PIPE GUARDS AND HANDRAILS FABRICATION DETAILS

December 2019

Structural
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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Pipe Guards and Handrails Fabrication Details

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1. **Scope**

This Practice provides requirements and details for fabrication of pipe guards for walking and working surfaces and pipe guards with pipe handrails for standard stairs used for access and egress in industrial facilities.

2. **References**

Applicable parts of the following Practices and references 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 will be used herein where appropriate.

2.1 **Process Industry Practices (PIP)**

- PIP STF05501 - *Fixed Ladders Fabrication Details*
- PIP STF05511 - *Standard Stairs Fabrication Details*
- PIP STF05530 - *Grating Fabrication Details*
- PIP STS05120 - *Structural and Miscellaneous Steel Fabrication Specification*

2.2 **Industry Codes and Standards**

- American Institute of Steel Construction (AISC)
  - ANSI/AISC 303-16 - *Code of Standard Practice for Steel Buildings and Bridges*
- American Society of Mechanical Engineers (ASME)
  - ASME B16.9 - *Factory-Made Wrought Buttwelding Fittings*
- ASTM International (ASTM)
  - ASTM A36/A36M - *Standard Specification for Carbon Structural Steel*
  - ASTM A53/A53M - *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*
  - ASTM A307 - *Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength*
  - ASTM A500/A500M - *Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes*

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)
  - *Regulations 29 CFR 1910 Subpart D - Walking-Working Surfaces - Final Rule Published in Federal Register, Volume 81, No. 223, on November 18, 2016*
3. Definitions

contract documents: Any and all documents, including codes, studies, design documents, specifications, sketches, practices, and data sheets, that 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 purchaser and guard and handrail fabricator.

design documents: The design drawings, or where the parties have agreed in the contract documents to provide digital model(s), the design model. A combination of drawings and digital models also may be provided.

design drawings: The graphic and pictorial portions of the contract documents showing the design, location, and dimensions of the work. These documents generally include, but are not necessarily limited to, plans, elevations, sections, details, schedules, diagrams and notes.

design model: A dimensionally accurate 3D digital model of the structure that conveys the structural steel requirements given in Section 3.1 of ANSI/AISC 303-16 for the building or structure.

engineer of record: Purchaser’s authorized representative with overall authority and responsibility for engineering design, quality, and performance of civil works, structure, foundations, materials, and appurtenances described in contract documents. Engineer of record is licensed as defined by laws of the locality in which the work is to be constructed, and is qualified to practice in the specialty discipline required for the work described in contract documents.

fabricator: Party responsible for providing fabricated structural and miscellaneous steel including guards and handrails in accordance with contract documents. The term fabricator applies also to fabricator’s subcontractor(s) and/or vendor(s).

guard: A vertical protective barrier erected along exposed edges of stairs, balconies, and similar areas.

handrail: A bar, pipe, or similar member designed to furnish persons with a handhold.

owner: Party who has authority through ownership, lease, or other legal agreement over site, facility, structure, or project wherein guards and handrails will be used.

purchaser: Party who awards contract to fabricator. Purchaser may be owner or owner’s authorized agent.

stairways (stairs): Risers and treads that connect one level with another, and includes any landings and platforms in between those levels. Stairways include standard, spiral, alternating tread-type, and ship stairs. In this Practice, when the term “stairs” is used, it is referring only to “standard stairs.”

standard stairs: A fixed or permanently installed stairway. Ship, spiral, and alternating tread-type stairs are not considered standard stairs. In this Practice when the term “stairs” is used, it is referring to “standard stairs.”

stile: A means of access or egress over an obstruction composed of an ascending stair, a top landing and a descending stair.

toe plate: A low protective barrier that is designed to prevent materials, tools, and equipment from falling to a lower level, and to protect employees from falling.
4. Requirements

4.1 Pipe guards and handrails shall be fabricated in accordance with PIP STS05120, this Practice and fabrication detail drawings STF05520-01 through STF05520-35.

