RMI Guideline for the Assessment and Repair or Replacement of Damaged Rack – Version 1.00

FOREWORD. This Guideline was developed by the Rack Manufacturers Institute, an Industry Group of MHI and represents suggested practices and considerations for repairing or replacing damaged racks. It is intended to provide useful information and guidance for owners, users, designers, purchasers and/or specifiers of repairs to racks and rack systems. It is advisory only and should only be regarded as a simple tool that its intended audience may or may not choose to follow, adopt, modify, or reject. The following information does not constitute a comprehensive safety program, cannot guard against pitfalls in operating, selecting and purchasing such a system, its repair or its replacement, and should not be relied upon as such. However, such a safety program should be developed, and an independent adviser should be consulted in doing so.

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1.0 Scope and Introduction

1.1 The Rack Manufacturers Institute (RMI) has developed this Guideline to provide a reference for Owners and Operators to define the proper steps for:

- Conducting assessments and surveys of rack damage.
- Reporting and record keeping of damage surveys and repairs on an ongoing basis.
- Evaluating a damaged rack system and developing engineering solutions for its repair and/or replacement.
- Installing solutions for repairs or replacements.

1.2 This Guideline highlights the importance of rack safety and certain risks, if poor practices are followed, and addresses frequent questions that may arise during rack repair projects. This Guideline builds on information that is contained in RMI/ANSI MH 16.1 [1], in the RMI “Considerations for the Planning and Use of Industrial Steel Storage Racks” [2] and in other documents that are available.

It is the intent of this Guideline to focus on the part of the rack system that is affected by damaged components being repaired, not to require that an entire system be evaluated in every circumstance.

1.3 Rack systems are highly engineered, high performance structures that are often exposed to product loads more than ten times the self-weight of the structure. Each component should have been designed, tested, manufactured, and subjected to rigorous quality controls to assure that it will safely withstand those demands.

1.4 RMI Specification [1] contemplates certain factors of safety but cannot include requirements that may be imposed as a result of post-manufacture damage. It is important that racks be regularly inspected and correctly maintained to retain the system’s design capacity and factors of safety.

1.5 Owners of racking systems need short-term and long-term strategies for damage surveys, executing repairs and record keeping.

Per RMI/ANSI MH 16.1 [1], Sections 1.4.2, 1.4.4, rack installations may require load application and rack configuration drawings and plaques. There may be requirements for new installations under certain building codes.

1.6 Repair, replacement or reconfiguration of rack systems could void manufacturer's warranties and guarantees because original equipment manufacturers (OEM) lack control over repair processes. Such a situation involving subsequent modifications could shift responsibilities for product liability from the original rack manufacturer to the rack repair provider and/or to the Owner.
1.7 The number one priority of any repair program must be to ensure that, when the repair process is complete, the rack system will provide a safe working environment for all employees working near or in the system.

2.0 Definitions and Responsibilities:

Rack Repair – encompasses the process of returning a damaged rack system to its required design capacity and integrity. Repair work may include repairing the damaged rack components, as well as, replacing them, as needed.

Component - is a finished part consisting of members. For example, an upright frame is considered a component, while the pieces that are used to build the frame are considered members.

Load Application and Rack Configuration (LARC) Drawings – show appropriate details of the rack structure and repair solution encompassing the section of the rack system that is affected by the repair.

Owner/Operator – is the party that is responsible for managing and maintaining the rack system with responsibilities that include:

- Maintaining a safe pallet rack system.
- Maintaining up-to-date drawings and engineering documentation.
- Maintaining load capacity plaques.
- Conducting regular inspections, as outlined in the RMI “Considerations for the Planning and Use of Industrial Steel Storage Racks” [2].
- Selecting a Supervising Engineer and Rack Repair Provider.

Supervising Engineer – is a qualified Rack Design Engineer who is skilled in structural analysis, design and application of rack systems, and whose responsibilities include:

- Identifying the original manufacturer of the rack system and whether or not the system is RMI/ANSI Specification [1] compliant, as applicable.
- Reviewing system documentation to validate the capacity rating for the section of the rack that is being repaired.
- Developing an assessment protocol to identify and grade damaged conditions that should identify overloading or damaged conditions, that could render the system unsafe and that could require unloading.
- Overseeing the scope and thoroughness of the assessment of damage repairs.
- Designing and approving the repair protocol to address all conditions identified by the Field Assessor.
- Developing repair solutions that address all of the loads imparted on the damaged components (static, seismic, etc.), not just the strength of
individual members being repaired. All work must be compliant with applicable state laws and building codes.

