ESTABLISHING OVERHEAD AND BURDEN IN A SHEET METAL BUSINESS

SHEET METAL & AIR CONDITIONING CONTRACTORS’ NATIONAL ASSOCIATION
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CONTRACTOR OPERATIONS MANUAL TASK FORCE

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SECTION I: INTRODUCTION

Sheet metal/HVAC contractors are unique in the construction industry in that they engineer, manufacture and install products made from raw materials. The scope of services provided by sheet metal contracts creates confusion and sometimes conflict with owners and general contractors who may not be familiar with the cost structure of a sheet metal/HVAC contractor. The purpose of this document is to detail the various types of expenses incurred by a sheet metal/HVAC contractor in support of a proper determination of overhead and burden rates. The objective is to provide a clear and concise discussion surrounding the scope of services provided by the sheet metal/HVAC contractor and thus how overhead and burden should be calculated.

It is important to note that an owner or general contractor may hire a sheet metal/HVAC contractor for a complete set of services (i.e. – engineer, spatial coordination, manufacture and install) or a limited scope of services (i.e. – manufacturing only). This is unique to sheet metal/HVAC contractors and therefore this document is laid out such that each potential service has been isolated and the associated overhead and burden for each distinct service can be calculated.

Further necessitating this clarification is a shift in contracting models away from the low-bid model of previous generations towards sophisticated models of Design-Build, Design-Assist, Integrated Project Delivery (IPD), and other approaches. Owners and general contractors (collectively referred to as clients) are requiring greater transparency and insight into the pricing and business models of their specialty contractors. It is no longer sufficient to submit a price, and be awarded a contract solely based on that price. In addition to requiring proposals that include project specific elements like schedule, engineering approach, and material selection, clients expect to see breakdowns on direct costs and indirect costs, as well as details on overhead and burden.

Figure 1 below is a graphic that will be used throughout this document to discuss the fixed and variable costs associated with each service offering of a sheet metal/HVAC contractor. Each type of overhead and burden is described in detail in the appendices. Fixed costs are specifically defined as costs that are incurred regardless of whether the sheet metal/HVAC contractor has a project to design, manufacture or install. Variable costs are specifically defined as costs that are incurred as a result of a project being designed, manufactured or installed. What follows is a brief description of each.

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**Figure 1 – Sheet Metal/HVAC Contractor Overhead and Burden**

<table>
<thead>
<tr>
<th>Overhead &amp; Burden</th>
<th>Fixed Costs</th>
<th>Variable Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial Coordination</td>
<td></td>
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</tr>
<tr>
<td>Overhead &amp; Burden (See Appendix B)</td>
<td></td>
<td></td>
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<tr>
<td>Manufacturing</td>
<td></td>
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<tr>
<td>Overhead &amp; Burden (See Appendix C)</td>
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<tr>
<td>Installation</td>
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<tr>
<td>Overhead &amp; Burden (See Appendix D)</td>
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</tbody>
</table>

Traditional Overhead & Burden

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Traditional Overhead and Burden (see also Appendix A)

Traditional overhead and burden is what most owners and general contractors understand. The sheet metal/HVAC contractor has a building, an estimating staff, an accounting staff and an executive team. The contractor must pay for insurance, utilities, property taxes and the like. All of these expenses are required for the company to be in business. Owners and general contractors generically refer to this as the contractors overhead and what is covered by the typical 10% allocation for overhead and 5% allocation for profit in the contract. For most sheet metal/HVAC contractors traditional overhead is likely less than 10%, their OVERALL overhead and burden encapsulating all services is much higher than 10%.

Spatial Coordination Overhead and Burden (see also Appendix B)

Spatial coordination is a generic term intended to cover engineering, design, detailing, CAD, BIM, etc. A generic term is being used to avoid a narrow definition of any given term or alternatively to avoid the variability these terms can have in the industry. Each project encountered by a sheet metal/HVAC contractor requires calculations and spatial coordination work to be performed to ensure the performance requirements can be met and that the product will fit in the designated space. There is no getting around this requirement. Traditional plan and specification specialty contractors would have limited spatial coordination capabilities. However, given the unique nature of a sheet metal business, they are required to have substantial coordination capabilities and thus they encounter overhead and burden associated with this service.