4.2 The project design documents and other contract documents specify the following information:
   a. Location and limits of guards and handrails
   b. Location and size of openings in guards for ladder access, equipment, piping, etc.
   c. Location of safety gate hinges at openings in guards for ladder access relative to the orientation of ladder
   d. Location and length of removable sections of guards
   e. Location of guards in braced bays, if different from that shown on fabrication detail drawing STF05520-13
   f. Toe plate details for checker plate, concrete, or other type floors
   g. Details of field modifications of existing guards and handrails
   h. Whether plastic inserts at open ends of pipe posts and handrails are required
   i. Connection details for any connections not included in details in this Practice
   j. Special fabrication details
   k. Any modifications to requirements of this Practice

4.3 Unless otherwise specified, pipe guards and handrails shall be fabricated with carbon steel, round structural tubing (hollow structural sections) in accordance with ASTM A500/A500M Grade C, HSS 1.900 x 0.145 (1.900 inches (48.3 mm) O.D. x 0.145 inches (3.68 mm) wall thickness) or pipe in accordance with ASTM A53/A53M Type E or S, Grade B, NPS 1 1/2 STD (1.900 inches (48.3 mm) O.D. x 0.145 inches (3.68 mm) wall thickness).

4.4 Unless otherwise specified, all other structural shapes, bars, and plates shall be ASTM A36/A36M steel.

4.5 Metric equivalents for plates, bars, structural shapes, and pipe shall be as specified in contract documents as applicable.

4.6 Guards and handrails shall be welded construction except as shown in design documents and/or attached details. All welds shall be continuous and sealed. All joints and welds in handrails and top rail of guards shall be smooth finished. Guards and handrails shall be surfaced in a manner to prevent injury from punctures or lacerations and clothing snags.

4.7 Unless otherwise specified, guard and handrail assemblies shall be galvanized after fabrication in accordance with PIP STS05120.

4.8 Alternative or additional coatings for guards and handrails (e.g., safety yellow paint), shall be in accordance with contract documents.

4.9 Unless otherwise specified, all bolts required for guard and handrail erection shall be provided by fabricator. Bolts shall be 5/8-inch (16-mm) ASTM A307 bolts galvanized in accordance with PIP STS05120.

4.10 A self-closing double-bar safety gate, in accordance with OSHA Regulations 29 CFR 1910 Subpart D and any other requirements specified in contract documents, shall be provided.
by fabricator at openings in guards for ladder access as shown in design documents. 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.

4.11 Stair stringers and treads shall be in accordance with PIP STF05511 and as specified in contract documents.

4.12 Fixed ladders and cages shall be in accordance with PIP STF05501 and as specified in contract documents.
3D PDF of Stair Tower with Typical Pipe Guard and Handrail Details

NOTE: The 3D PDF object below is viewable on this page by enabling the content as prompted by the pop-up and then clicking anywhere on the page for it to be viewed. The view can be disabled after it is enabled by right clicking and selecting "Disable Content" and re-enabled by left clicking anywhere on the page.
ELEVATION

NOTES:
1. MEMBER SIZES FOR TOP RAIL, INTERMEDIATE RAIL, AND POSTS ARE PIPE NPS 1 1/2 STD OR ROUND HSS 1.900X0.145.
2. TOE PLATE IS PL 1/4" X 4".
3. METRIC EQUIVALENTS FOR PLATES, BARS, STRUCTURAL SHAPES, AND PIPE SHALL BE AS SPECIFIED IN CONTRACT DOCUMENTS AS APPLICABLE.
4. CANTILEVERS AT ENDS OF GUARD SECTIONS ARE OPTIONAL. DELETE CANTILEVER IF THIS IMPROVES THE OVERALL LAYOUT.
5. FOR CORNER DETAILS, SEE DETAIL 16 AND 17 ON STF05520-16.

