PIP STF05501
Fixed Ladders and Cages Fabrication Details
PURPOSE AND USE OF PROCESS INDUSTRY PRACTICES

In an effort to minimize the cost of process industry facilities, this Practice has been prepared from the technical requirements in the existing standards of major industrial users, contractors, or standards organizations. By harmonizing these technical requirements into a single set of Practices, administrative, application, and engineering costs to both the purchaser and the manufacturer should be reduced. While this Practice is expected to incorporate the majority of requirements of most users, individual applications may involve requirements that will be appended to and take precedence over this Practice. Determinations concerning fitness for purpose and particular matters or application of the Practice to particular project or engineering situations should not be made solely on information contained in these materials. The use of trade names from time to time should not be viewed as an expression of preference but rather recognized as normal usage in the trade. Other brands having the same specifications are equally correct and may be substituted for those named. All Practices or guidelines are intended to be consistent with applicable laws and regulations including OSHA requirements. To the extent these Practices or guidelines should conflict with OSHA or other applicable laws or regulations, such laws or regulations must be followed. Consult an appropriate professional before applying or acting on any material contained in or suggested by the Practice.

This Practice is subject to revision at any time.

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1. **Scope**

This Practice describes requirements and provides details for fabricating typical OSHA-regulated fixed ladders and cages for open structures, miscellaneous platforms, and vessels for regular operational access and egress.

*Comment:* As of the effective date of January 17, 2017, this Practice is no longer fully compliant with new *OSHA Regulations 29 CFR 1910 Subpart D – Walking-Working Surfaces* that were published on November 18, 2016. This Practice will need to be supplemented or modified by the user to be in full compliance with the new OSHA regulations until the complete revision of this Practice incorporating the changes is published by PIP.

2. **References**

Applicable parts of the following Practices, industry codes and standards, and government regulations shall be considered an integral part of this Practice. The edition in effect on the date of contract award shall be used, except as otherwise noted. Short titles are used herein where appropriate.

2.1 **Process Industry Practices (PIP)**

- PIP STI00301 - Concrete Typical Details
- PIP STS05120 - Structural and Miscellaneous Steel Fabrication Specification

2.2 **Industry Codes and Standards**

- ASTM International (ASTM)
  - ASTM A36/A36M - *Standard Specification for Carbon Structural Steel*
  - ASTM A307 - *Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength*

2.3 **Government Regulations**

The following government document has been used as a reference in the development of this Practice.

- U.S. Department of Labor (DOL) - Occupational Safety and Health Administration (OSHA)

3. **Definitions**

*contract documents:* Any and all documents, including codes, studies, design drawings, specifications, sketches, practices, and data sheets, that the purchaser or engineer of record has transmitted or otherwise communicated, either by incorporation or reference, and made part of the legal contract agreement or purchase order between the purchaser and the structure/platform fabricator, ladder fabricator and/or vessel manufacturer.

*design drawings:* Drawings produced by the structure/platform engineer and/or the vessel engineer that show the structure, vessel, platform, and ladder and cage arrangements and details
4. Requirements

4.1 Fixed ladders and cages shall be fabricated in accordance with *PIP STS05120*, this Practice and fabrication detail drawings *PIP STF05501-01* through *PIP STF05501-11*.

4.2 The project design drawings and other contract documents specify the following information:

a. Location and orientation of ladder and cage including the centerline of rungs in the plane of the ladder and the centerline of the ladder and cage perpendicular to the plane of the ladder

b. Location of safety gate hinges relative to the orientation of ladder
c. Selection of Type 1 ladder base (no connection at base) or Type 2 ladder base (with connection at base) for ladders at vertical vessels. See ladder base details on drawing PIP STF05501-03.

d. Top of bottom rung elevation for ladders at vertical vessels with Type 1 ladder base. See ladder base details on drawing PIP STF05501-03.

e. Bottom of ladder elevation for ladders at structures/platforms and horizontal vessels, and ladders at vertical vessels with Type 2 ladder base. See ladder base details on drawings PIP STF05501-02 and PIP STF05501-03.

f. Top of platform elevations (walking surface) for platforms serviced by ladder

g. Locations and details for ladder support members and support connectors to structures/platforms or vessels

h. Locations and details for ladder guide connectors to structures/platforms or vessels

i. Whether a cage is required for the ladder

j. Bottom of cage elevation if a cage is required

k. Special fabrication details

l. Any modifications to the requirements of this Practice

4.3 Unless otherwise specified, all material for ladders and cages shall be ASTM A36/A36M steel. Metric equivalents for plates, bars and structural shapes shall be as specified in contract documents as applicable.

4.4 Selection of ladder rails shall be based on guide locations shown on design drawings and the unguided length criteria shown on drawing PIP STF05501-01, unless otherwise specified in contract documents.