Manufacturing Overhead and Burden (see also Appendix C)

With minor exceptions, the sheet metal business is the only construction industry segment that consistently takes raw material and manufactures raw products into a finished or semi-finished form within a shop environment. It is important to note that the number and cost of the equipment required in a sheet metal manufacturing facility are significantly greater than those that would be found in a structural steel or pipe manufacturing facility. While those two industry segments rely primarily on welding equipment, there is a large variety of equipment required by even the smallest of sheet metal shops. The net result is highly specialized and expensive equipment with low utilization rates. The low utilization rates are due to the custom, job shop nature of the products that must be manufactured as there is no single standard for ductwork size and configuration. Low utilization rates mean the fixed costs must be spread across fewer products which means higher burden per piece of product manufactured.

Installation Overhead and Burden (see also Appendix D)

The installation phase of a project sees the lowest overall fixed cost but very high variable costs. This is because all the of the labor, materials, equipment and subcontracts are considered variable and dependent on the nature of the work. There are also statutory requirements such as FICA, FUTA and SUTA that must be captured and paid to the appropriate agency. Union contractors also have pension and benefits obligations that are defined by their collective bargaining agreements. Again, these would be considered variable costs as they vary with the labor. Most contractors buy personal protective equipment and charge it to a single general ledger account. The funds for this are accrued through a non-statutory burden accrual. An example might be $0.50 per hour tacked onto the labor. Additional things that a contractor might consider fixed as a part of the installation phase would be training, small tools, or consumables. However, if they are bought specifically for a project and charged to a project, then those costs would be considered variable and part of the project.
SECTION II: UNIQUENESS OF THE SHEET METAL INDUSTRY

Once again, with minor exceptions, the sheet metal business is the only construction industry segment that consistently takes raw material and manufactures raw products into a finished or semi-finished form within a shop environment. As such, it is defined as a Project Engineer-to-Order business. As illustrated in Figure 2 below, sheet metal/HVAC contractors must be able to provide all of the services illustrated in the Engineer-to-Order work flow. This is a very important point to understand as it is this broad scope of services that is unique to sheet metal businesses and is why the overhead and burden is so different than a typical specialty contractor.

Sheet metal/HVAC contractors are considered Project Engineer-to-Order when they are hired to provide spatial coordination, manufacturing and installation services. A sheet metal/HVAC contractor would be considered Engineer-to-Order if the owner only hired them for spatial coordination and manufacturing services and had someone else install the product. An example of a Make-to-Order business is Dell. You pick what you want from a predefined list of options and they make your computer to order.

The bottom line is, without all the overhead necessary to support all the functions described in the project Engineer-to-Order work flow, building a custom sheet metal project would not be possible.

Establishing the proper burden may seem like a daunting task given all the types of costs that need to be considered. Figure 3 can be used by sheet metal/HVAC contractors not currently calculating their burdens, enabling them to start tracking costs and providing a flow chart that describes the sequence that sheet metal/HVAC contractors may use in determining their burdens.

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**Figure 2 – Lead Time, Overhead and Burden Requirements by Business Type**

<table>
<thead>
<tr>
<th>Project ETO Delivery Lead Time</th>
<th>Project Engineer-to-Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>Purchase</td>
</tr>
<tr>
<td>Manufacture/Fab</td>
<td>Assemble</td>
</tr>
<tr>
<td>Ship</td>
<td>Installation</td>
</tr>
<tr>
<td>ETO Delivery Lead Time</td>
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<tr>
<td>Design</td>
<td>Purchase</td>
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<tr>
<td>Manufacture/Fab</td>
<td>Assemble</td>
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<tr>
<td>Ship</td>
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<tr>
<td>MTO Delivery Lead Time</td>
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<tr>
<td>Inventory</td>
<td>Manufacture/Fab</td>
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<tr>
<td>Assemble</td>
<td>Ship</td>
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<tr>
<td>ATO Delivery Lead Time</td>
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<tr>
<td>Manufacture</td>
<td>Inventory</td>
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<td>Assemble</td>
<td>Ship</td>
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<tr>
<td>MTS Delivery Lead Time</td>
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<tr>
<td>Manufacture</td>
<td>Assemble</td>
</tr>
<tr>
<td>Inventory</td>
<td>Ship</td>
</tr>
</tbody>
</table>
Figure 3 – Sequence for Calculating Burden

1. Collect Data
   Accurate information is a must. If you have no current control system that captures labor hours, equipment hours and costs, implement those changes NOW.

2. Collect History of Fixed and Variable Costs
   A list of fixed and variable expenses has been provided. Collect a history of these expenses to establish a baseline.