ABBREVIATIONS AND SYMBOLS:
B.O. BOTTOM OF
Q. CENTER LINE
CLR CLEAR
CONC CONCRETE
CONN CONNECTION
DIA DIAMETER
EL ELEVATION
FLG FLANGE
GALV GALVANIZED
GRTG GRATING
HORIZ HORIZONTAL
HSS HOLLOW STRUCTURAL SECTION
INTM INTERMEDIATE
LG LONG
MAX MAXIMUM
MIN MINIMUM
NPS NOMINAL PIPE SIZE
OPP OPPOSITE
PL PLATE
SIM SIMILAR
STL STEEL
THK THICK OR THICKNESS
T.O. TOP OF
TYP TYPICAL
WP WORK POINT
W/ WITH
° AT
& AND

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
**SECTION A-A**
STF05520-01

<table>
<thead>
<tr>
<th>SUPPORT BEAM</th>
<th>POST TO BEAM CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL WB, ALL W10, DEEPER W-SHAPEs WITH WEB THICKNESS LESS THAN 0.37&quot; (9), AND ALL CHANNELS TOED OUT</td>
<td>DETAIL 1 ON STF05520-03</td>
</tr>
<tr>
<td>ALL OTHER W-SHAPEs</td>
<td>DETAIL 2 ON STF05520-04</td>
</tr>
<tr>
<td>ALL CHANNELS TOED IN</td>
<td>DETAIL 3 ON STF05520-04</td>
</tr>
</tbody>
</table>

The details below are to be used if the post is required to be spaced away from the support beam due to fireproofing or for other reasons.

| ALL WB, ALL W10, DEEPER W-SHAPEs WITH WEB THICKNESS LESS THAN 0.37" (9), AND ALL CHANNELS TOED OUT | DETAIL 4 ON STF05520-05 |
| ALL OTHER W-SHAPEs | DETAIL 5 ON STF05520-05 |

**DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.**
POST CONNECTION TO SUPPORT BEAM

SECTION B-B

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
PROCESS INDUSTRY PRACTICES
FABRICATION/INSTALLATION DETAILS

PIPE GUARDS AND HANDRAILS
POST TO BEAM CONNECTION DETAILS

<table>
<thead>
<tr>
<th>BEAM FLG THK ((t_t))</th>
<th>A (in)</th>
<th>WT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1/2&quot; \leq t_t \leq 1&quot;)</td>
<td>2 1/4&quot;</td>
<td>7x11</td>
</tr>
<tr>
<td>(1&quot; &lt; t_t \leq 2&quot;)</td>
<td>3 1/4&quot;</td>
<td>8x13</td>
</tr>
<tr>
<td>(t_t &gt; 2&quot;)</td>
<td>5 1/4&quot;</td>
<td>9x17.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BEAM FLG THK ((t_t))</th>
<th>A (mm)</th>
<th>WT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(13 \leq t_t \leq 25)</td>
<td>53</td>
<td>7x11</td>
</tr>
<tr>
<td>(25 &lt; t_t \leq 50)</td>
<td>78</td>
<td>8x13</td>
</tr>
<tr>
<td>(t_t &gt; 50)</td>
<td>128</td>
<td>9x17.5</td>
</tr>
</tbody>
</table>

POST CONNECTION TO SUPPORT BEAM

DETAIL 2
STF05520-02

POST CONNECTION TO CHANNEL TOED IN

DETAIL 3
STF05520-02

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
POST CONNECTION AT FIREPROOFED SUPPORT

DETAIL 4
STF05520-02

NOTE:
FOR ADDITIONAL INFORMATION SEE DETAIL 1 ON STF05520-03.

POST CONNECTION AT FIREPROOFED SUPPORT

DETAIL 5
STF05520-02

NOTE:
FOR ADDITIONAL INFORMATION SEE DETAIL 2 ON STF05520-04.

