otherwise specified. Brick shall be placed in a running bond with joint finished to produce a concave, flush, beaded, raked form. Detailing, such as soldier courses, rowlocks, quoins etc. shall be shown in the construction documents. See construction documents for complete fireplace details.

**DIVISION 05 00 00. METALS**

**05 00 00 - Metals**

Contractor shall review construction documents and provide labor and materials pertaining to metal work as required in said documents and as specified herein, while complying with all applicable building codes.

**05 05 00 – Common Work Results for Metals**

**SPECIFIER NOTE:**

**resource management:** Mining raw materials (iron, limestone, coal) can produce soil erosion, pollutant runoff, and habitat loss. Ore refinement produces heat, combustion emissions and requires significant amounts of water. Supply of some of the raw materials (nickel, chromium, and manganese) is very limited.

The iron and steel industry sector has multi-media impacts, including air contaminants (SOx, NOx, PM2), wastewater contaminants, hazardous and solid wastes. As a result, they are the largest U.S. consumers of recycled steel scrap, but also face issues with contaminants in scrap products. Refer to the Steel Recycling Institute (SRI) [www.recycle-steel.org](http://www.recycle-steel.org)

The energy used by minimills generates greenhouse gas emissions from power generation. An emerging trend to generate heat on-site by burning carbon may improve energy efficiency but may also increase emissions. Refer to [www.epa.gov/sectors/ironsteel/index.html](http://www.epa.gov/sectors/ironsteel/index.html) for more information.

EPA partnerships have addressed environmental impacts from metal finishing; refer to [www.epa.gov/sectors/metalfinishing/index.html](http://www.epa.gov/sectors/metalfinishing/index.html) and from die casting; refer to [www.epa.gov/sectors/metalcasting/index.html](http://www.epa.gov/sectors/metalcasting/index.html)

Aluminum is fabricated from bauxite, a mineral found primarily in tropical areas. A significant factor in the clear-cutting of tropical rainforests is the desire to gain access to bauxite mines. Aluminum is extensively recycled from both post-industrial sources, such as used beverage cans, scrapped automobiles and end-of-life building products, and from post-consumer sources, such as aluminum building components, means that aluminum is only beginning to be recycled from building applications. To produce aluminum from recycled material requires less energy and greenhouse gas emissions required to produce aluminum than from new bauxite. Each ton of recycled aluminum saves 4 tons of bauxite. In addition, using aluminum instead of raw materials reduces the generation of air pollution, such as SOx, by 95 percent and water pollution by 97 percent. About one third of the aluminum used in the United States comes from recycled material with post-consumer scrap contributing about 40 percent of that total.

**toxicity/IEQ:** Metal is considered inert. Factory applied finishes emit considerably less VOCs in situ than field applied coatings because the primary outgassing occurs at the plant under controlled conditions.
**PART 1 - GENERAL**

**1.1 SUMMARY**

A. This Section includes:
   1. Steel.
   2. Aluminum.
   3. Copper.
   4. [xxxx].

**1.2 SUBMITTALS**

A. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:

**SPECIFIER NOTE:**

Green building rating systems often include credit for materials of recycled content. USGBC-LEED™ v2.2, for example, includes credit for materials with recycled content, calculated on the basis of pre-consumer and post-consumer percentage content and it includes credit for use of salvaged/recovered materials. Green Globes-US also provides points for reused building materials and for building materials with recycled content.

1. Recycled Content:
   a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
   b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
   c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
   d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.

**SPECIFIER NOTE:**

Specifying local materials may help minimize transportation impacts; however it may not have a significant impact on reducing the embodied energy of a building material because of efficiencies of scale in some modes of transportation. Green building rating systems frequently include credits for local materials. Transportation impacts include: fossil fuel consumption, air pollution, and labor. USGBC-LEED™ v2.2 includes credits for materials extracted/harvested and manufactured within a 500 mile radius from the project site.
Green Globes-US also provides points for materials that are locally manufactured.

2. Local/Regional Materials:
   a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and the project site.
   b. Manufacturing location(s): Indicate location of manufacturing facility, indicate distance between manufacturing facility and the project site.
   c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
   d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

PART 2 - PRODUCTS

SPECIFIER NOTE:
EO 13423 includes requirements for Federal Agencies to use "sustainable environmental practices, including acquisition of biobased, environmentally preferable, energy-efficient, and recycled-content products"

Specifically, under the Sustainable Building requirements per Guiding Principle #5 Reduce Environmental Impact of Materials, EO13423 directs Federal agencies to "use products meeting or exceeding EPA's recycled content recommendations" for EPA-designated products and for other products to "use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (based on cost) of the total value of the materials in the project."

2.1 MATERIALS

A. Steel:

SPECIFIER NOTE:
US-EPA Comprehensive Procurement Guidelines (CPG) discusses steel manufactured in either a Basic Oxygen Furnace (BOF) or an Electric Arc Furnace (EAF). Steel from the BDF process contains 25-30 percent total recovered materials, of which 16 percent is post-consumer steel. Steel from the EAF process contains a total of 100 percent recovered steel, of which 67 percent is post-consumer.