4.5 Entire ladder and cage assembly shall be welded construction. All welds shall be smooth, continuous, and sealed. Weld spatter on rungs and rails shall be removed.

4.6 Unless otherwise specified, ladder and cage assemblies shall be galvanized after fabrication in accordance with PIP STS05120.

4.7 Alternative or additional coatings for ladder and cage assemblies (e.g., safety yellow paint), shall be in accordance with contract documents.

4.8 A self-closing double-bar safety gate, in accordance with OSHA Regulations 29 CFR 1910 Subpart D and any other requirements specified in the contract documents, shall be provided at the opening in the platform railing for all platforms serviced by the ladder. Safety gates shall be trial fitted in the shop and shipped loose. Unless otherwise specified, swing gates shall have a minimum required swing angle of 90 degrees.

4.9 Unless otherwise specified, all bolts required for ladder and cage assembly erection shall be provided by ladder fabricator. Bolts shall be 5/8-inch (16-mm) ASTM A307 bolts galvanized in accordance with PIP STS05120.
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PROCESS INDUSTRY PRACTICES
FABRICATION/INSTALLATION DETAILS

FIXED LADDERS AND CAGES
LADDER RUNG AND BASE DETAILS

1. CONNECTION TO STEEL OR CRATING AT ELEVATED PLATFORM:
   LADDER FABRICATOR SHALL PROVIDE 2-CONNECTION BOLT ASSEMBLIES
   AT THE BASE OF EACH LADDER.
   EACH CONNECTION BOLT ASSEMBLY SHALL CONSIST OF
   1~ASTM A307 5/8" (16) DIAMETER BOLT, 1~NUT, 1~ WASHER,
   AND 1~PLATE 2 1/2" x 2 1/2" x 1/4".

2. CONNECTION TO CONCRETE AT GRADE:
   LADDER PAD INSTALLER TO PROVIDE LADDER PAD
   AND 5/8" (16) DIAMETER ADHESIVE ANCHORS.
   (SEE PIP STI03310 FOR LADDER PAD DETAILS)

LADDER BASE DETAILS

AT STRUCTURE/PLATFORM OR HORIZONTAL VESSEL

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS
IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.

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PROCESS INDUSTRY PRACTICES
FABRICATION/INSTALLATION DETAILS
FIXED LADDERS AND CAGES
LADDER BASE DETAILS AT VERTICAL VESSEL

STF05501-03
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REAFFIRMED: NA
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STF05501

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TYPE 1 (NO CONNECTION AT BASE)

SIDE ELEVATION

1-6' (460)

3/8" BAR (TYP) 3/16" WEB (TYP)
2' (50) 2' (50) (TYP)
1 5/8" (41) LONG ANGLE AT CHANNEL RAIL (TYP)
1 1/2" (63) LONG ANGLE AT BAR RAIL (TYP)

SEAL WELD (TYP)
11/16" (18) DIA HOLE IN RAIL FOR 5/8" (16) DIAMETER SMOOTH ROD (TYP)

BAR RAIL (TYP)

BOTTOM OF LADDER RAILS -

TOP OF BOTTOM RUNG ELEVATION (SEE DESIGN DRAWING)

WALKING SURFACE AT GRADE OR ELEVATED PLATFORM

LADDER BASE CONNECTION NOTES:
1. CONNECTION TO STEEL OR GRATING AT ELEVATED PLATFORM:
   LADDER FABRICATOR SHALL PROVIDE 2-CONNECTION BOLT ASSEMBLIES AT THE BASE OF EACH LADDER.
   EACH CONNECTION BOLT ASSEMBLY SHALL CONSIST OF 1-ASTM A307 5/8" (16) DIAMETER BOLT, 1-NUT,
   1-WASHER, AND 1-PLATE 2 1/2" x 2 1/2" x 1/4".

2. CONNECTION TO CONCRETE AT GRADE:
   LADDER PAD INSTALLER TO PROVIDE LADDER PAD AND 5/8" (16) DIAMETER ADHESIVE ANCHORS.
   (SEE PIP ST103310 FOR LADDER PAD DETAILS)

3. VERTICAL POSITION OF ROD RELATIVE TO SLOTTED HOLE SHOWN IS BASED ON VESSEL AND LADDER AT
   AMBIENT TEMPERATURE.

TYPE 2 (WITH CONNECTION AT BASE)

FRONT ELEVATION

LADDER BASE DETAILS AT VERTICAL VESSEL
(SEE DESIGN DRAWINGS FOR BASE DETAIL TYPE SELECTION)

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
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BAR 3" x 1/4" AT TOP HOOP (TYP) (BY LADDER FABRICATOR)

BAR 2" x 1/4" AT TOP INTERMEDIATE HOOP (TYP) (BY LADDER FABRICATOR)