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES; METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
RAILS TO POST CONNECTION
DETAIL 8
STF05520-01

- Ø 11/16" (18) DIA HOLE IN ANGLE AND 11/16" (18) X 1 1/4" (32) LG SLOT IN TOE PL FOR 5/8" (16) DIA BOLT

TOE PLATE TO POST CONNECTION
DETAIL 9
GRTG AND SUPPORT BEAM NOT SHOWN FOR CLARITY
STF05520-01 & 06

SECTION F-F

BOLT HEAD ON PLATFORM SIDE
L2x2x1/4" x 4" (100) LONG (NOTE 2)

NOTES:
1. SEE STF05520-01, NOTE 1 FOR RAIL, POST AND TOE PLATE MEMBER SIZES.
2. TOE PLATE CONNECTION MAY BE ON EITHER SIDE OF GUARD POST.

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

1. Use Type 1 where columns continue 3'-6" (1070) or more above top of grating.
2. Use Type 2 where columns end at top of steel elevation.
3. Where columns continue less than 3'-6" (1070) above top of grating, but do extend above the top of steel, use Type 1 details for toe plate and grating. If columns do not interfere with the guard system, use Type 2 details for guard top rail, intermediate rail, and posts. If columns do interfere with the guard system, treat the columns as obstructions and follow the details on drawing STF05520-14.

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
USE DETAIL 11 ON STF05520-10 IF THIS DISTANCE EXCEEDS 5 1/2" (140)  

SUPPORT BEAM  
(W-SHAPE OR CHANNEL)  

FOR TOE PL SPlice  
SEE DETAIL 20 ON STF05520-27  

TOE PL WELDED TO GRATING  
(BY GRATING FABRICATOR)  
(SEE PIP STF05530)  

COLUMN  

GUARD  

TOE PL  

FOR TOE PL SPlice  
SEE DETAIL 20 ON STF05520-27  

SUPPORT BEAM  
(W-SHAPE OR CHANNEL)  

PLAN  
GUARD AT TYPICAL COLUMN  
DETAIL 10  
STF05520-08, 18 & 26  

NOTE:  
GUARD CLEARANCE SHOWN IS TO EDGE OF COLUMN OR FIREPROOFING.  

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS  
IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
PLAN
GUARD AT DEEP COLUMN
DETAIL 11
STF05520-08, 18 & 26

NOTE:
GUARD CLEARANCE SHOWN IS TO EDGE OF COLUMN OR FIREPROOFING.

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES; METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
ADJUST GUARD LOCATION
BASED ON WIDEST FLANGE
OF SUPPORT BEAMS

TOE PL
GUARD
POST

SUPPORT BEAM
(W-SHAPE OR CHANNEL)

COLUMN

SUPPORT BEAM
(W-SHAPE OR CHANNEL)

PLAN
GUARD AT TYPICAL TOP LEVEL COLUMN
DETAIL 13
STF05520-08

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
PIPE GUARDS AND HANDRAILS
GUARD AT COLUMNS - DETAILS

PLAN
GUARD AT DEEP TOP LEVEL COLUMN
DETAIL 14
STF05520-08

PLAN
GUARD AT CORNER TOP LEVEL COLUMN
DETAIL 15
STF05520-08

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

(View looking outward from inside structure)

1 1/2" (40) MIN CLR FROM BRACE OR FIREPROOFING

SECTION G-G

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

$\frac{11}{16}''$ (18) $\times$ 1 1/4'' (32) LG SLOTS IN TOE PLATE AND REMOVABLE TOE PLATE AND $11/16''$ (18) HOLES IN ANGLE FOR 5/8'' (16) BOLTS (SEE DETAIL 19 ON STF05520-27 FOR VERTICAL DIMENSIONS TO HOLES)

SEE SECTION F-F ON STF05520-07 FOR ADDITIONAL INFORMATION

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
MITER
DETAIL 16
STF05520-01 & 28

