensive than large quantities. Economy of scale can be achieved through bulk-purchasing and some assemblies can be prefabricated in a shop versus in the field. In a remodel, the concentration of work can also dictate the savings or premium applied to quantities in the estimate. For instance, the upgrade of five dampers that can be accessed from one or two rooms will cost less to install than five spread throughout the entire floor of a hospital. Cost per unit for the same five would also be driven down if another 50 were being installed,

since the time spent gaining familiarity with the building and staff will be distributed over a much larger scope.

Geographic and Fiscal Market Factors

As is the case with any construction work, and business in general, it is important to consider the current and future market conditions when establishing unit rates. Availability of manpower and lead times for material can contribute significantly to increased project costs and delayed schedules. These can be accounted for in the short-term within unit rates, or with the inclusion of Escalation as a percentage of total construction cost for long-term projects.

Seasonal Effect on Work

Since most, if not all, work for this scope will take place in conditioned space, typical seasonal factors will not play a significant role. Areas with poor winter conditions may see a slight drop in pricing during, as more resources become available during the seasonal slow-down. For compact schedules, it will be important to consider the number of holidays that fall within a calendar-day schedule, as the winter holiday season can have a significant impact.

SECTION 4 - Overview of Labor, Material, Equipment, Indirect Costs and Mark-Up:

In a basic estimate utilizing CSI MasterFormat, the owner will be presented with a document that includes a list of quantities and unit rates to support the estimated cost. For simplicity, the unit rates will be a fully-loaded value, meaning it includes everything, outside of General Conditions, required in order to get that particular work item from the factory to the installed finished product. The primary factors in establishing a viable unit rate are: labor, material, equipment, indirect costs, and mark-up.

Labor Rates

Labor rates are typically established by a company for each level of billable employees (e.g. laborer vs. journeyman). These rates are calculated to include the full cost of the employee's take-home pay, taxes, workman's compensation, social security, Medicare, and benefits, which include things like health

insurance, holiday pay and paid time off. These are typically reviewed annually to accommodate inflation, tax changes, etc. In unionized areas, this will be revisited after union contract agreements are reached to accommodate any wage increases and/or working arrangement stipulations. Depending on the provisions of the contract, labor is typically factored at a straight-time (regular business hours) rate, while premium time rates for night-work or shift-work are included as an add-alternate unit rate or percentage increase of the construction cost.

Material Rates

Material rates are established using historical data and current market trends. Lead time should be considered and expediting fees included in the unit rates if the material is on the critical path of a fast-tracked schedule. Material rates should include all facets of cost to get the material into the journeyman's hands. This can include sales tax (unless the project is tax exempt), shop drawings, design fees, mounting hardware, freight to job site, storage on-site, and punch list work. For items that have inherent waste factors, such as metal studs and drywall, the established unit rates should cover the expense of anticipated waste.

Equipment Rates

For equipment that is owned by the company, the initial cost, maintenance costs, and depreciation will be evaluated to determine the rate to be charged for a given work item. For non-standard equipment, or equipment that will be rented, a quote should be obtained and the cost of the rental (including delivery to site, fuel, etc.) should be distributed among the work items that will utilize that piece of equipment.

Indirect Costs

Indirect costs should also be factored into the installed unit rate. Indirect costs include all miscellaneous items required for a complete installation that are not directly covered under General Conditions. These typically consist of things like small tools, consumable goods like nails and screws, plan update and

review, clean-up, and contractor permits (excluding Building Permits, which are typically paid directly by the owner).

Mark-up

Unit rates for lower-tier subcontracts should be inclusive of their complete contract value, including mark-up. The General Contractor's mark-up should be carried "below the line"[2] as a percentage of the total cost of construction.

In the absence of adequate historical data for a given work item, or as a check-number[3], there are numerous places to find standard unit rates for almost every work item imaginable. RS Means is a primary source for published unit pricing, accessed with a paid subscription. Some government entities also publish a unit price book that can be used to check the validity of determined unit rates, although these are primarily focused on site work pertaining to the Department of Transportation. When in doubt, the supplier of the material in question should be contacted for current pricing and expected labor productivity rates.

