

5 Metals

GENERAL

Designers shall verify that all applicable portions of these standards are incorporated into the project's design, drawings, specifications and final construction. Requests for variances from these standards shall be submitted in writing to the DCM Project Manager, using the KU Standards Variance Request Form found in [Appendix A1.1](#), for review and written approval or rejection as indicated on the form.

RELATED DOCUMENTS & REQUIREMENTS

Refer to the following for requirements that also apply to work of this section.

- Division 1 - General Requirements**; refer to sections regarding construction testing and field quality control requirements.
 - Quality Control Testing: Unless directed otherwise, the Owner shall separately contract for quality control testing during construction, not the Contractor. Verify with DCM for each project.
- Division 2 – Sitework**: Contains additional information about ramps, walks, and site improvements that may be related to work of this section.

FASTENERS – DESIGN GUIDELINES

General: Designers shall be responsible for determining the appropriate fasteners to be used for each type of connection and material, taking into account structural requirements such as dead and live loads, atmospheric exposures, code requirements and durability needs. Each required fastener shall be indicated in the drawings or specified, with the following information included.

- Material (steel, stainless steel, high-strength steel, etc.)
- Finish, if applicable (galvanized, pre-finished paint to match substrate material)
- Diameter (1/4", 3/8", etc.)
- Length &/or Embedment, if applicable (EX: depth of embedment for expansion anchors determines load bearing capacity, & is to be specified by designers.)
- Head or Type, if applicable (truss bolt, panhead, sheet metal screw, gasketed SMS, carriage bolt, etc)
- On-Center Spacing (EX: UL Standard I-28 stipulates specific o.c. spacings for fasteners in roof edge nailers in order to meet certain wind uplift criteria; as well as other criteria such as fastener diameters; designers are to stipulate fastener spacings.)

Nailer, Blocking & Miscellaneous Roofing System Members: Designers shall pay particular attention to the designation of fasteners for members to which roofing membranes, flashings, roof edges and copings are attached.

- ❑ Designers shall verify manufacturer's fastener requirements in order to meet specified wind uplift or fire rating requirements, and indicate the specific fasteners accordingly.

METAL RAILINGS – DESIGN GUIDELINES

Exterior Guardrails: The University's currently preferred guardrail design incorporates a double top rail, and narrow vertical balusters that extend from the bottom rail to the lower of the two top rails.

- ❑ Example Railing: The guardrails along 15th Street, east of Engel Road, on top of the retaining walls near the Jayhawker Towers parking lots, are the a good example of an acceptable railing design.

Handrails:

- ❑ All handrails shall be round and shall have no more than a 1-5/8" actual outside diameter.
- ❑ All handrails shall be detailed to return to walls, and shall be noted to have closed ends.

Mounting Method:

- ❑ The preferred mounting method is to embed the vertical railing members into sleeves cast into concrete structures, or cast them directly into poured concrete structures.
- ❑ Sleeved embeds shall be filled with non-shrink, flowable grout, formed to drain away from vertical embedded railing members.
- ❑ A coved bead of sealant shall be shown to seal joint around base of embedded pipe.
- ❑ Designers shall pay special attention to railing details to avoid edge "breakout" or spalling conditions. No railing or embedded sleeve shall extend closer than 1" clear to the edge of concrete structure edges.

Expansion: Metal handrails and guardrails shall be sectioned to provide for expansion and contraction, with appropriate slip joints that maintain railings in alignment.

Exit Stop Gates: Provide gates at top of "down" stairs to prevent pedestrian travel past a required exit.

- ❑ Exit stop gates shall not be secured directly to walls, since expansion-anchored, individual hinge screws have proven easy to pull out of walls.
- ❑ It is recommended to attach to walls with either a continuous hinge with multiple anchors, or a steel support post anchored to wall, with hinges welded to it.

METAL STAIRS – DESIGN GUIDELINES

Risers: Steel-framed stairways shall have closed metal pan risers.

PIPE AND TUBE RAILINGS – 05521

Materials: Guardrails and handrails should be fabricated from structurally durable materials.

- Round pipe railings shall be fabricated from 1-1/4" nominal diameter, Schedule 40 steel pipe (1-5/8" actual O.D.) or similar aluminum or stainless steel materials, rather than 1-1/2" nominal diameter pipe (1-7/8" actual O.D.).
- Square tube railings shall be fabricated from 1-1/4" or 1-1/2" outside dimension steel tubes, with not less than a 14 gauge wall thickness.
- Vertical balusters shall be fabricated from solid plates, wires or bars. Hollow or lightweight materials are not acceptable.

Fabrication: All railings shall have mitered and fully welded joints, filled with epoxy body putty and ground smooth as required to create smooth joint transitions.

- Mechanical connections should be carefully considered. Side-mounted, friction-kept, or Allen-screw-mounted mechanical connections of stair rail systems have not proven to be durable, and are not recommended.

Wall Brackets: All wall-mounted handrail brackets shall have concealed fasteners to wall substrates.

Finishes:

- All exterior guardrails shall be fabricated and then receive a full coverage, hot-dip galvanized coating.
- Railings shall have a medium bronze anodized or prefinished coating, or shall be painted to match KU's standard medium bronze metal trim color.

ARCHITECTURAL JOINT SYSTEMS – 05811

All building expansion joints 1" or greater in width, for both vertical and horizontal joints, shall be detailed to receive a pre-manufactured joint system to cover and seal the joint.

- Joint systems shall be mechanically fastened to wall, floor or ceiling substrates; taped or adhesive-only attachments are not acceptable.