BEND
DETAIL 17
STF05520-01 & 28

NOTES:
1. FOR GUARD CORNERS (BOTH VERTICAL AND HORIZONTAL), USE MITER DETAIL 16 UNLESS OTHERWISE NOTED IN DESIGN DOCUMENTS.
2. FOR HANDRAILS, USE METER DETAIL 16 OR BEND DETAIL 17 AT FABRICATOR’S OPTION, UNLESS SPECIFICALLY NOTED IN DESIGN DOCUMENTS.
3. LONG RADIUS ELBOW IN ACCORDANCE WITH ASME B16.9 IS ACCEPTABLE.

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

GUARD/HANDRAIL ACROSS INTM LANDING TO BE SIMILAR TO STILE GUARD/HANDRAIL TYPE 1, 2 OR 3 AS REQUIRED (SEE STF05520-29, STF05520-30 AND STF05520-31)

EDGE OF NOSING ON TREAD

NOTE:
1. HANDRAIL SHALL BE PIPE NPS 1 1/2 STD (OR ROUND HSS 1.900X0.145).
2. POST LOCATIONS SHOWN ARE FOR ILLUSTRATION ONLY. FABRICATOR TO DETERMINE ACTUAL LOCATIONS BASED ON THE DETAILS IN THIS PRACTICE.

TYPICAL ELEVATION
INTERMEDIATE STAIR LANDING

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

GUARD/HANDRAIL AT STAIRS

NOTE:
FOR ARRANGEMENT OF TOE PLATES, SEE STF05520-26.

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

NOTES:
1. SEE NOTE 1 ON STF05520-17 FOR HANDRAIL MEMBER SIZE.
2. SEE DESIGN DOCUMENTS FOR LOCATION OF WP IN RELATION TO HEADER BEAM LOCATION.
3. LOCATION OF HANDRAIL RETURN TO GUARD SHALL BE MINIMUM 1'-0" (305) BEYOND WP AT TOP OF STAIR.

<table>
<thead>
<tr>
<th>TYPE OF HEADER BEAM</th>
<th>DIMENSION: END OF GUARD TO HEADER BEAM LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHANNEL TOED IN</td>
<td>1/2&quot; (12)</td>
</tr>
<tr>
<td>CHANNEL TOED OUT</td>
<td>1/4&quot; (6) + b_r</td>
</tr>
<tr>
<td>W-SHAPE</td>
<td>1/4&quot; (6) + b_r/2</td>
</tr>
</tbody>
</table>

"b_r" DENOTES FLANGE WIDTH

SECTION L-L

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

GUARD/HANDRAIL AT STAIRS - SECTIONS

SECTION M-M TYPE 1
STF05520-18

SECTION M-M TYPE 2
STF05520-18

NOTES:
1. SEE NOTE 1 ON STF05520-17 FOR HANDRAIL MEMBER SIZE.
2. SEE DESIGN DOCUMENTS FOR LOCATION OF WP IN RELATION TO HEADER BEAM LOCATION.
3. USE SECTION M-M TYPE 1 IF DIMENSION FROM WP TO HEADER BEAM LOCATION EQUALS TREAD DEPTH PLUS DIMENSION FROM TABLE ON STF05520-20; IF GREATER, USE SECTION M-M TYPE 2.

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
SECTION N-N TYPE 1
STF05520-18

NOTE 2
HEADER BEAM LOCATION
(BACK OF CHANNEL OR Φ W-SHAPE)

NOTE 2
HEADER BEAM LOCATION
(BACK OF CHANNEL OR Φ W-SHAPE)