Recommendations for recycled content in steel reinforcing are not stated.

Typical BOF products include: hollow structural sections, steel studs, purlins, and wall studs. Typical EAF products include: beams and columns, channels, angles, plate, steel deck, and piling.

The amount of recycled content in steel products varies over time, both as a function of the cost of steel scrap and its availability.
BOF Steel Recycled Content Value for Typical Product:
Steel Stud Framing
Value = ($XXXX) (23.0 % + ½ 7.3 %) = ($XXXX) (26.65 %)

EAF Steel Recycled Content Value for Typical Product:
Wide Flange Structural Steel Framing
Value = ($XXXX) (58.6 % + ½ 32.6 %) = ($XXXX) (74.90 %)

For more information, refer to SRI at www.recycle-steel.org which includes detailed information on recycling rates, recycling databases, and the environmental benefits of steel for homes building, steel roofing, and bridges; and, the American Institute of Steel Construction at www.aisc.org/sustainability which includes detailed information on how steel factors into the LEED rating system, steel mill recycled content documentation, and articles about the use of steel in sustainable projects.

1. Recycled Content: Minimum [23] [58] [xxxx] percent post-consumer recycled content, or minimum [7] [32] [xxxx] percent pre-consumer recycled content at contractor's option.

B. Aluminum:

SPECIFIER NOTE:
Green building rating systems often include credit for materials of recycled content, and may distinguish allowable credit for post-consumer and post-industrial recycled content. USGBC-LEED™ v2.2, for example, factors 100 percent of post-consumer recycled content but only 50 percent of pre-consumer (post-industrial) recycled content into calculations for its recycled content materials category. LEED v2.2 grants one credit to a project for using materials with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial content constitutes at least 10 percent of the total value of the materials in the project (post-consumer + 1/2 post-industrial). It grants an additional point for 20% (post-consumer + 1/2 post-industrial).

Green Globes-US also provides points for reused building materials and for building materials with recycled content. Recycled content is typically determined by calculating the weight of the recycled material divided by the total weight of the product and expressed as a percentage. (The recycled content "value" of a product as assessed under LEED is determined by multiplying the recycled content percentage and the cost of the product.)

Verify with manufacturer for product availability and recycled content.

1. Recycled Content: Minimum [5] [10] [xxxx] percent post-consumer recycled content, or minimum [20] [40] [xxxx] percent pre-consumer recycled content at contractor's option.

C. Copper:

1. Recycled Content: Minimum [5] [10] [xxxx] percent post-consumer recycled content, or minimum [20] [40] [xxxx] percent pre-consumer recycled content at contractor's option.

2.2 FACTORY FINISHING
SPECIFIER NOTE:
Specify factory finishing rather than field-coating where possible. Plant fabrication/finishing handles raw materials and by-products at a single location that typically allows for greater efficiency and better pollution prevention than job site fabrication/finishing.
Powder coating is preferable to solvent based coating application systems. Powder coating uses an electrostatic charge to adhere colored powder to metal. The powder remaining in the electrostatic chamber is 'vacuumed' out and reused.
Consider factory finishing that utilizes mechanical process rather than chemical processes such as abrasive blasting, grinding, buffing, and polishing do not generate as much hazardous waste as chemical and electrical processes.
When electroplating is necessary, select one of the available replacement technologies listed by the US EPA. The EPA has identified as toxic and/or polluting cadmium plating materials, chromium plating materials, cyanide-based electroplating, and copper/ for copper/ electroless copper solutions. Available replacement technologies include: cyanide copper plating, metal stripping and zinc-plating; ion vapor deposition (PVD); Chromium-free substitutes for selected immersion coatings; and Trivalent chromium plating for decorative applications.

A. Finishing System:
   1. Toxicity: [Solvent coating systems are not permitted.]
   2. Anti-Corrosive Paint: Comply with GS-03.

05 05 23 - Metal Fastenings
Provide 1/2" diameter x 10" long anchor bolts in filled cells and poured concrete at 48" on center (OC) maximum at all window locations and on each side of exterior doors. For slabs, install appropriate tie downs or straps as required by applicable building codes.

05 10 00 – Structural Steel

SPECIFIER NOTE:
resource management: Refer to Section 05 05 00 (05050) for general information on mining and metals industries.

The steel industry, the world's largest recycler, utilizes scrap in both of the primary manufacturing processes (Basic Oxygen Furnace and Electric Arc Furnace). The Electric Arc Furnace process, sometimes called minimills, utilizes virtually 100% steel scrap, while the Basic Oxygen Furnace process utilizes approximately 30% steel scrap in making new steel.

Steel in existing buildings may be considered a resource for the future. To date, there is no single organization that provides estimates for potential future supplies of steel scrap. However, the AISI, SRI, and IISI provide estimates for steel production and recycling rates.