SECTION 5 – SPECIAL RISK CONSIDERATIONS:

While construction activities within any occupied building can pose hazards, work to the HVAC system of an active hospital is arguably one of the most perilous. Building occupants often have compromised immune systems, making them highly susceptible to infection from dust and debris created during construction activities. Contractors must be conscious of the risks at all times, as failure to properly ensure negative air pressure could result in the loss of a life. This constant onus of safety will typically results in lower productivity, coupled with costly safety equipment. Once construction is complete, the importance of properly installed fire dampers is paramount. In the event of a fire within a hospital, the integrity of the fire-rated partitions can mean life or death for immobilized patients.

SECTION 6 – RATIOS AND ANALYSIS – METRICS AND REVIEW FOR PROPER QA/QC:

Ideally, some historical data will be available for comparison of the estimate at hand. A simple cost per square foot comparison may be a helpful benchmark, provided the previous projects are based on a similar building use and size. However, a more accurate benchmark would be a typical cost per type of damper. For example, the historical cost of a 'new static damper installed in an existing shaft wall', or a 'new damper installed in an existing floor plate' could be compared to the 'unit cost per location' from a similar breakdown of the current estimate.

Another approach to validating the current estimate would be to step back and consider the overall project using basic manpower logic. The estimator will need to consider the schedule that has been agreed upon and the staffing that will be required to meet that schedule. Instead of pricing the job using unit rates that have been loaded with labor, the pricing could be re-evaluated for straight material cost with labor considered separately. The black and white takeoff should provide a reliable quantity for material pricing. The next step would be to consider how many journeyman (and laborers, etc.) will be assigned to the project and for how long. The estimator will consider if the lump sum of the construction costs is enough to cover: the full salary of the journeymen for the full duration, the rental or depreciation of containment carts, walk-off mats, and HEPA filters, and the base material for the job. On projects of this nature, it is likely that there will be significant unproductive time, so it is important to consider the overall schedule to ensure the decreased productivity has been accounted for in the unit rates.

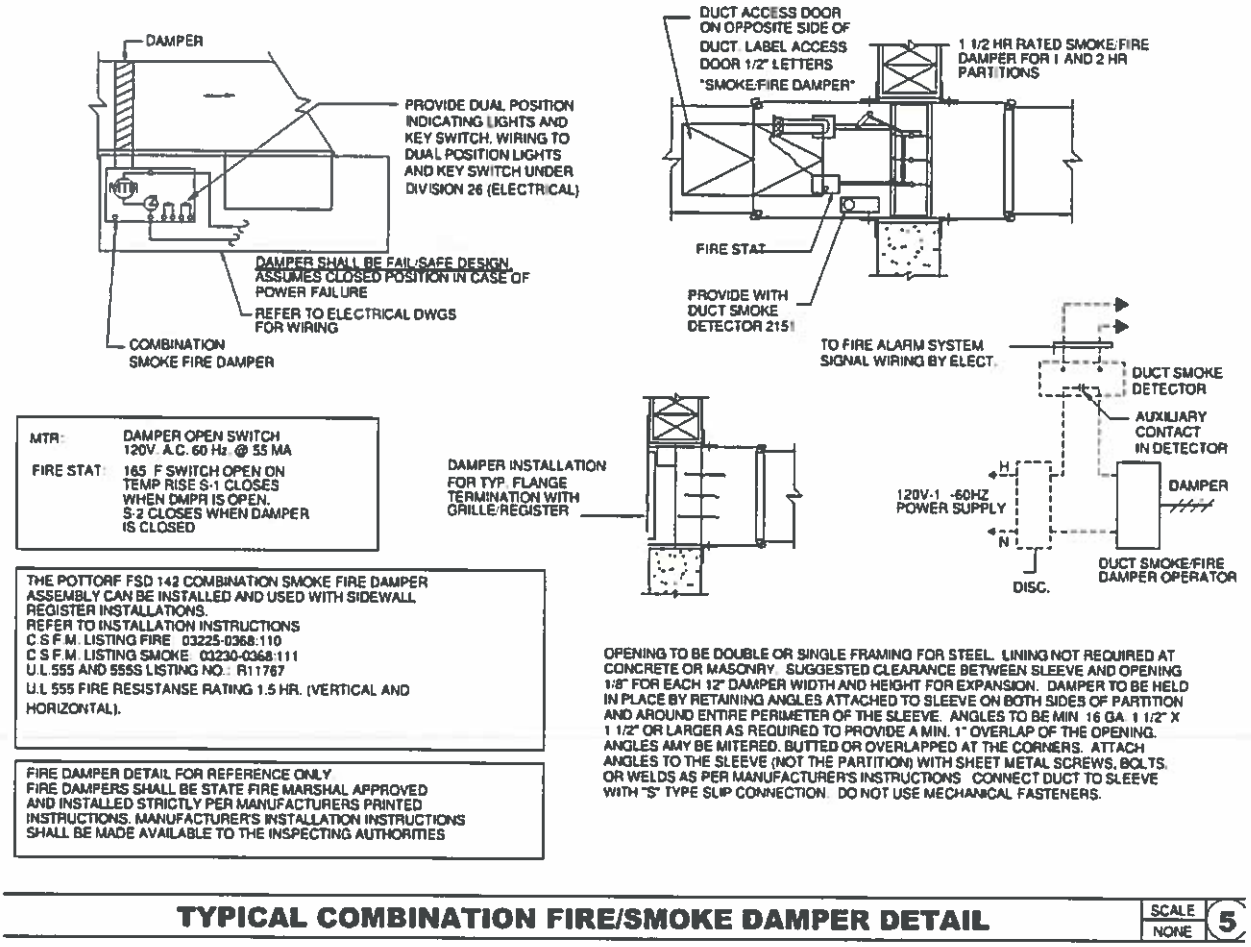
SECTION 7 – MISCELLANEOUS PERTINENT INFORMATION:

Depending on the method of project delivery, such as lump sum, time and materials, or guaranteed maximum prices, unit rates and allowances may need to be adjusted. The discussion above generally relates to a lump sum contract. However, if the project will be done on a time and materials basis, the labor rates will not need to be loaded for inefficiencies because unproductive time will be billable. This

delivery method can be beneficial for short projects on a fast schedule because the owner is incentivized to fully cooperate in order to facilitate quick and easy access to areas of work, since waiting time will be included on the ticketed work.

SECTION 8 – SAMPLE DRAWINGS, SCHEDULES AND SECTIONS:

The following are a few examples of relevant documents that are often encountered in the course of estimating fire damper upgrades within a hospital.



(Figure 2): A sample typical fire damper detail from a hospital project in the state of California

2.43 DEMOLISH EXISTING FLOORING.

2.44 DEMOLISH PORTION OF EXISTING 2-HOUR SHAFT WALL AS REQUIRED BY NEW MECHANCIAL DUCT AND DAMPER. FRAME NEW OPENING AND REPAIR EXISTING 2-HOUR SHAFT WALL ASSEMBLY. SEE FRAMING DETAILS ON SHEET A5-03 AND 2-HOUR SHAFT WALL TYPE DETAIL 6/A5.20. COORDINATE LOCATION AND OPENING SIZE WITH MECHANICAL DRAWINGS. PROTECT SHAFT OPENING WITH TWO LAYERS OF 5/8" TYPE 'X' GYPSUM BOARD DURING CONSTRUCTION.