T.O. TOP RAIL
1'-9" (535) MAX
SEE TABLE ON STF05520-20

EDGE OF NOSING ON TREAD

T.O. HANDRAIL

T.O. INTM RAIL

T.O. TREAD

T.O. GRTG

NOTES:
1. SEE NOTE 1 ON STF05520-17 FOR HANDRAIL MEMBER SIZE.
2. SEE DESIGN DOCUMENTS FOR LOCATION OF WP IN RELATION TO HEADER BEAM LOCATION.
3. USE SECTION N-N TYPE 1 IF DIMENSION FROM WP TO HEADER BEAM LOCATION
   EQUALS TREAD DEPTH PLUS DIMENSION FROM TABLE ON
   STF05520-20; IF GREATER, USE
   SECTION N-N TYPE 2.
4. LOCATION OF HANDRAIL RETURN TO GUARD SHALL BE MINIMUM
   ONE TREAD DEPTH BEYOND WP AT BOTTOM OF STAIR.

SECTION N-N TYPE 2
STF05520-18

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

SEE NOTE 1 ON STF05520-17 FOR HANDRAIL MEMBER SIZE.
SECTION Q-Q TYPE 1  
STF05520-18

SECTION Q-Q TYPE 2  
STF05520-18

SECTION Q-Q TYPE 3  
STF05520-18

NOTE:
THE APPLICABLE SECTION TYPE WILL DEPEND ON THE STAIR LAYOUT. SEE DESIGN DOCUMENTS.

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
PIPE GUARDS AND HANDRAILS
HANDRAIL - FIELD SPlice

PLAN

HANDRAIL FIELD SPlice
DETAIL 18
STF05520-14, 24 & 30

MANUFACTURED PIPE SLEEVE LOCK

SET SCREWS FROM BOTTOM

SECTION R-R

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
TOE PLATES AT STAIR TOWER — PLAN

SEE DETAIL 12 ON STF05520-10
TOE PL ATTACHED TO GUARD POSTS

SEE DETAIL 10 ON STF05520-09
OR DETAIL 11 ON STF05520-10 STRUCTURE AS APPLICABLE SIDE

FOR TOE PL SPLICE SEE DETAIL 20 ON STF05520-27
TOE PL WELDED TO GRTG (BY GRTG FABRICATOR) (SEE PIP STF05530)

FOR TOE PL SPLICE SEE DETAIL 20 ON STF05520-27
TOE PL WELDED TO STRINGER (BY STL FABRICATOR)

GUARD ON LANDING
TOE PL WELDED TO GRTG (BY GRTG FABRICATOR) (SEE PIP STF05530)

HANDRAIL

TOE PL WELDED TO GRTG (BY GRTG FABRICATOR) (SEE PIP STF05530)

UPPER LANDING

PLAN

TOE PLATES AT STAIR TOWER

NOTE:
SEE STF05520-18 FOR LOCATION OF ADDITIONAL SECTIONS WHICH PROVIDE INFORMATION RELATED TO TOE PLATE.

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

SECTION T-T

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
ELEVATION - STILE GUARD/HANDRAIL TYPE 1

NOTES:

1. DIMENSIONS SHOWN ARE TYPICAL BOTH ENDS OF STILE.
2. STILE GUARD/HANDRAIL TYPE IS SHOWN IN THE DESIGN DOCUMENTS.
3. WORK POINT (WP) LOCATIONS ARE SHOWN IN THE DESIGN DOCUMENTS.
4. STILE IS SHOWN SYMMETRICAL; HOWEVER, THIS MAY NOT BE THE CASE.
   SEE DESIGN DOCUMENTS.
ELEVATION - STILE GUARD/HANDRAIL TYPE 2

NOTES:
1. DIMENSIONS SHOWN ARE TYPICAL BOTH ENDS OF STILE.
2. STILE GUARD/HANDRAIL TYPE IS SHOWN IN THE DESIGN DOCUMENTS.
3. WORK POINT (WP) LOCATIONS ARE SHOWN IN THE DESIGN DOCUMENTS.
4. STILE IS SHOWN SYMMETRICAL; HOWEVER, THIS MAY NOT BE THE CASE.
   SEE DESIGN DOCUMENTS.
ELEVATION – STILE GUARD/HANDRAIL TYPE 3