3. Forecast Changes to Fixed and Variable Costs
   Look at the next year and forecast changes to your expenses (will you have increased maintenance or depreciation costs?) Will your hours have worked in the shop increase?

4. Determine Number of Shop Hours (Use provided list to identify all those personnel to be included within the shop)
   You must determine how to collect hours. Use this information to forecast what you think will happen during the next year.

5. Calculate Burden (Can choose hourly charge or percentage) (See Appendices for Explanation)

SECTION III: SUMMARY

The nature of a sheet metal and HVAC contracting business is different than a traditional specialty contractor. It requires high fixed costs and low variable costs which is very different than most contractors. Customers must understand this difference and recognize the need to properly compensate sheet metal manufacturers and HVAC Contractors for their costs. Additionally, owners and general contractors are notorious for asking sheet metal companies to participate in pre-construction efforts requiring the use of their design, detailing and field staff expertise. Unfortunately, the participation in the process does not always ensure contract award, thus the sheet metal company has incurred expense with no offsetting revenue. It would only seem fair that owners and general contractors should reimburse the sheet metal manufacturer for their design services rendered.
APPENDIX A: CALCULATING TRADITIONAL OVERHEAD AND BURDEN

The cost categories included in traditional overhead and burden will vary from company to company. As illustrated in Figure 1, these costs are required for the sheet metal/HVAC contractor to be in business. The following are cost categories that could potentially be included in traditional overhead and burden:

**Fixed Costs**

1. **Depreciation:** Any expenditures for any owned equipment would have a percentage written off each year as part of a general overhead expense and the cost of doing business.

2. **Dues and Memberships:** Fees paid to trade associations and professional organizations.

3. **Estimating Salaries:** Salaries paid to estimating staff used in the pursuit of projects.

4. **Insurance:** Insurance includes general liability insurance, key man life insurance policies (life insurance on key employees where the company is the beneficiary), workers’ compensation insurance, and other insurance not covered elsewhere. Vehicle insurance should be included in the equipment expense line item and insurance provided as an employee benefit should be included in Employee Benefits line item.

5. **Legal and Professional Fees:** The cost of legal and professional services for the benefit of the company. This would also include reviewing contracts for work.

6. **Accounting Salaries:** This is salaries for back-office accounting staff, and not for specific personnel assigned to one project.

7. **Officer Salaries:** This is the salaries for the officers of the company.

8. **Rent:** These are the general overhead costs, and should not be allocated to the project or shop.

9. **Repairs and Maintenance:** Repairs and maintenance include the cost of maintaining office facilities and the associated capital equipment—computers and furnishings—covered under the general overhead budget. The cost of vehicle maintenance is included in the equipment expense line item.

10. **Utilities:** Office utilities include water, sewer, natural gas, electricity, garbage collection, and other utility costs associated with the main office. Those for a specific project should be billed directly to that project.

11. **Miscellaneous:** This would be for costs not assigned to other categories, and is best utilized for infrequent or unusual costs.

**Variable Costs**

1. **Advertising:** Costs to market the company including the cost of preparing materials, signage, trade journals, etc. If signage is for one specific project, then that cost should be allocated to the project itself.

2. **Bad Debts:** This includes writing off bad debts. For companies that do a lot of one-time work for multiple clients on the service side such as HVAC companies that do replacement residential work, this can be a significant expense.

3. **Communications**
4. **Employee Benefits**: These are specific to the general overhead staff and should not be for those allocated to construction or manufacturing staff.

5. **Equipment Expenses**: These are specific to the general overhead staff and should not be for those allocated to construction or manufacturing staff.

6. **Interest**: This is the interest on loans for operating capital for the company.

7. **Sales Commissions**: Commissions paid to employees responsible for bringing in additional revenue.

8. **Travel and Entertainment**: Includes cost for management overhead and staff when traveling away from the office. This could include meals and entertainment or they can be allocated as a separate line item.

9. **Unapplied Labor**: These are the cost of employees who normally are billed to a construction or shop project, but are not assigned or billable to a project.

10. **Unapplied Equipment**: These are the costs of equipment that normally are billed to a construction or shop project, but are not assigned or billable to a project.

11. **Taxes (Payroll and Other)**: This also includes property taxes, business licenses and other government mandated costs required to operate the business.