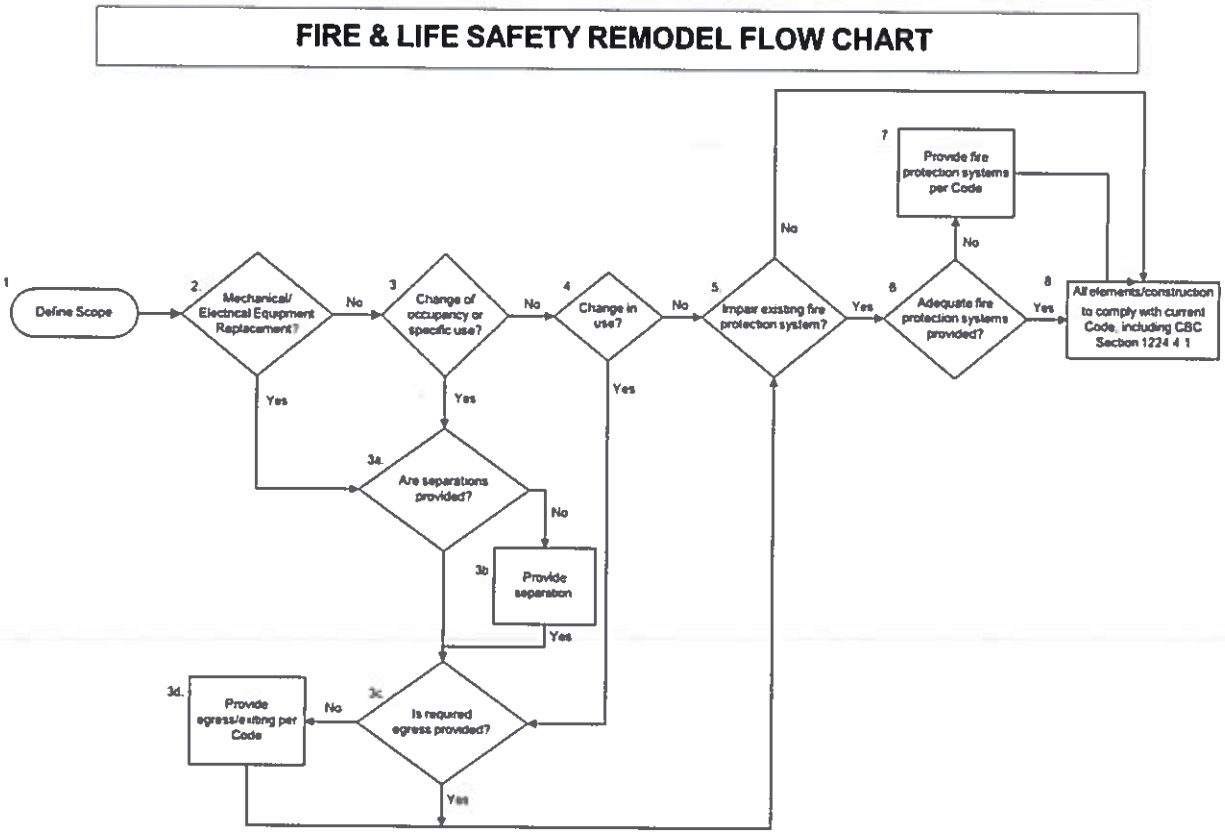
2.46 REMOVE EXISTING WALL PROTECTION PANEL.

2.47 NEW GLAZING AND MULLIONS. SEE SHEET A4-01 AND A4-02 FOR SCOPE OF WORK.

2.48 DEMOLISH PORTION OF EXISTING CONCRETE FLOOR AS REQUIRED BY NEW FLOOR SINK. COORDINATE WITH PLUMBING DRAWINGS.

2.49 DEMOLISH DOOR AND HARDWARE ONLY.

(Figure 3): *A sample construction note that outlines scope and special considerations for fire life safety during construction activities.*



(Figure 4): *Fire & Life Safety Remodel Flow Chart from the Office of Statewide Health Planning and Development, Facilities Development Division (OSHPD) CAN 2-102.6.* (Coleman P. , Revised 2013)

PROJECT CODE SUMMARY

MINIMUM FIRE-RESISTANCE REQUIREMENTS:

FIRE-RESISTIVE RATING REQUIREMENTS FOR BUILDING ELEMENTS : *(PER CBC TABLE 601)*

TYPE OF CONSTRUCTION:	IA	IIB
PRIMARY STRUCTURAL FRAME :	3 HOURS	0 HOURS
BEARING WALLS (EXT) :	3 HOURS	0 HOURS
BEARING WALLS (INTR) :	3 HOURS	0 HOURS
NON-BRG WALLS AND PARTITIONS (EXT) PER CBC TABLE 602	0 HOURS	0 HOURS
NON-BRG WALLS AND PARTITIONS (INTR) :	0 HOURS	0 HOURS
FLOOR CONSTR AND SECONDARY MEMBERS :	2 HOURS	0 HOURS
ROOF CONSTR AND SECONDARY MEMBERS :	1.5 HOURS	0 HOURS

FIRE-RESISTANCE RATING FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE (X) : *(PER CBC TABLE 602)*