NOTES:
1. DIMENSIONS SHOWN ARE TYPICAL BOTH ENDS OF STILE.
2. STILE GUARD/HANDRAIL TYPE IS SHOWN IN THE DESIGN DOCUMENTS.
3. WORK POINT (WP) LOCATIONS ARE SHOWN IN THE DESIGN DOCUMENTS.
4. STILE IS SHOWN SYMMETRICAL; HOWEVER, THIS MAY NOT BE THE CASE. SEE DESIGN DOCUMENTS.
**PLAN AT ACCESS TO SIDE-STEP LADDER**

- **Opening in Guard Between Posts**
  - To match flared opening in ladder rails.

- **Self-Closing Double-Bar Safety Gate**
  - To be provided by guard fabricator.

**PLAN AT TOP OF THROUGH LADDER**

- **Opening in Guard Between Posts**
  - To match flared opening in ladder rails.

- **Self-Closing Double-Bar Safety Gate**
  - To be provided by guard fabricator.

**Notes:**
- If ladder includes cage, connection bar welded to ladder rail extends and becomes top hoop of cage.
- Dimensions are given in feet and/or inches. Metric dimensions in parentheses are in millimeters, unless otherwise noted.
DETAIL 21

THROUGH LADDER TOP CONNECTION TO GUARD POST

STF05520-32

NOTE:

IF LADDER INCLUDES CAGE, THE CONNECTION BAR WELDED TO THE LADDER RAIL WILL EXTEND BEYOND THE CONNECTION AND BECOME THE TOP HOOP OF THE CAGE. THE CONNECTION BAR WELDED TO THE GUARD WILL BE THE SAME WHETHER OR NOT A CAGE IS FURNISHED WITH THE LADDER.

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
PIPE GUARD POST
(TOP RAIL NOT SHOWN)

CONN BAR 3" x 1/4"
(BY GUARD FABRICATOR)

TOP HOOP BAR 3" x 1/4"
WELDED TO LADDER RAIL
(BY LADDER FABRICATOR)

Ø 11/16" (18) DIA HOLES
FOR 5/8" (16) DIA BOLT
AT CENTERLINE OF CONN
BAR (BOLT BY LADDER
FABRICATOR)

DETAIL 22
SIDE-STEP LADDER WITH CAGE
HOOP CONNECTION TO GUARD POST
STF05520–32

CONN BAR OR TOP HOOP BAR
3" x 1/4" WELDED TO LADDER
RAIL (BY LADDER FABRICATOR)

Ø 1" (25)
45° BEVEL
TOP OF TOP RAIL AND
TOP OF CONN BAR

GUARD POST AT
LADDER OPENING

SECTION W–W
CONNECTION BAR TO GUARD POST
STF05520–33, 34

DIMENSIONS ARE GIVEN IN FEET AND/OR INCHES. METRIC DIMENSIONS
IN PARENTHESES ARE IN MILLIMETERS, UNLESS OTHERWISE NOTED.
WHERE CAGE WITH (3) EXTENDED VERTICAL BARS AT THE BACK IS TO BE PROVIDED, GUARD FABRICATOR TO PROVIDE CONNECTION PLATES WELDED TO TOP RAIL OF PLATFORM GUARD FOR CONNECTING VERTICAL BARS TO GUARD

WHERE CAGE WITH (3) EXTENDED VERTICAL BARS AT THE SIDE IS TO BE PROVIDED, GUARD FABRICATOR TO PROVIDE CONNECTION PLATES WELDED TO TOP RAIL OF PLATFORM GUARD FOR CONNECTING VERTICAL BARS TO GUARD

TOP RAIL OF PLATFORM GUARD

PLAN

LADDER CAGE AT ELEVATED PLATFORM

SECTION X-X

Dimensions are given in feet and/or inches; metric dimensions in parentheses are in millimeters, unless otherwise noted.