Field Assessor - works under the direction of the Supervising Engineer with responsibilities that include:

- Identifying the manufacturer of a rack system (where possible) and obtaining the system’s documentation, if available. (If original engineering documentation is not available, field measurements to document the actual details of the rack system’s fabrication may have to be taken.)
- Reviewing the system’s configuration and comparing it to the system's drawings (beam levels, loads, etc.).
- Noting any variances from system drawings.
- Identifying all damage based on instructions from the Supervising Engineer and recording the location of damaged components.
- Performing post-repair or replacement inspections and reporting the results, as required by the Supervising Engineer.

OEM – is the original equipment manufacturer of the racking system.

Rack Repair Provider - is the responsible party for assessing and/or repairing the rack system or components including:

- Reviewing drawings and repair solutions that the Supervising Engineer recommends.
- Implementing the repair or replacement solution, as directed by the Supervising Engineer.
- Providing updated LARC drawings to the Owner that incorporate proposed repairs or replacements, as directed by the Supervising Engineer.

3.0 Rack Repair Principles

3.1 The responsibilities of Owners/Operators include:

- Maintaining appropriate documents that reflect the design and engineering of the rack system.
- Consulting with an appropriate Rack Design Professional or Engineer when moving, reconfiguring, replacing or repairing rack systems.
- Maintaining a regular program for inspecting and maintaining racks as outlined in the RMI “Considerations for the Planning and Use of Industrial Steel Storage Racks” [2].

3.2 The RMI Specification [1] can provide the technical framework that guides the design of rack repair solutions.
3.3 The repair process (assessment, design and installation) must be overseen by a qualified Rack Design Engineer (Supervising Engineer).

3.4 The assessment and design of rack repairs must address all loads that may be imparted on damaged members (static, seismic, etc.), not just on the specific members being repaired.

3.5 Rack systems lacking original engineering documentation must be evaluated in accordance with applicable building codes. If stamped and sealed calculations of the original installation are needed, but not available, the system must be evaluated in accordance with applicable building codes.

4.0 Risks of Ignoring Damage

4.1 Pallet rack systems which are properly designed, manufactured, installed, used and maintained, can provide years of trouble-free, safe service. When properly used by careful, well trained fork lift operators, rack should need little maintenance or repair.

When racks are damaged or improperly repaired, the load-carrying capacity of the structure may be reduced. Although a single instance of damage to the rack may not result in failure, severe or accumulated damage will reduce the capacity of the system and may ultimately lead to its collapse.

The cost of rack collapses may far exceed the value of the entire rack structure and may lead to:

- Injury or loss of life
- Loss of product
- Loss of business and business interruption
- Large cleanup and replacement expenses
- Costly litigation

4.2 As the cases in Table 1 show, inattention to rack safety or improper rack repair may result in the rack’s failure or collapse resulting in injury or possibly death.
<table>
<thead>
<tr>
<th>Summary of Accident</th>
<th>Cause of Accident</th>
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<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Location: A food industry company warehouse.</td>
<td>Failure of a pallet rack upright frame following repair work involving the butt welding of two portions of a column.</td>
</tr>
<tr>
<td>Consequences: A worker was fatally injured.</td>
<td>The supplier did not establish any inspection procedure for the rack components before it was delivered and installed at the customer’s premises.</td>
</tr>
<tr>
<td>Summary: A temporary pallet rack collapsed, and the loads fell on the worker seated next to the pallet rack</td>
<td>Inadequate repair method that failed to take into account the quality of the steel used and the racking manufacturer’s recommendations.</td>
</tr>
<tr>
<td>2. Location: The warehouse of a food industry wholesaler.</td>
<td>An unprotected upright frame column was struck by a hand-operated truck that encroached on the main aisle. This rack was struck by the lift truck driven by the worker.</td>
</tr>
<tr>
<td>Consequences: A worker was fatally injured.</td>
<td>Impact between the lift truck and the pallet rack.</td>
</tr>
<tr>
<td>Summary: A pallet rack collapsed following an indirect impact between the lift truck and an upright frame column.</td>
<td></td>
</tr>
</tbody>
</table>