CONSTRUCTION TYPE / OCCUPANCY	IIB / B	IA / S-1	IIIA / A-3	VA / R-1
X < 5 FT	1 HOURS	2 HOURS	1 HOURS	1 HOURS
5 FT < X < 10 FT	1 HOURS	1 HOURS	1 HOURS	1 HOURS
10 FT < X < 30 FT	0 HOURS	2 HOURS	1 HOURS	1 HOURS
X > 30 FT	0 HOURS	0 HOURS	0 HOURS	0 HOURS

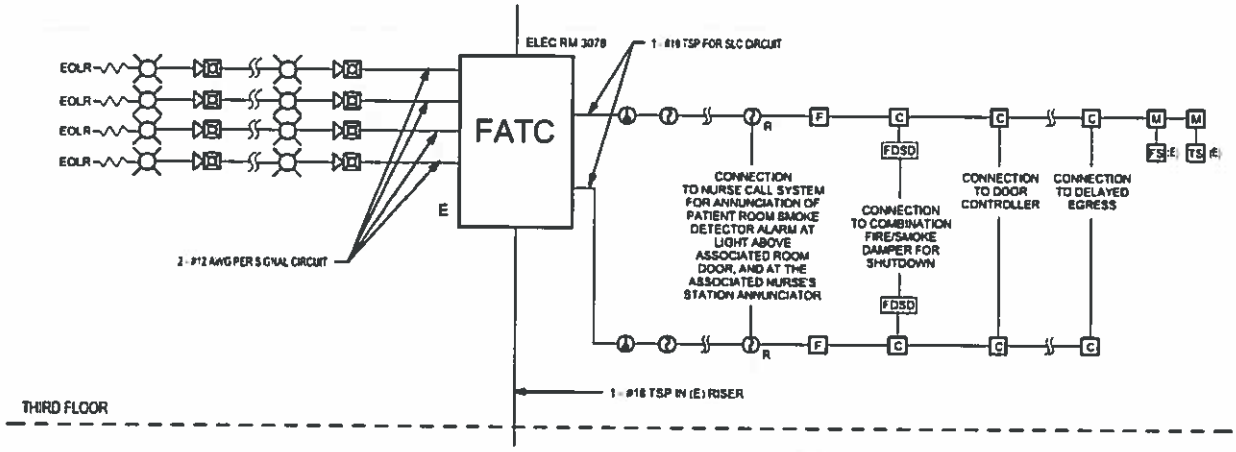
ADDITIONAL FIRE-RESISTIVE RATINGS :

DESCRIPTION	CODE SECTION	RATING (HR)
SHAFT ENCLOSURES	CBC 713.4	
FOUR STORIES OR MORE :		2
LESS THAN FOUR STORIES:		1
EXIT ENCLOSURES	CBC 1022.2	
FOUR STORIES OR MORE :		2
LESS THAN FOUR STORIES:		1
EXIT PASSAGEWAYS :	CBC 1023.3	2
HOISTWAY ENCLOSURES :	CBC 3002.1	2
ELEVATOR MACHINE ROOMS :	CBC 3006.4	2