Once the fixed and variable budgets have been established, the formula for calculating the traditional overhead and burden rate is:

$$\text{Traditional Overhead Rate} = \frac{\text{Total Fixed and Variable Budget}}{\text{Total Budgeted Cost}}$$

It is recommended that companies use an ROI based approach to budgeting and using marginal contribution as the basis of establishing the revenue target. The formula is:

$$\text{Revenue Required} = \text{Fixed Overhead} (\$) + \text{Desired Profit} (\$) \div \text{Gross Profit} (%)$$

The owner and general contractors assertion that a contractual markup on 10% for overhead might be fair if the sheet metal/HVAC contractor only had the expenses listed above. The fact is, the sheet metal/HVAC contractor also has to pay for spatial coordination, a manufacturing facility and field installation.

**A Note on Shared Overhead:**

*It is common for contractors to have a shared mix-use facility where general overhead office space, spatial coordination space, and fabrication space are all in one building. In these instances, each contractor should make an appropriate and consistent determination for how to apportion costs to the correct bucket. One simple method is for contractors to apportion fixed cost based on square footage and then office expenses proportionally based on head count.*
APPENDIX B: CALCULATING SPATIAL COORDINATION OVERHEAD AND BURDEN

As discussed and illustrated in Figure 1, it is helpful to approach spatial coordination like a standalone service as not all projects will require all services offered by the sheet metal/HVAC contractor. It is not uncommon for clients to only use the sheet metal/HVAC contractor’s spatial coordination services and not the manufacturing or installation portion of the contractor’s service offerings.

It is helpful for the sheet metal/HVAC contractor to setup a separate cost center or general ledger account structure to track spatial coordination costs separately. The GL structure should reflect the fixed and variable costs described below.

Below are typical costs associated with a spatial coordination burden that should be accounted for in calculating the appropriate rate.

Fixed Costs

1. **Product Design Costs:** To manufacture product, a design must be arrived upon that meets building codes and industry norms and defines what is going to be built. The ductwork must be sized to provide sufficient air supply and return and vents must be properly installed. The design may also need to incorporate architectural aspects such as round or ovalized ductwork when being used in an exposed environment. In order to complete the design, sheet metal manufacturers must invest in expensive hardware and software that supports the design process, produces the necessary calculations and can validate that the desired result can be achieved with a given design. These software programs typically have annual licensing fees and can be very expensive. The human element of this issue (i.e. – who runs the software) will be discussed in detail in the Variable Costs of a Manufacturing Facility section.

2. **Spatial Coordination Facility Costs:** The space allocated for the spatial coordination function should be included in the spatial coordination burden calculation. This is separate from any general overhead space used for back office work. Additionally, any licensing, property tax, leasehold improvements, and depreciation should be included.

3. **Utilities & Insurance Costs:** The cost of the utilities and insurance associated with the spatial coordination space should be included in the spatial coordination burden calculation

4. **Maintenance Costs:** The costs associated with the maintenance of the spatial coordination facility should be included in the burden calculation.

There are also variable costs that should be accounted for when calculating the spatial coordination burden rate.

Variable Costs

1. **Design Personnel:** Highly skilled designers are required to evaluate the needs of a specific project and determine the basis of design. These employees are frequently licensed engineers who are difficult to find and highly compensated.

2. **Detailing and Spatial Coordination Personnel:** Prior to manufacturing products, sheet metal manufacturers are required to coordinate the routings and elevations of the sheet metal as designed. The intent is to identify conflicts with other trades and to ensure the designed product will fit in the space allocated. Often, designs
must be modified because the ductwork blocks other trades or will not fit in the allocated space, therefore it
must be redesigned to overcome the installation constraints identified in the modeling process. It would be
quite expensive to manufacture product that does not fit properly in the available space and thus must throw
it away and start over. Validating the design through the detailing and coordination process is a must. The
detailing and design staff are also highly skilled individuals who frequently must work in conjunction with Field
Managers to accurately represent the installed products. The knowledge of the trade plus the required software
skills are rare in the industry, so it is not uncommon to see a BIM / CAD / Detailing person aligned with a field
manager to complete this step of the process.

3. **Payroll Taxes, Insurance and Benefits:** For the most part, all the employees listed above will be subject to
payroll taxes and will require health insurance, worker’s compensation insurance, and other benefits that are
very expensive to provide.

4. **Training:** Training for each of the positions delineated above is required on an ongoing basis as the products,
process, technology, and manufacturing techniques are evolving at a rapid rate. The training must be completed
during regular working hours, rendering the staff unavailable to produce product while being trained.