Table 1

4.3 Examples of rack system collapses resulting from improper maintenance are shown below:

| Rack damage was ignored | Rack collapse led to the surrounding building’s collapse |
4.4 Rack damage may not be noticed or may be ignored because the rack structure continues to be standing. Examples of damaged rack are shown below:

<table>
<thead>
<tr>
<th>Missing diagonal</th>
<th>Sheared anchor; footplate separated from column</th>
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</thead>
<tbody>
<tr>
<td><img src="image1" alt="Missing diagonal" /></td>
<td><img src="image2" alt="Sheared anchor; footplate separated from column" /></td>
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</table>

<table>
<thead>
<tr>
<th>Damaged upright column</th>
<th>Damaged column with home-grown repair</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Damaged upright column" /></td>
<td><img src="image4" alt="Damaged column with home-grown repair" /></td>
</tr>
</tbody>
</table>
In each of these examples, the damaged rack systems should be assessed and repaired or replaced, as directed by a qualified rack engineer.

4.6 Attempts to repair racks are often made without appropriate engineering oversight because "we have always done this" or "he is a good welder". Without proper engineering oversight, there is no proof or assurance that the repair is sound and will yield a safe operating system.
In these instances, the person who made the repair improvised, but a qualified engineer reviewing it recognized that the repairs had not been properly designed and had created a potentially unsafe condition. The improper repairs were removed and replaced with appropriate engineered solutions.

5.0 Repair options:

5.1 Replacement:

When original or updated engineering documentation is available, replacement of damaged components with identical parts from the original manufacturer is an approved method to address the damaged rack, as long as the rack system still meets appropriate capacity requirements. It is important to not interchange uprights, beams or other components that look “similar” to each other, but may be designed and approved to interface with different models of rack, without appropriate approval.

RMI members have performed extensive testing to ensure that their proprietary components will meet the RMI Specification [1]. When products from different manufacturers are mixed, appropriate testing must be performed to validate the capacity of the mixed components. Mixing and matching components without engineering oversight is not recommended, because it is highly risky. Replacing a load-bearing component of a rack structure without performing an engineering evaluation, that incorporates the loads on the replaced component, is not recommended.
5.2 Rack Repair Kits:

In some situations it may be more economical, or otherwise more advantageous, to remove the damaged section of an upright and to replace it with a pre-engineered rack repair kit.

Such kits are typically bolted or welded in place and anchored to the floor. When designing the kit, a Supervising Engineer must evaluate the configuration and loading of the existing rack at the location of the damage, taking into account the loads imparted on the damaged component, not just on the particular member being repaired. Each load configuration must be evaluated separately. The repair kits must be engineered to meet applicable building codes.

5.3 Member Straightening:

If a repair solution requires bending or straightening damaged members, the straightening process must ensure that appropriate properties of the steel are maintained in the repaired member as approved by the Supervising Engineer.

5.4 Welded Field Repair:

Where replacement or repair kits are not an option, the Owner may choose to perform a welded field repair on a rack system. Any field repairs must be overseen by a qualified Professional Engineer so that the work is performed in accordance with applicable American Welding Society (AWS) codes. (Refer to Appendix 1 for additional risks that are associated with field welding.)

6.0 Repair Assessment

6.1 RMI Specification [1] recommends that all damaged rack be isolated and evaluated by a qualified professional prior to repair or replacement of the damaged components.

A major challenge in developing an effective repair program for racks is to ensure that the repairs are performed to a uniform, engineering-driven standard with supporting documentation that establishes that good practices were followed. Because of the long lifecycle of rack systems, such documentation can pose special challenges for Owners because many rack systems are moved, reconfigured, repurposed or changed in some way from what was originally designed and installed.

6.2 Performing a proper assessment of damage can be more complicated than simply fixing the worst damage. Any process of assessing damage to a rack system must be conducted under the direction of a Supervising Engineer.

This does not mean that the Supervising Engineer has to perform the assessment; however, the Supervising Engineer should approve the assessment.
process and protocol and should communicate regularly with the Field Assessor to ensure that the appropriate information is sufficiently documented for a complete evaluation of the repair.

6.3 Repair programs may be constrained by budgets or the temptation to repair only the worst damage. All damage that the Supervising Engineer concludes must be repaired must be corrected so that the rack system can provide a safe working environment.