SELF-CLOSING DOUBLE-BAR SAFETY GATE SHALL BE PROVIDED AS REQUIRED BY OSHA REGULATIONS

NOTE:
SEE DESIGN DRAWING FOR LOCATION OF LADDER

PLAN
TOP HOOP AND TOP INTERMEDIATE HOOP DETAILS
STEP THRU LADDER

FACE TO FACE OF RAILING POSTS AND FLANED LADDER RAILS

NOTE:
SAFETY GATE AND LADDER SUPPORT CONNECTION NOT SHOWN FOR CLARITY (SEE STF05501-08 FOR SUPPORT CONNECTION DETAILS TO STRUCTURE/PLATFORM)

CHANNEL RAIL TRANSITION TO BAR RAIL

FLARED LADDER RAIL DETAILS
STEP THRU LADDER

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES; METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.

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**PROCESS INDUSTRY PRACTICES**

**FABRICATION/INSTALLATION DETAILS**

**FIXED LADDERS AND CAGES**

**SIDE STEP LADDER SUPPORT**

**CONNECTION DETAILS TO VERTICAL VESSEL**

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**PLAN**

**SIDE STEP LADDER SUPPORT**

**CONNECTION DETAILS TO VERTICAL VESSEL**

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**ELEVATION**

**SIDE STEP LADDER SUPPORT**

**CONNECTION DETAILS TO VERTICAL VESSEL**

*(ONE SET PER LADDER)*

Dimensions are given in feet and/or inches. Metric dimensions in parentheses are in millimeters, unless otherwise noted.
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PROCESS INDUSTRY PRACTICES
FABRICATION/INSTALLATION DETAILS
FIXED LADDERS AND CAGES
STEP THRU LADDER SUPPORT
CONNECTION DETAILS TO STRUCTURE/PLATFORM

NOTE:
SAFETY GATE NOT SHOWN FOR CLARITY

NOTE:
SEE DESIGN DRAWING FOR LOCATION OF LADDER

LEGEND NOTES

A SEE DESIGN DRAWING FOR SUPPORT CONNECTORS TO STRUCTURE/PLATFORM (FABRICATED BY STRUCTURE/PLATFORM FABRICATOR)

B 3/8" x 6" OUTSIDE EACH LADDER RAIL FOR BAR RAIL (BY LADDER FABRICATOR) (SEE DETAIL THIS DRAWING FOR PLATE CONNECTION TO CHANNEL RAIL)

C PLATE AND SUPPORT CONNECTOR (SEE DESIGN DRAWING)

D 2-5/8" (16) DIA ASTM A307 BOLTS (BY LADDER FABRICATOR) (INSTALL WITH BOLT HEAD TO INSIDE OF LADDER)

ELEVATION
STEP THRU LADDER SUPPORT
CONNECTION DETAILS TO STRUCTURE/PLATFORM
(ONE SET PER LADDER)

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DETAIL
PLATE CONNECTION TO CHANNEL RAIL
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Plan
Ladder Guide
Connection Details to Structure/Platform

Elevation
Ladder Guide
Connection Details to Structure/Platform

Dimensions are given in feet and/or inches. Metric dimensions in parentheses are in millimeters, unless otherwise noted.
STANDARD FLARE CAGE WITH 3 ~ EXTENDED VERTICAL BARS AT THE BACK SHALL BE PROVIDED.

UP TO 6'-0" (1800)

STANDARD FLARE CAGE WITHOUT EXTENDED VERTICAL BARS AT THE BACK SHALL BE PROVIDED IF CAGE IS SHOWN ON DESIGN DRAWING.

OVER 6'-0" (1800)

EXTENDED VERTICAL BARS CONNECTED AT RAILING

WELD ADDITIONAL VERTICAL BAR 1 1/2" x 1/4" FOR CORNER CONDITION

NOTE:
SEE DESIGN DRAWING FOR LOCATION OF LADDER

PLAN

LADDER CAGE DETAILS AT ELEVATED PLATFORM

3 ~ BARS 1 1/2" x 1/4"
EQUALLY SPACED BETWEEN BOTTOM OF CAGE AND TOP OF RAILING

VERTICAL BAR CONNECTION TO TOP RAIL WITH 5/8" (16) DIA ASTM A307 BOLTS (BY LADDER FABRICATOR)

TOP OF PLATFORM RAILING

3/16 (5) TYP

EXTENDED VERTICAL BARS

BOTTOM OF CAGE ELEVATION (SEE DESIGN DRAWING)

7'-0" (2100) MIN

BOTTOM OF LADDER AND TOP OF PLATFORM ELEVATION (WALKING SURFACE) (SEE DESIGN DRAWING)

SECTION A-A

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