Once all of the relevant costs have been identified, calculating a spatial coordination burden rate is straightforward.

\[
\text{Spatial Coordination Burden} = \frac{\text{Total Spatial Coordination Fixed and Variable Costs}}{\text{Total Budgeted Spatial Coordination Labor Hours}}
\]

Once the spatial coordination burden rate has been established, a billing multiplier (like an A/E design firm) can be
calculated. This billing multiplier is a rate to be used for billing out spatial coordination services.

\[
\text{Billing Multiplier} = \frac{\text{Spatial Coordination Burden} + 1}{100\% - \text{Gross Profit Goal}\%}
\]

If an overhead expense is used in calculating a special coordination burden rate, then it is important the expense
not be used twice to calculate another overhead account such as G&A. The benefit to this method is that in the
event a client chooses only to use the spatial coordination services of a sheet metal/HVAC contractor, and not the
fabrication services, the contractor can still achieve target profit goals that the company has established.
APPENDIX C: CALCULATING MANUFACTURING OVERHEAD AND BURDEN

As discussed and shown in *Figure 1*, a sheet metal shop, much like any manufacturing facility, must invest heavily in the assets that will allow the company to produce products. In this case, we are looking at the costs incurred to have the ability to manufacture custom sheet metal products to meet a specific owner, designer, building or application requirement. The associated fixed and variable costs are explored below.

**Fixed Costs**

1. **Fabrication Process Costs:** Once again sheet metal manufacturers must invest in expensive hardware and software (different than the design or detailing software) that supports the transfer of coordinated drawing information onto plasma cutters and other specialized manufacturing tools. These software programs typically have annual licensing fees and can be very expensive. The human element of this issue (i.e. – who runs the software) will be discussed as a variable cost.

2. **Facility Costs:** Sheet metal manufacturing facilities are notoriously space constrained but still require a large amount of square footage to produce and store the product. The facility must be large enough to store raw materials, work in progress product and finished goods. The cost of owning, leasing or renting the sheet metal manufacturing shop should be included in the burden calculation. Additionally, any licensing, property tax, leasehold improvements, and depreciation should be included.

3. **Utilities & Insurance Costs:** The cost of the utilities and insurance (general liability and related property insurance, not worker’s compensation) associated with the sheet metal manufacturing facility should be included in the burden calculation.

4. **Facility Maintenance Costs:** The costs associated with the general maintenance of the manufacturing facility should be included in the burden calculation.

5. **Equipment Ownership Costs:** As previously stated, the ownership cost of the specialized equipment required to manufacture custom sheet metal products should be included in the manufacturing burden calculation. The equipment used in a sheet metal manufacturing facility can be quite expensive and upwards of $500K for coil lines and plasma cutters. Additional specialized tooling and equipment (shears, brakes, rollers, form-fitters, lock formers, welders, etc.) are required to complete the assembly process. Equipment ownership costs include the purchase price, depreciation, and salvage value. The equipment ownership costs are highly dependent on utilization (i.e. – active equipment hours, equipment in use) and given the intermittent nature of sheet metal manufacturers the ownership costs are distributed across a small number of active hours resulting in a higher equipment cost. The operating costs of the equipment will be discussed in detail in the variable costs of a manufacturing facility section.

6. **Cost of Capital:** Setting up a sheet metal manufacturing facility requires the deployment of significant amounts of capital. The capital can be financed using short term debt, long term debt, or equity. The weighted average cost of capital, which accounts for the percentage of debt and the associated form of financing and the imputed interest rate, averages 14.9% in the construction industry from 2012-2016. This cost of capital is a hidden cost to the manufacturing business as it restrains cash flow inhibiting growth or alternative investment opportunities. Examples of where the cost is incurred include the facility, equipment, raw materials and finished goods inventory. The cost of capital should be included in the burden calculation.
7. **Miscellaneous Costs:** Costs such as Underwriters Laboratory certifications, ISO 9001 Compliance and any other specialize certifications should be included in the burden calculation.

### Variable Costs

1. **Field Personnel:** Experienced tradesmen are frequently required to provide input into the manufacturing process to address issues such as: vertical transportation of the product, pathways, and transportation constraints. Their experience and input is vital to a successful project.