CORRIDORS. *(CBC TABLE 1018.1)* SPRINKLERED ●
OCCUPANCY: *I-2* OCC LOAD SERVED: *>6* RATING (HR): *1*

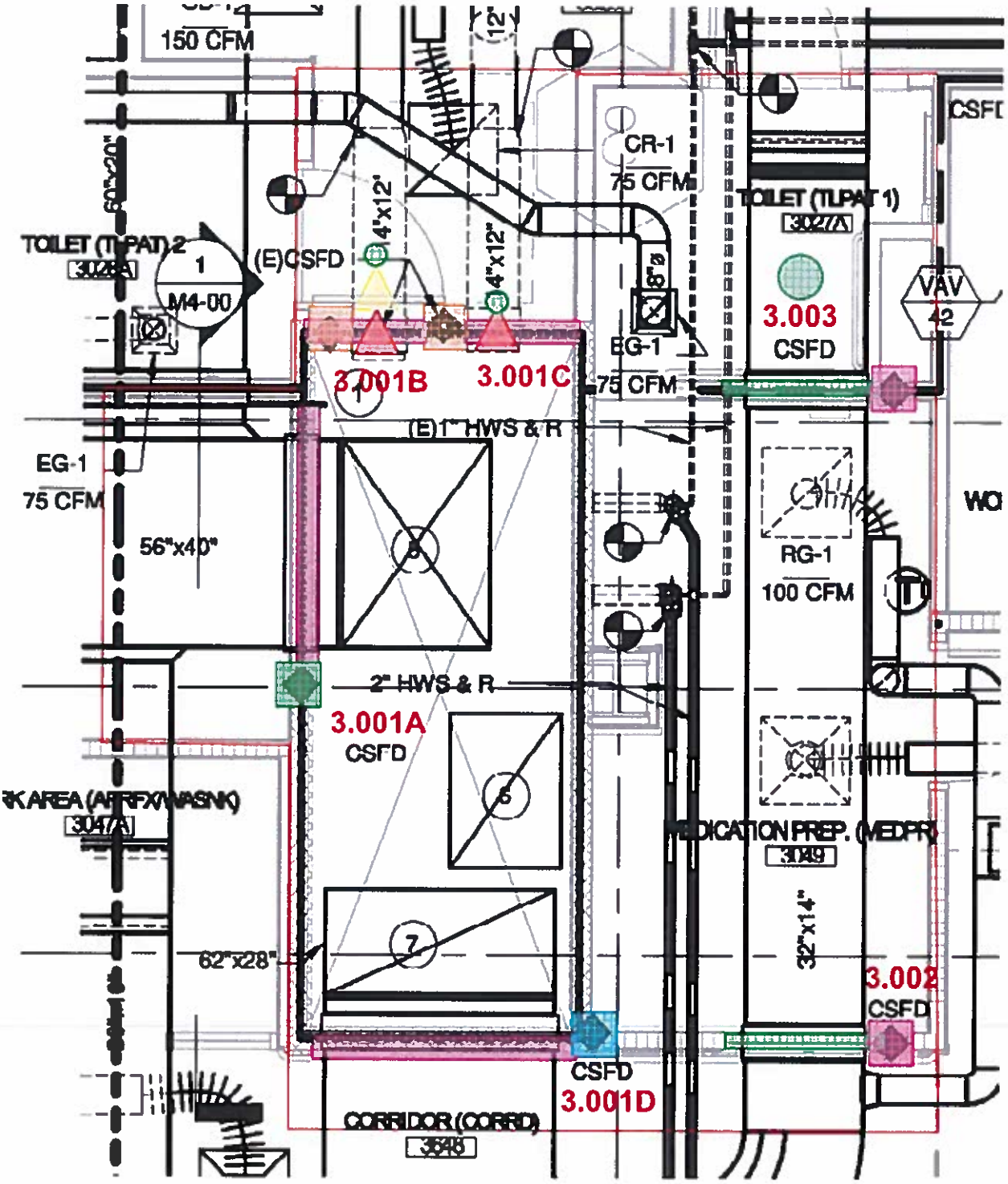
OPENING FIRE PROTECTION ASSEMBLIES, RATING AND MARKINGS TO BE PER *(PER CBC TABLE 716.5)*

***(Figure 5)**: This sample summary outlines the various code requirements within a given facility*



***(Figure 6)**: A sample single-line fire alarm diagram*

SECTION 9 – SAMPLE TAKEOFF AND PRICING:



(Figure 7): A sample construction document with takeoff performed in On-Screen Takeoff

No.	Name	Height	Quantity1	UOM1	Quantity2	UOM2	Quantity3	UOM3
01000 Control Areas								
(unassigned)								
(unassigned)								
1	Control Area	0"	380	SF	85	LF	1	EA
09100 Interior Metal Stud Walls								
(unassigned)								
(unassigned)								
3	Int. Metal Studs - Rated Wall, 1-hour, patch at new damper	6' 0"	7	LF	43	SF	2	EA
2	Int. Metal Studs - Shaft Wall, repairs to existing	6' 0"	17	LF	103	SF	4	EA
(unassigned)								
(unassigned)								
(unassigned)								
7	Existing CSFD, 14"x12"	0"	2	EA	0		0	
10	New Access Panel, Duct, 8"	0"	1	EA	0		0	
8	New CSFD, 32"x14"	0"	2	EA	0		0	
6	New CSFD, 56"x48"	0"	1	EA	0		0	
5	New CSFD, 62"x28"	0"	1	EA	0		0	
9	New Retaining Angles at Existing 14"x12" Damper	0"	2	EA	0		0	
08400 Speciality Doors								
(unassigned)								
(unassigned)								
11	New Access Panel, 24"	0"	1	EA	0		0	
02410 Bldg Demolition								
(unassigned)								
(unassigned)								
13	Remove sealants at existing damper & replace retaining angles, 14"x12"	0"	2	EA	0		0	

