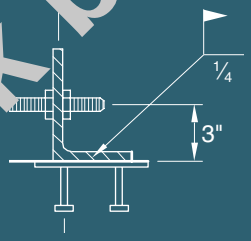
Design Guide

PCI Connections Manual
for precast and prestressed concrete construction



Prepared by the
PCI Connection
Details Committee

First Edition

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Substantial effort has been made to ensure that all data and information in this manual are accurate. However, PCI cannot accept responsibility for any errors or oversights in the use of material or in the preparation of engineering plans. This publication is intended for use by personnel competent to evaluate the significance and limitations of its contents and able to accept responsibility for the application of the material it contains. Special conditions on a project may require more specific evaluation of practical engineering judgement.

While every effort has been made to prepare this publication as the national standards for the industry, it is possible that there may be some conflicts between the material herein and local practices.

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Table of Contents

Chapter 1
Introduction to Connections

Introduction to Connections

1.1 Scope of Report

1.1.1 General

Connections are fundamental to all building and construction no matter what material is used. The purpose of a connection is to transfer load and provide stability, which means the design of connections is one of the most important steps in the engineering of precast/prestressed concrete structures. Standard precast concrete connections are the subject of this report. Although the connections are noted as "typical precast concrete connections," the manual does not limit the designer or precast concrete producer to using only the connections shown in this report as long as the alternate connection satisfies the objective of the design.

The designer must be well versed in all of the factors that influence the determination of applied loads and thus in the design of various connections. This report takes a typical connection and establishes a nominal connection capacity. It is the responsibility of the designer to verify that the applied loads do not exceed the given connection capacity under the given design assumptions. This report should be used by an engineer who is familiar with structural mechanics and who uses engineering judgment in applying these standard connections to a specific structure. Note the term "designed by others" means designed by the engineer of record or the contractor—not the precaster. A typical design example is presented with each connection detail table in order to illustrate the design method used to arrive at a particular connection capacity. The capacities shown are maximum for the direction shown and the effect of interaction should be considered where appropriate.

1.1.2 Standardization

During the evolution of the precast/prestressed concrete industry, certain approaches for making connections have been found to satisfy the objectives of owners, contractors, precast/prestressed concrete manufacturers, and designers. The objectives of a good connection combine practicality and economy with sound design and therefore require an understanding of factors such as strength, serviceability, ductility, production techniques, erection techniques, aesthetics, and economics.

This report categorizes and describes connections that the Committee believes have satisfied all the noted objectives over several years of construction and use.

The connections shown in this report perform well in seismic design categories A, B, and C. Special detailing and design considerations will be required in seismic design categories D, E, and F.

1.1.3 Organization of Connections

The connections presented in this report are given in the following general categories:

- Foundation Connections
- Beam–Column, Double Tee–Spandrel
- Double Tee–Wall Connections
- Wall Panel–Wall Connections
- Architectural Claddings Connections
- Miscellaneous Connections
- Seismic Connections

Refer to the Table of Contents for a more detailed breakdown within these groups. Although these categories are very broad, the members of the committee believe that the general layout of the text should be familiar to most readers.

1.1.4 Format

The connections depicted in this report show a simplified graphic schematic of the connection in the middle of a typical page with design assumptions on the upper left hand side, followed by the connection capacity table. Sample problems are presented with examples.

1.1.5 Limitations

Some of the most important considerations in building design, such as building layout, configuration, and selection of types of precast members, are discussed in the *PCI Design Handbook* (6th edition). This report should be used as a reference for the reader in determining which approaches to certain connections are considered standard by the Committee. For any particular project, the designer should analyze the conditions specific to that project and determine if the standard connections shown in this report are desirable or applicable. There may be several successful solutions to each connection problem, and the design methods and examples included in this report are not the only acceptable ones. The connections presented in this report, however, have satisfied the noted objectives over several years of construction and use.

Disclaimer: The Committee wants to reiterate that this report is intended for use by those with an understanding of engineering mechanics and structural design, and in no case should it replace good engineering judgment.