2. **Procurement:** Once a design has been detailed and coordinated, a sheet metal/HVAC contractor must procure the materials necessary to produce the product. Sheet metal manufacturers frequently procure and hold raw materials in inventory of different sizes and gauges to allow a rapid start to the project. This does not negate the role of procurement but rather justifies why it is such a vital role that must be captured in the overall cost.

3. **Manufacturing Personnel (Shop Labor):** Staff must be available, often with highly specialized skills, to convert detail drawings into assembled products ready for field installation.

4. **Supervisory Personnel:** Like any business, supervisors are required to ensure a smooth flow of the work and compliance with the required standards and specifications.

5. **Shop Maintenance Personnel:** Shops do not maintain themselves; when things need to be fixed, shop maintenance staff need to be on hand. Whether it’s a roof leak, a power problem, or a mechanical issue with a piece of equipment, sheet metal manufacturers must have staff on hand that can fix the issue to keep the production line running. Equipment, technology, and controls of newly purchased or updated shop equipment requires additional training of the shop maintenance personnel to ensure proper preventative maintenance practices are established and followed. In many cases, this specialized knowledge will also require the services of a subcontractor which results in additional costs. Shop maintenance can cause schedule delays due to inoperable equipment which also impacts productivity due to out of sequence work.

6. **Quality Control:** Quality control is also a significant issue in a manufacturing facility. Often a dedicated staff must monitor and document the manufacturing process to ensure compliance with customer specific quality requirements. For products that do not have a specific quality requirement, shops must develop their own standards and train all staff to those standards and ensure they are upheld with a verification and inspection process. Lastly, many contracts are now requiring duct protection, particularly for hospitals or other areas where air quality is extremely important. Green Building certifications are also increasing QAQC costs through increased requirements of sourcing, logistics and duct leakage requirements. Once again, staff must be educated and trained to these standards (e.g. – Duct Leakage 2) and inspections for compliance conducted.

7. **Safety:** Industry and customer requirements for OSHA 30, lifting, fall protection, etc. must be incorporated into the manufacturing burden calculation or the field labor burden calculation as a non-statutory accrual. Additionally, the personal protective equipment or PPE required includes hard hats, gloves, safety glasses, vests, high visibility clothing, harnesses, etc. which are expensive and add up quickly.

8. **Logistics:** Sheet metal and HVAC contractors also must deal with the logistics of shipping finished goods to the jobsites. Projects with accelerated schedules, Lean / Just in Time deliveries, etc. are forcing contractors into the shipping and logistics business. This element may require trucks, specialized rigs to maximize shipping amounts since you are mostly shipping “air”, inventory management systems, shipping containers, and material handling equipment. These items all add costs.
9. **Payroll Taxes, Insurance and Benefits:** For the most part, all the employees listed above will be subject to payroll taxes and will require health insurance, worker’s compensation insurance, and other benefits that are very expensive to provide.

10. **Training:** Training for the positions delineated above is required on an ongoing basis as the products, process, technology, and manufacturing techniques are evolving at a rapid rate. The training must be completed during regular working hours, rendering the staff unavailable to produce product while being trained. Specially-trained equipment operators must be readily available for fabrication activities. As the equipment becomes more sophisticated, training requirements increase, thus making the skills of operating certain equipment critical to the success of a sheet metal manufacturer.

Now that the costs of fixed costs of owning and the variable costs of operating a sheet metal manufacturing facility are understood the methods by which the burden can be recovered can be evaluated. Four methods will be evaluated.

**Method 1: Schedule Based Method (Allocate Fixed Costs based on Job Duration and Direct Job Charge Variable Costs)**

In this method, the fixed costs are covered by establishing a daily rate:

\[
\text{Allocation of Fixed Shop Cost} = \frac{\text{Total Fixed Costs}}{254 \text{ Working Days}}
\]

The job would be charged the fixed costs based on the schedule duration in work days it takes to produce the products for the specific job. As an example, if the fixed costs were $1M annually, that is the equivalent of $3,937 per work day. If a project takes 5 days to complete, the job would be charged 5 days x $3,937 = $19,685. The obvious flaw in this method is that the 254 working days is unrealistic.

All the variable costs are direct job costed to the project. This is a simple process for companies that produce a small number of large jobs, but may be difficult for smaller contractors to implement.