6.4 Best Practices

6.4.1 Projects with original engineering drawings and documentation:

- Validate that the rack is in the location identified in the engineering documentation.
- Validate that the rack system has not been reconfigured from the original drawings.

If there is no change from original drawings: If there is no change to the rack system, the Field Assessor can readily document all instances of damage and can present the results of his survey to the Supervising Engineer, who can develop appropriate repair solutions. Appropriate steps for inspection are included in Section 6 of RMI “Considerations for the Planning and Use of Industrial Steel Storage Racks” [2]:

*If stamped and sealed calculations are not available from the original project, and now are required, the system must be evaluated under current RMI/ANSI and Building Code requirements (as required by state law).*

*If the rack system’s configuration has changed, but documentation has not been updated and the system has not been relocated to a new facility:* The Supervising Engineer (or other authorities) may have the discretion to calculate the capacity of the system based upon codes that were in effect when the system was installed.

6.4.2 Projects with missing or no documentation:

The original documentation and calculations should be researched because this is normally the simplest solution.

If the original documentation is not available, a Supervising Engineer should be selected to develop the assessment process, to supervise the preparation of the engineering package and to approve it.

The assessment process encompasses collecting all relevant information needed by the Supervising Engineer that may include but not be limited to: the identity of the rack system manufacturer, the number of affected parts, rack construction,
the sizes of affected members, the properties of materials, gauges, spacing, elevations, loads, anchoring and slab.

Based on the protocol that the Supervising Engineer develops, the Field Assessor should document all damage and present the results of his survey to the Supervising Engineer who should develop appropriate repair solutions.

7.0 Repair the System versus Repair a Component

7.1 When repairing rack systems, the Supervising Engineer must evaluate the loads that are imparted on the damaged component, not just on the specific member being repaired. This evaluation is especially important with older systems that may have been moved or reconfigured during their lifetime. The following example shows how a seemingly simple reconfiguration can dramatically reduce the load capacity of a system and can create a significant safety risk.

An Owner reconfigured a rack without engineering oversight. The Owner’s maintenance department removed the lower level of a push-back rack system to allow for additional clearance for fork lifts to drive under the rack to place floor-level pallets.

The Owner did not realize that this reconfiguration reduced the capacity of the rack system from 3,000 lbs. (1,360 kg) per pallet to 1,800 lbs. (816 kg) per pallet because the unsupported span of the uprights was increased. The Owner continued to store 3,000 lb. (1,360 kg) pallets on the system, thereby exposing lift truck operators driving under a system that was loaded 66% over its rated capacity.
A simple engineering review of the system that would be conducted before the repairs were implemented would have uncovered this unsafe operating condition, and would have allowed the repair supplier to work with the Owner to avoid this unsafe condition, so that the repaired system provided the appropriate load capacity.

7.2 Owners, manufacturers and repair suppliers should not rely only on experience or history when planning or executing rack repair. It is critical to first ensure that the original system meets applicable codes and safety requirements, before repairs are begun. If this critical step is ignored, the repair provider could repair a damaged component but leave the rest of the system in an unsafe condition if, for example, the system was overloaded. Careful review by a qualified Rack Design Engineer is imperative.

8.0 Engineering

8.1 Drawings and maintaining proper documentation:
8.1.1 If the existing LARC drawings are not available, new LARC drawings showing the load capacity of the repaired system must be created. The Supervising Engineer should approve such drawings before repairs are begun. LARC drawings should provide clear information defining the repair or replacement, as well as, configurations of bays or sections affected by the repair or replacement.

Notice should be conspicuously depicted on LARC drawings showing that the Supervising Engineer is to evaluate any deviations from the drawings and that any deviation may impair the safety of the rack system. (RMI/ANSI MH 16.1 [1], Section 1.4.5).

An example LARC Drawing.
*Note that design loads and beam elevations are clearly identified

8.1.2 Load Capacity Plaque

As outlined in RMI/ANSI MH 16.1 [1], Section 1.4.2, the Owner is responsible to ensure that load capacity plaques are conspicuously displayed in one or more prominent locations. If there are any changes to the rack configuration, the capacity plaques must be updated and reinstalled.
8.2 Technical Requirements

8.2.1 The Supervising Engineer shall review the maximum loading capabilities of the system with the Owner/Operator. If appropriate, the Supervising Engineer should determine all external loading requirements of the rack structure, including product load, wind load, snow load, rain on snow surcharge, snow drifting, seismic load and dead and live load from structures supported by the storage rack and more. The necessary strength and stiffness of the members and connections shall be determined by structural analysis for the appropriate load combinations (ASD or LRFD, as required by RMI/ANSI MH 16.1 [1] Section 2.1 or 2.2, respectively).

