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MACHINING PROCEDURE

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Abstract:
This document describes the Company's machining procedure.

REVISION LOG

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DOCUMENT CHANGE RECORD

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1.0 REFERENCES

- ANSI B1.1 Unified Inch Screw Threads (UN, UNR, and UNJ Thread Forms)
- ANSI B46.1 Surface Texture (Surface Roughness, Waviness, and Lay)
- ASTM A668 Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use
- ASTM B22 Standard Specification for Bronze Castings for Bridges and Turntables
- ASTM B100 Standard Specification for Wrought Copper-Alloy Bearing and Expansion Plates and Sheets for Bridge and Other Structural Use
- AWS D1.5, Bridge Welding Code

2.0 EQUIPMENT

[redacted]

(your list)

3.0 MATERIALS

(your list)

4.0 MACHINING PROCEDURES

4.1 Principal Controlling Dimensions and Material Properties

The Company is responsible for modifying dimensions of members and pieces to compensate for [redacted] the final product design dimensions shown on the Plans.

4.2 Primary Components

Shop drawings of primary components of the steel superstructures are fully reviewed, including [redacted]

The review includes:

1. [redacted]
2. [redacted]

3. [redacted]
4. [redacted]
5. [redacted]
6. [redacted]
7. [redacted]
8. [redacted]
9. [redacted]
10. [redacted]

4.3 Bearing Sole Plates

When the steel is erected to a grade of one percent or less, or the change in height over the length of the sole plate is less than ⅛ inch [3mm],it will not be necessary to [redacted]

4.4 Repair

When written repair procedures are required for the repair of defects, repair procedure drawings are prepared to show [redacted] the Responsible Authority's signature to indicate that the defect was [redacted]

The proposed repair procedure is described in detail, including:

a) [redacted]
b) [redacted]
c) [redacted]
d) [redacted]

e) [redacted]

f) [redacted]

g) [redacted]

h) [redacted]

4.5 Cutting - General

Steel and weld metal may be thermally cut provided [redacted] cut surfaces are produced using [redacted] manually guided [redacted]

In all thermal cutting, the cutting flame is adjusted and manipulated to avoid [redacted] roughness does not exceed 2000 microinches. Roughness exceeding these values and occasional notches or gouges no more than [redacted] s are removed by [redacted]

Occasional notches or gouges that exceed [redacted] are repaired by [redacted] suitably preparing [redacted] main material subject to tensile stress [redacted]

Re-entrant corners are filleted to a radius of not less than [redacted] radius and its contiguous cuts [redacted]

4.5.1 Thermal Cutting of A709 Steels (50,000 psi minimum yield strength or higher)

The Company confirms that the flame cut edges of primary/main material are not [redacted] found to have a Rockwell Hardness Value of [redacted] hard surfaces are removed by [redacted]

4.6 Surfaces and Edges to be Welded

Surfaces and edges to be welded are [redacted] that would adversely affect the quality or strength of the weld. Surfaces to be welded and surfaces adjacent to a weld are also free of [redacted] approved welding processes. This mill-scale provision applies to all [redacted] general blast cleaning prior to [redacted]

No mill scale is permitted [redacted]

Edges of material thicker than [redacted] is to carry calculated stress:

- [redacted]
- [redacted]
- [redacted]

- [redacted]

The form of edge preparation for butt joints conforms to [redacted] removal of defective work or material. All air carbon arc gouged surfaces are [redacted]

4.6.1 Flange Plates

All flange plates are furnished with [redacted]

4.6.2 Web-Plates

Web plates of built-up beams and girders, box girders and box arches are [redacted] sufficient extra camber into [redacted]

4.6.3 Truss Members

All plates in welded sections of truss web, arch and chord members have their [redacted] at least 1/16 inch by [redacted]

4.6.4 Stiffeners and Connection Plates

Stiffeners and connection plates welded transverse to girder webs and flanges are furnished with [redacted] oxygen cut edges. All stiffeners and connection plates that are painted have their unwelded corners [redacted] in the vertical direction is 5 times [redacted]

4.6.5 Lateral Gusset Plates

Gusset plates and other connections welded parallel to lines of stress in tension members have [redacted] sheared

edges [redacted]

4.6.6 Splice Plates and Gusset Plates

Girder and stringer splice plates and truss gusset plates are [redacted]

4.6.7 Sheared Edges

Sheared edges of plates thicker than [redacted] are removed to a depth of [redacted] cut produced by shearing, which is [redacted].

4.7 Bending of Structural Steel Plates

Cold or low heat bending of material carrying primary stress is not [redacted] To facilitate bending, the steel is [redacted]

When flange plates or connection plates carrying primary stress are bent to a radius of [redacted] the area to be bent is heated [redacted] after bending is complete and [redacted]

4.8 Machining of Contact Surfaces

4.8.1 Bearing Surfaces

The surface finish of bearing and base plates and other bearing surfaces that come in contact with each other or with concrete are required to meet the American National Standard for Surface Roughness as defined in ANSI B46.1, Surface Roughness, Waviness and Lay, Part I.