(Figure 8): The corresponding takeoff summary from On-Screen Takeoff for the scope of work in Figure 7, above

						Total Area:	380
Div.	Code	Component Description	Quantity		Unit Cost	$	TOTAL $
1	01 00 00	**GENERAL REQUIREMENTS**					
1	01 00 00	General Requirements					$2,111
1	01 00 00	General Requirements	4.0%		$21,108	$844	
1	01 00 00	Construction Phasing	6.0%		$21,108	$1,266	
1	01 30 00	Administrative Requirements					$1,055
1	01 35 00	Special Procedures					
1	01 35 33	Infection Control Procedures	5.0%		$21,108	$1,055	
1	01 50 00	Temporary Facilities And Controls					$633
1	01 54 00	Construction Aids					
1	01 54 16	Temporary Hoists or after-hours labor for stocking	3.0%		$21,108	$633	
		TOTAL GENERAL REQUIREMENTS					$3,799
2	02 00 00	**EXISTING CONDITIONS**					
2	02 40 00	Demolition And Structure Moving					$254
2	02 41 00	Demolition					
2	02 41 13	Selective Demolition					
2	02 41 13	Remove existing sealants	9	LF	$6.11	$53	
2	02 41 13	Remove existing partition/shaft wall	146	SF	$1.38	$201	
		TOTAL EXISTING CONDITIONS					$254
7	07 00 00	**THERMAL and MOISTURE PROTECTION**					
7	07 80 00	Fire and Smoke Protection					$2,899
7	07 81 00	Applied Fireproofing					
7	07 81 16	Cementitious Fireproofing					
7	07 81 16	Fireproofing patching	438	SF	$1.25	$548	
7	07 84 00	Firestopping					
7	07 84 13	Penetration Firestopping					
7	07 84 13	Premium for 1-hour rated partitions	146	LF	$7.80	$1,139	
7	07 84 43	Fire-Resistant Joint Sealants, premium	146	LF	$8.30	$1,212	
		TOTAL THERMAL and MOISTURE PROTECTION					$2,899
8	08 00 00	**OPENINGS**					
8	08 30 00	Specialty Doors and Frames					$173
8	08 31 00	Access Doors And Panels					
8	08 31 16	Access Panels And Frames					
8	08 31 16	Ceiling access panels, 24" x 24", supply	1	EA	$69.26	$69	
8	08 31 16	Ceiling access panels, 24" x 24", install	1	EA	$103.90	$104	
		TOTAL OPENINGS					$173
9	09 00 00	**FINISHES**					
9	09 20 00	Plaster And Gypsum Board					$2,920
9	09 22 00	Supports For Plaster And Gypsum Board					
9	09 22 16	Interior Wall					
9	09 22 16	Steel stud framing, 20 ga - 3 5/8" @ 16" o.c.	43	SF	$10.53	$453	
9	09 22 16	Steel stud framing, 20 ga - 4" CH studs @ 24" o.c.	103	SF	$14.43	$1,486	