8.2.2 The components affected, by the repair or replacement, shall meet all the material and design requirements of the RMI/ANSI MH 16.1 Specification [1] and Commentary, which details component design requirements. Sections 8.3 through 8.5 in this guideline are for some components that are not mentioned in the RMI/ANSI MH 16.1 Specification [1], but are important and unique to the repair of storage racks.

8.2.3 When testing is required, representative samples of specific components from the existing system being repaired shall be used with the new repair component
in a procedure that is approved and overseen by the Supervising Engineer. This testing may be done in any facility acceptable to the Supervising Engineer, and the testing records shall be maintained by the Supervising Engineer.

8.3 Column

8.3.1 Column Splice

If it is necessary to repair a column segment with a new section, a splice may be used to join the two components. The continuity of the load path across this splice joint is critical to the structural integrity of the repair.

The column splice must meet the loading requirements of the applicable loading combinations in RMI/ANSI MH 16.1 [1] Section 2.1 or Section 2.2. The splice connection shall be evaluated for the following factors including, but not limited to: column axial force, flexural buckling, torsional buckling, flexural-torsional buckling, column axial slip resistance, the column bending strength, the column bending stiffness.

8.3.2 Column Baseplate

A column baseplate may have to be repaired with a new plate because the column must be re-anchored and old hole locations are no longer available. The bending stiffness of the base joint may be critical to the success of the repair.

The column base plate must be shown to meet the loading requirements of the applicable loading combinations in RMI/ANSI MH 16.1 [1] Section 2.1 or Section 2.2. The base connection shall be evaluated for the following factors including, but not limited to: the column downward axial force, the column uplift, the base joint bending strength, the base joint bending stiffness.

If replacement anchors cannot be located in the same place relative to the column, a new location must be designed and tested. Replacement anchors shall be located in the same hole or not less than 3 times the larger anchor diameter from existing anchor holes whether the holes are empty or contain the remnants of old anchors. If existing anchor holes are filled with "dry-pack mortar" and the mortar has set for not fewer than 7 days, replacement anchors shall be placed not less than 1.5 times the diameter of the largest anchor from existing holes.

When welding new base plates onto existing frames, field welding risks discussed in Appendix 1 should be carefully considered.
8.4 Bracing Continuity

Original frame bracing generally provides a continuous load path to the supports. Repair of that bracing must be shown to establish a satisfactory replacement of the original load path.

The design of the repaired bracing system with an evaluation of the repair kit and the existing structure must ensure that stability and force requirements meet RMI/ANSI MH 16.1 [1], Section 2.4. Frame bracing and its connections to the column must be shown to have the necessary strength and stiffness to support the column axial and bending load. All frame bracing that is replaced or repaired, must be capable of carrying this load.

Consideration must be given to compression bracing members that have discontinuities or splices.

8.5 Shelf Beams

8.5.1 Shelf Connection

The shelf beam-to-column connector of conventional racking is the primary joint that stabilizes the storage rack columns in the down-aisle direction. These connections vary widely from manufacturer to manufacturer. Each original equipment manufacturer has tested its connector with its column in accordance with RMI/ANSI MH 16.1 [1].

If a shelf must be replaced, the Supervising Engineer shall obtain (or develop through testing) the beam-to-column test results that are for the specific combination being used, and shall incorporate that data into the design of the repair solution.

8.5.2 Lateral Bracing of Beam

Beams (particularly open sections) that are bent about their major axis are subject to lateral buckling of the compression flange. If the replacement beams are open sections, the design shall account for this buckling, or adequately brace the compression flange.

9.0 Installation

9.1 Introduction: This Section addresses considerations that are unique to rack repair or to replacement installations. For general guidance, refer to RMI/ANSI MH 16.1 [1] and the RMI “Considerations for the Planning and Use of Industrial Steel Storage Racks” [2].