- Ends of compression members, bearing stiffeners and fillers in compression: [redacted] in
- Heavy plates in contact as part of bearing assemblies which are welded: [redacted] in
- Pins, pin holes, rotating portion of top of rockers and rocker sockets in sole plates: [redacted] in

- Rollers and rockers: [redacted] in
- Sliding bearing – stainless steel to polytetrafluoroethylene (PTFE): [redacted] in (No. 8 bright mirror finish)
- Sliding bearing – steel to copper alloys or steel to stainless steel: [redacted] in
- Sliding bearings with a surface roughness greater than [redacted] in shall be machined so that the lay of the cut is parallel to the direction of movement.
- Steel slabs or plates in contact with a concrete surface: [redacted] in

Machined surfaces are plane and true conforming accurately to [redacted]

Parts in bearing are required to have [redacted] Base and sole plates that are plane and true are not [redacted]

Surfaces of fabricated members are not machined until [redacted]

4.8.2 Abutting Joints

Abutting compression members are machined as specified above unless [redacted] the design is based upon transmitting [redacted] in which case ends of members are [redacted]

4.8.3 End Connection Angles

End connection angles of floor beams and stringers are flush with each other and accurately set as to position and length of member. In general, end connection angles are not [redacted] milled after [redacted]

4.9 Bolt Holes in Steel Members

4.9.1 General

The following methods of hole preparation are used and are clearly shown on shop drawings:

- CNC: [redacted]
- CNC-MDT: [redacted]
- DA: [redacted]
- DT: [redacted]
- DTU: [redacted]
- RA: [redacted]
- RTA: [redacted]
- [redacted] (DA) [redacted] (DT) and [redacted] (DTU)
  - Holes drilled from the solid are [redacted]
  - Holes are accurately [redacted]
  - Burrs on the surfaces are removed by [redacted]
- [redacted] (CNC-MDT)

- [redacted]
- Holes are accurately [redacted]
- Burrs on the surfaces are removed by [redacted]
- Twist drills, reamers and hand held drilling equipment are [redacted]

- [redacted] (RA)
  - [redacted]
  - Holes that are reamed are [redacted] as follows:
    - [redacted]
    - [redacted]
  - For sub-punched holes, [redacted]
  - Sub-size holes are [redacted] If this requirement is not fulfilled, [redacted] all cold worked (punch sheared) material will be [redacted] If the accuracy of sub-punched work will [redacted]

[redacted]

- During Reaming:
  - [redacted]
- After Reaming:
  - [redacted]
  - [redacted]
- [redacted] (CNC):
  - Method is reviewed by the Company for all [redacted]
  - Holes match drilled are [redacted]
  - Holes are accurately [redacted]
  - Burrs on the surfaces are removed by [redacted]

4.9.2 Bolt Holes in Primary Members: Girders, Stringers, Floorbeams, Arches, Towers, Bents, and Rigid Frames

Holes are drilled in assembly using either: RA, DA, DT, CNC-MDT, or accomplished by a method such as CNC approved by the Company, which is [redacted]

The following ancillary components also have their holes made as noted above:

- [redacted]
- [redacted]

Reaming or drilling is done after [redacted]

4.9.3 Bolt Holes in Primary Members: Trusses and Lift Bridges

Members include:

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

Holes are drilled in assembly using either: RA, DA, DT, CNC-MDT, or accomplished by a method approved by the Company, which is [redacted]

Reaming or drilling is done after [redacted]

Gusset plates or other parts attached to top and bottom chords have holes: RA, DA, or drilled by a method approved by the Company.

4.10 Bolt Holes in Secondary Members and Components

4.10.1 General

Secondary members and components are those members that are not [redacted] Holes in secondary members [redacted] by more than 1/16 inch [2mm]. Holes are [redacted]

4.10.2 Size of Holes in Secondary Members.

Standard size holes may be used in all plies of [redacted] but may be allowed in [redacted] provided:

a) [redacted]

b) [redacted]

c) [redacted]

d) [redacted]

e) [redacted]

f) [redacted]

The diameter of over-size holes is [redacted] larger than bolts [redacted] and greater in diameter.

4.11 Pins and Rollers

4.11.1 General

The material furnished for pins and rollers conform to the following requirements:

- [redacted]
- [redacted]
- [redacted]

Pins and rollers are accurately [redacted] bored before the pin is subjected to [redacted] is conducted in a manner that prevents [redacted]

Pins that contain interior defects are [redacted]

4.11.2 Boring Pin Holes

Holes for pins are [redacted] is always made. The length outside to outside of holes in tension members and inside to inside of holes in compression members do not [redacted]

4.11.3 Pin Clearances

The diameter of the pin hole does not [redacted]

4.11.4 Pin Threads

Pin threads are required to make [redacted]

4.11.5 Pilot and Driving Nuts

Two pilot nuts and two driving nuts are [redacted]

4.12 Bronze Surfaced Expansion Bearings

Bronze conforms to ASTM B100, Copper Alloy No. 510 or 511, or ASTM B22, Copper Alloy No. 911 or 913. Attachment is by [redacted] approved by the Company. Machining of the bronze surface is not [redacted] Machining shall not [redacted]

5.0 CLEANING and PROTECTIVE COATINGS

5.1 Machined Surfaces

Machine finished surfaces in sliding contact, including pins, pin holes, surfaces in sockets at the top of rocker bearings, etc, receive [redacted] Bronze plates in sliding contact are also [redacted]

[redacted] All other machine finished surfaces are [redacted]

6.0 WORKMANSHIP

6.1 Common Base Metal Discontinuities - Laminations

Laminations are planar discontinuities elongated in the rolling direction. They are most commonly found near [redacted] when cutting or machining exposes internal laminations. Laminations are formed when [redacted] Laminations generally run [redacted]

Some laminations are partially [redacted] roll-forge welded may conduct [redacted] generally cannot be relied upon to [redacted]