Iron is the largest raw material stream in steelmaking. The first record of the use of iron goes back to 2500-2000 BC, and the first deliberate production of iron began around 1300 BC. High temperature processes were first introduced in Germany around 1300 AD, using a very similar design to today's modern blast furnaces. Charcoal was the primary fuel used in the furnaces until 1718 when coke is reported in the United Kingdom. The modern blast furnace was developed...
Second World War and remains the main process used to make iron.

As Per the U.S. EPA Profile of the Iron and Steel Industry, EPA/310-R-95-005, numerous outputs are produced as a result of the manufacturing of coke, iron, and steel, the forming of metals into basic shapes, and the cleaning and scaling of metal surfaces. These outputs, categorized by process (RCRA waste code provided where applicable), include:

Cokemaking

Inputs:
- Coal, heat, quench water

Outputs:
- Process residues from coke by-product recovery (RCRA K143, K148)
- Coke oven gas by-products such as coal tar, light oil, ammonia liquor, and the remainder of the gas stream is used as fuel. Coal tar is typically refined to produce industrial products including pitch, creosote oil, refined tar, naphthalene, and bitumen.
- Charging emissions (fine particles of coke generated during oven transport, loading and unloading of coke that are captured by pollution control equipment. Approximately one pound per ton of coke produced are captured and generally land disposed).
- Ammonia, phenol, cyanide and hydrogen sulfide
- Oil (K143 and K144)
- Lime sludge, generated from the ammonia still (K060)
- Decanter tank tar sludge (K087)
- Benzene releases in coke by-product recovery operations
- Naphthalene residues, generated in the final cooling tower
- Tar residues (K035, K141, K142, and K147)
- Sulfur compounds, emitted from the stacks of the coke ovens
- Wastewater from cleaning and cooling (contains zinc, ammonia still lime (K060), or decanter tank tar (K087), tar distillation residues (K035)
- Coke oven gas condensate from piping and distribution system; may be a RCRA characteristic waste for benzene.

Ironmaking

Inputs:
- Iron ore (primarily in the form of taconite pellets), coke, sinter, coal

Outputs:
Slag, which is either sold as a by-product, primarily for use in the construction industry, or landfilled.

- Residual sulfur dioxide or hydrogen sulfide
- Particulates captured in the gas, including the air pollution control treatment plant (WTP) sludge
- Iron is the predominant metal found in the process wastewater
- Blast furnace gas (CO)

**Steelmaking**

**Inputs:**

- In the steelmaking process that uses a basic oxygen furnace (BOF), inputs include molten iron, metal scrap, and high-purity oxygen.
- In the steelmaking process that uses an electric arc furnace (EAF), the primary inputs are scrap metal, electric energy and graphite electrodes.
- For both processes, fluxes and alloys are added, and may include and alloying agents such as aluminum, manganese, and others.

**Outputs:**

- Basic Oxygen Furnace emission control dust and sludge, a metals-bearing waste.
- Electric Arc Furnace emission control dust and sludge (K061); generally, 20 pounds of dust per ton of steel is expected, but as much as 40 pounds of dust may be generated depending on the scrap that is used.
- Metal dusts (consisting of iron particulate, zinc, and other metals, scrap and flux [lime and/or fluor spar]) not associated with the EAF.
- Slag.
- Carbon monoxide.
- Nitrogen oxides and ozone, which are generated during the melting process.

**Forming, Cleaning, and Descaling**

**Inputs:**

- Carbon steel is pickled with hydrochloric or sulfuric acid; stainless steel with hydrochloric, nitric, and hydrofluoric acids.
- Various organic chemicals are used in the pickling process.
- Alkaline cleaners may also be used to remove mineral oils and animal fats from the steel surface. Common alkaline cleaning agents include: caustic soda, soda ash, alkaline silicates, phosphates.

**Outputs:**
• Wastewater sludge from rolling, cooling, descaling, and rinsing operations which may contain cadmium (D006), chromium (D007), lead (D008)
• Oils and greases from hot and cold rolling
• Spent pickle liquor (K062)
• Spent pickle liquor rinse water sludge from cleaning operations
• Wastewater from the rinse baths. Rinse water from coating processes may contain lead, cadmium, or chromium.
• Grindings from roll refinishing may be RCRA characteristic waste
• Zinc dross

toxicity/IEQ: Metal is considered inert. Factory applied finishes emit considerably less VOCs in situ than field applied coatings because the primary outgassing occurs at the plant under controlled conditions.

performance: Steel is made by reducing the carbon content in iron to levels below 2%. The reduction of carbon reduces the brittleness of the material, making it easier to shape. Performance is comparable for green methods and standard methods.

Where feasible, use mechanical connections to allow for deconstruction and reuse.

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Structural steel.

1.2 SUBMITTALS

A. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:

   SPECIFIER NOTE:
   Green building rating systems often include credit for materials of recycled content. USGBC-LEED™ v2.2, for example, includes credit for materials with recycled content, calculated on the basis of pre-consumer and post-consumer percentage content, and includes credit for use of salvaged/recovered materials. Green Globes-US also provides points for reused building materials and for building materials with recycled content.

   1. Recycled Content:
      a. Indicate recycled content; indicate percentage of pre-consumer recycled content per unit of product.
      b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.