**Method 2: Shop Labor Based Method (Percentage Based Formula using Shop Labor as the Denominator)**

Another common method to determine the burden is to use a percentage based formula that uses the costs of manufacturing labor (shop labor) as the denominator. This method ensures the customer pays the burden for the hours worked on their project which is more practical for smaller shops that do many small projects.

\[
\text{Burden} = \frac{\text{Total Fixed Costs} + \text{Total Variable Costs}}{\text{Total Shop Labor Hours (or Pounds)}}
\]

The most difficult aspect of this approach is that the total variable manufacturing labor must be forecasted. While the level of designers, detailers, shop supervisors and procurement staff are fairly static, the number of manufacturing workers can be variable. In this case, it is recommended to evaluate past trends of staffing to forecast a reasonable number of manufacturing hours. The underlying assumption here is that for every pound of sheet metal produced, it takes about the same amount of fixed and variable costs to produce each type of product.
Method 3: Field Labor Based Method (Percentage Based Formula using Direct Labor as the denominator)

Another approach to determine the proper allocation is to use direct labor as the denominator. This approach requires some forecasting. The formula would be as follows:

\[ \text{Burden} = \frac{\text{Total Fixed Costs} + \text{Total Variable Costs}}{\text{Total Direct Labor (Field) Hours Charged to Project}} \]

This approach requires the approximation of Variable Manufacturing burden (which again is fairly static with the exception of manufacturing staff) and the total estimated field labor hours. Both of these elements can be predicted with a reasonable degree of accuracy based on past performance and expected volumes going forward.

Method 4: Direct Job Cost Method

In this method, the burden is allocated based upon the direct job costs. The formula is:

\[ \text{Burden} = \frac{\text{Total Fixed Costs} + \text{Total Variable Costs}}{\text{Projected Direct Job Costs for Labor and Material for the Year}} \]

This method will reduce the overall percentage but is somewhat risky if the composition of the cost of goods sold is variable in a company or revenue may not hit the business plan.
APPENDIX D: CALCULATING INSTALLATION OVERHEAD AND BURDEN

When preparing the field burdens to calculate job costs, projections, or establishing budgets consistency in methodology is important. Burden includes all payroll taxes, unemployment insurance, workers compensation insurance, general liability health insurance, and fringe benefits (or cash equivalent paid by the owner).

Fixed Costs
1. **Tools and Supplies:** This is a non-statutory accrual, this is a fixed cost and charged to a single ledger account. If specific to a project, then this should be allocated as a variable project cost.

Variable Costs
1. **Field Personnel:** The cost of the craftsmen performing the work is a variable cost and dependent on the amount of work to be performed and the type of work.
2. **Supervisory Personnel:** Like any business, supervisors are required to ensure a smooth flow of the work and compliance with the required standards and specifications.
3. **Payroll Taxes, Insurance and Benefits:** For the most part, all the employees listed above will be subject to payroll taxes and will require health insurance, worker’s compensation insurance, and other benefits that are very expensive to provide.
4. **Training:** Specially-trained field personnel must be readily available for installation and testing activities. As the equipment for installation becomes more sophisticated, training requirements increase.
5. **Safety:** Industry and customer requirements for OSHA 30, lifting, fall protection, etc. must be incorporated into the manufacturing burden calculation or the field labor burden calculation as a non-statutory accrual. Additionally, the personal protective equipment or PPE required includes hard hats, gloves, safety glasses, vests, high visibility clothing, harnesses, etc. which are expensive and add up quickly. Note that this is when accrued to a single ledger account. If specific to a project then this should be allocated as a variable project cost.

To calculate the burden rates for an hourly employee, the total number of hours for a period must be estimated, which could include any overtime, double-time, weekend, or other special rates.

\[ Wages = (\text{Hourly Wage Rate} \times \text{Total Estimated Hours}) + \text{Anticipated Bonuses} \]

For a salaried employee, the total number of hours do not need to be estimated as that is flat regardless of hours worked. The total wages are calculated by summing the salaries and any anticipated bonuses.

Each contractor should review its fixed and variable costs and determine the final mix of what is considered a “burden” cost. Once the fixed and variable installation costs have been properly allocated the rate calculation can be performed.

\[ \text{Installation Burden} = \frac{\text{Fixed Labor Costs} + \text{Variable Labor Costs (Including Payroll)}}{\text{Total Actual Direct Hours}} \]
A Note on Unions:

Contractors with union employees are often required to pay the union directly to pay for union provided benefits, services and training. Those union payments should be included in the cost of the benefits for burden calculations, but any union dues paid by the employees should not be included. Those do not represent a cost to the contractor.