9.2 Straight and Plumb: The first factor to check is whether the loaded rack structure that is being repaired is plumb and within tolerances that are
established by the Supervising Engineer. RMI/ANSI MH 16.1 [1], Section 1.4.11 calls for a minimum plumbness and straightness (both cross and down aisle) of 1/2" per 10’ of height. If the structure’s plumbness or straightness is out of tolerance, it must be plumbed and straightened as part of the repair process. After completion of the repair work, the plumbness and straightness of the repaired rack when loaded must be verified as being within tolerance for the entire height of the frame (Repaired Section + Original Frame Members).

9.3 Repair Kit Splice Joint Cut Tolerances: In cases where a section of an existing rack structure is removed and replaced with a repair kit, the tolerances for the splice joint that are specified by the Supervising Engineer must be maintained in the field. The kit design may require that the existing rack column rest directly on the horizontal surface of the repair kit to generate full rated capacity. (In these cases, the connecting bolts do not have sufficient capacity to carry the load themselves). If there is a gap between the existing column and the repair kit, the gap must be shimmed as specified by the Supervising Engineer.

9.4 Working in Loaded Rack: In some cases it is possible to repair a damaged rack while it is still loaded by using a jack that is attached to the rack column above the damaged section. Such a jack would temporarily relieve the rack column of the load, allowing the repair work to be completed without having to unload the rack. When using such a jack to support the loaded rack, the jack and its attachment to the column must have a certified capacity that is capable of supporting the actual load on the rack structure. The lifting device must be designed and validated for such an application by a qualified engineer. Special considerations to address include:

- Floor conditions must be considered when selecting a jacking method. For example, jacks that rely on friction to remain in place may not be appropriate for certain floor conditions.
- When a front column is supported by a jack and the existing bracing sections are removed to install a repair kit, the rear column’s unsupported height may increase significantly, which may reduce its capacity. The Supervising Engineer must evaluate the load that the unbraced rear column will have to support during such a repair.

9.5 Anchoring Repaired Rack: The Supervising Engineer should consider the location of existing anchor holes and should design the kit for repair or replacement for proper anchoring. It is unacceptable to leave repaired rack unanchored.

9.6 Re-Use of Hardware: Where specified, bolts shall be installed to the recommended tightening requirements, which may be critical to the structural performance of the connections. The re-use of existing fasteners during rack repairs is not recommended, unless the OEM or Supervising Engineer approves them for the application.
Appendix 1

Risks of Field Welding:

Although field welding may seem to be a fast and economical option in repairing a damaged rack system, there are several risk factors that should be reviewed before moving forward.

**Fire Risk:** The welding process will throw off sparks and embers into the area immediately surrounding the work, which may include flammable materials. This has often resulted in catastrophic fires and product damage. If field welding is the only option, the repair supplier must follow all appropriate fire safety procedures. Consult OSHA standard 29 CFR 1910.252(a) for more detail.

**Weld Contamination:**

"...The portions of such surfaces which will be welded shall be thoroughly cleaned of all foreign matter including paint for at least 2 in [50 mm] from the root of the weld."

*Reference:* American Welding Society Specification- D1.1/D1.1M [3]; Section 8.5.1 Base-Metal Condition

When racks are manufactured, the environment where welding is performed is tightly controlled so that the welds meet engineered design requirements. In a field situation where a painted product is welded, the surface where welding is to take place must be cleaned to bare metal so that there is no contamination of the weld metal which could otherwise result in a weakened weld or hydrogen embrittlement – in turn, leading to failure.

**Operating Temperature:** Welding processes generally assume that the welds are made in relatively narrow operating temperatures. When a welded solution is necessary to pallet racks that are used in cooler or freezer environments, it is incumbent upon the repair provider to ensure that weld techniques for low temperature implementation including ensuring proper ventilation (heating of the material may be required) are followed. Welding in freezers is generally discouraged.

If field welding is necessary, the Supervising Engineer must provide a qualified or pre-qualified procedure for the weld joint that meets appropriate AWS standards.

**Welder Certification:** Welder certifications are limited to specific skill sets that the welder has demonstrated and are often not transferrable. A welder who is certified for making a fillet weld in a flat position may not be certified (or have the skill) to make a fillet weld in a vertical or overhead position that may be necessary to effect a proper repair. A welder must present documentation of his certification to execute the welding procedure specified by the Supervising Engineer.
References


2. Rack Manufacturers Institute (RMI) (2012), Considerations for the Planning and Use of Industrial Steel Storage Racks, MHI 2012, Charlotte, NC.