9	09 29 00	Gypsum Board					
9	09 29 00	Interior Wall Sheathing					
9	09 29 00	Gypsum board, 5/8" thick, level 4 finish, type X	146	SF	$3.25	$475	
9	09 29 00	Shaft wall liner, 1" thick	103	SF	$4.91	$506	
9	09 80 00	Acoustic Treatment					$126
9	09 81 00	Acoustic Insulation					
9	09 81 16	Acoustic Blanket Insulation					
9	09 81 16	Interior sound batt insulation	146	SF	$0.86	$126	
		TOTAL FINISHES					$3,048
		MECHANICAL					
23	23 00 00	HVAC					
23	23 00 00	Heating, Ventilating, and Air-Conditioning (HVAC)					$749
23	23 05 00	Common Work Results For HVAC					
23	23 05 48	Vibration And Seismic Controls For HVAC Piping And Equipment					
23	23 05 48	Seismic bracing	380	GSF	$1.65	$627	
23	23 05 53	Identification For HVAC Piping And Equipment					
23	23 05 53	Identification	6	EA	$20.34	$122	
23	23 05 93	Testing, Adjusting, And Balancing For HVAC					
23	23 05 93	Test / balance HVAC				Excluded	
23	23 05 93	Start-up/check-out				Excluded	
23	23 30 00	HVAC Air Distribution					$13,987
23	23 33 00	Air Duct Accessories					
23	23 33 13	Dampers					
23	23 33 13	Combination fire / smoke damper, 32"x14"	2	EA	$1,177.87	$2,356	
23	23 33 13	Combination fire / smoke damper, 56"x48"	1	EA	$7,067.20	$7,067	
23	23 33 13	Combination fire / smoke damper, 62"x28"	1	EA	$4,564.23	$4,564	
		TOTAL HVAC					$14,736
		TOTAL MECHANICAL					$14,736
		TARGET COST OF WORK					$24,907
0	00 83 00	Construction Contingency	5.00%				$1,055
0	00 72 00	Contractor's General Conditions	9.00%				$1,995
0	00 81 00	Contractor's Fee	3.50%				$942
0	00 73 16	Insurance	1.00%				$251
0	00 73 18	Bonds	0.00%				$0
0	00 73 21	Subguard Insurance	1.25%				$264
0	00 87 00	Local Taxes	0.00%				$0
		BUDGET FOR BUILDING					$29,414

(Figure 9): A sample estimate using the quantities taken from Figure 7 and 8 above

Certain items, such as architectural access panels, will not be shown on the drawings, as their layout is left to the contractor's discretion. These items are generally estimated using a historically established ratio of count per gross square foot of work area. It is important to consider the actual number and layout of these items to ensure that the GSF quantity will be adequate but not overly conservative. In this instance, a typical ratio of 1 access panel per 250 SF of control area holds true. As a check-number, this work comes to $77.40/SF, or $7,353 per new damper, which is in-line with historical data for a similar scope of work.

SECTION 10 – GLOSSARY:

1. UL Listing: Stands for Underwriters Laboratories. A consultant that certifies the safety of consumer products.

2. Below the Line: This is a term to separate the work items above the subtotal "cost of work" from the "below the line" additions such as General Conditions, Fee, Insurance, and Subguard Insurance, which encompass the "direct cost of construction". Furthermore, the "soft costs" of a project would include the direct costs plus other intangibles such as building permits, architectural fees and engineering fees.

3. Check-number: Comparative pricing for the same or similar scope of work to verify the validity of an estimate.

SECTION 11 – REFERENCES:

Coleman, P. A. (October 2012). Guide for Working on Projects Under OSPHD Jurisdiction - Tips from the Experts. Sacramento, CA, USA: N/A.

Coleman, P. (Revised 2013, August 08). Fire & Life Safety Remodel Flow Chart from the Office of Statewide Health Planning and Development, Facilities Development Division, CAN 2-102.6. Los Angeles, CA, USA.

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Jenna Swiecki

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July 7, 2015

How to Estimate the Cost of Fire Damper Upgrades within a Hospital

By Jenna Swiecki

July, 2015

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Jenna Swiecki

Jenna Swiecki

July, 2015

Autobiographical Sketch

Jenna Swiecki was born and raised in central Illinois. She earned a B.S. in General Engineering, with a secondary concentration in Construction, from the University of Illinois at Urbana-Champaign. During summer breaks from college, she worked as a quality control technician testing concrete on a major highway reconstruction project. After graduation, Jenna moved to Chicago, Illinois, to work as a Project Engineer, and later a Project Manager, for Novak Construction. During her tenure at Novak, she built Costco Wholesale warehouses and gas stations throughout the East Coast and Midwest, and was involved with various hospital upgrades and assisted-living facility renovations. At the end of 2014, after stepping away from construction for three years to raise two small children, Jenna relocated to San Diego, California, to work as a Cost Manager for the Healthcare Division at Cumming Corporation, an international project management and cost consulting firm.