

## Best Practice Form

<b>Best Practice Title:</b>	<b>Structural Code Guidance for Decontamination and Decommissioning Activities at DOE Facilities</b>		
<b>DOE Site:</b>	Idaho National Lab	<b>Facility Name:</b>	All D&D Facilities
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### **Brief Description of Best Practice:** (Provide a short, "abstract-like" description of the best practice)

Decontamination and decommissioning (D&D) of facilities at U.S. Department of Energy (DOE) sites require engineering standards to safely accomplish D&D missions. Current engineering standards do not adequately address the unique situations arising during D&D activities. A new guidance document was developed to establish new code guidance governing structural design during D&D phases. SEI/ASCE 37-02 "Design Loads on Structures During Construction," is used to establish the basis of this document.

### **Summary:**

To more closely align the national code with D&D activities, the new guidance document provides guidance on how to interpret SEI/ASCE 37-02, "Design Loads on Structures During Construction," for D&D structural activities at DOE sites.

The national consensus codes for structural design provide guidance that ensures safe occupancy of permanent structures. However, they may not be applicable to temporary D&D structures. D&D structures, systems, and components will shortly be demolished and, therefore, have a temporary occupancy or use similar to new construction phases of a project, but with a limited life span. For example, compliance with existing structural design codes for D&D phases may result in precluding the use of heavy equipment because of existing load factors. Using safety factors that are appropriate may result in allowing the use of heavy equipment, thus removing workers from increased industrial and radiological hazards.

Because there are similarities between construction and D&D, it is proposed that the existing code SEI/ASCE 37-02 be modified by the guidance document and used for D&D activities.

**Why the best practice was used:** (Briefly describe the issue/improvement opportunity the best practice was developed to address)

This best practice was developed because current engineering standards do not adequately address the unique situations arising during D&D activities. This document modifies, clarifies, and provides guidance for using SEI/ASCE 37-02 to include D&D design. All sections of ASCE 37-02 apply to D&D, if not modified or excluded in the guidance document. The guidance document is applicable to all DOE sites.

**What problems/issues were associated with the best practice:** (Briefly describe the problems/issues experienced with the initial deployment of the best practice that, if avoided, would make the deployment of this best practice easier the "next time".)

Without a uniform structural code guidance for D&D activities at DOE facilities, each DOE site/project created and maintained their own policies and procedures. Some sites used the SEI/ASCE 37-02 "Design Loads on Structures During Construction" for guidance and some did not. Now that the uniform structural code guidance has been developed, the issue associated with this best practice will be in the implementation of the guidance across all sites and projects.

**How the success of the Best Practice was measured:** (What data/operating experience is available to document how successful the best practice has been?)

This Guidance has been implemented over the past 6 years at various sites at the Idaho National Laboratory. Following this guidance has allowed us to work more efficiently without compromising safety. These practices were instituted at the following D&D projects: Experimental Test Reactor, Material Test Reactor, Power Burst Facility, EBR-II Sodium Treatment Process and various other support facilities to these reactors.

**What are the benefits of the best practice:** (Briefly describe the benefits derived from implementing the best practice.)

The intent of writing the guidance document is to provide clear and uniform guidance to D&D design engineering, to make D&D engineering efforts and field applications more cost effective, and to ensure the safety of D&D personnel.

**Alternative solutions considered:** (Other solutions to the issue/improvement opportunity considered prior to implementing the best practice?)

Previous to the development of the guidance document, each DOE site/project created and maintained their own policies/procedures to guide structural D&D activities with varying degrees of success. A standardized consistent approach across all DOE sites and projects was needed.

**Additional Information**

Reference:	Structural Code Guidance for Decontamination and Decommissioning Activities at DOE Facilities, June 2012, CWI-M-1265, Revision 0.
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Technology Links:	
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Vendor Links:	
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Videos Pictures:	
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Comments:	Reference document is attached to this best practice.
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CWI-M-1265  
Revision 0

# STRUCTURAL CODE GUIDANCE FOR DECONTAMINATION AND DECOMMISSIONING ACTIVITIES AT DOE FACILITIES

June 2012

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**Approved for public release; distribution is unlimited.**

## **ABSTRACT**

Decontamination and decommissioning (D&D) of facilities at U.S. Department of Energy (DOE) sites require engineering standards to safely accomplish D&D missions. Current engineering standards do not adequately address the unique situations arising during D&D activities. It is, therefore, proposed that a new guidance document be developed that will establish new code guidance governing structural design during D&D phases. SEI/ASCE 37-02 “Design Loads on Structures During Construction,” is used to establish the basis of this document.



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## **ACRONYMS**

D&D decontamination and decommissioning  
DOE U.S. Department of Energy

# **STRUCTURAL CODE GUIDANCE FOR DECONTAMINATION AND DECOMMISSIONING ACTIVITIES AT DOE FACILITIES**

## **INTRODUCTION**

Decontamination and decommissioning (D&D) of facilities at U.S. Department of Energy (DOE) sites require engineering standards to safely accomplish D&D missions. Current engineering standards do not adequately address the unique situations arising during D&D activities. To more closely align the national code with D&D activities, this document provides guidance on how to interpret SEI/ASCE 37-02, “Design Loads on Structures During Construction,” for D&D structural activities at DOE sites.

The national consensus codes for structural design provide guidance that ensures safe occupancy of permanent structures. However, they may not be applicable to temporary D&D structures. D&D structures, systems, and components will shortly be demolished and, therefore, have a temporary occupancy or use similar to new construction phases of a project, but with a limited life span. For example, compliance with existing structural design codes for D&D phases may result in precluding the use of heavy equipment because of existing load factors. Using safety factors that are appropriate may result in allowing the use of heavy equipment, thus removing workers from increased industrial and radiological hazards.

Because there are similarities between construction and D&D, it is proposed that the existing code SEI/ASCE 37-02 be modified by this guidance document and used for D&D activities.

## **ORGANIZATION**

This guidance document addresses, in tabular form, design loads on structures during D&D work, using SEI/ASCE 37-02 as its baseline document, and modifies specific portions of SEI/ASCE 37-02 to make it applicable to design and analysis of structures during D&D work. This document is formatted in a manner similar to ASCE 37-02 in that each page consists of two text columns. The first column includes the D&D modification to SEI/ASCE 37-02, the second column includes the applicable commentary. The numbering system of this document matches the numbering system used in ASCE 37-02, thus facilitating quick reference between the codes. New sections have been added to this document that are not part of ASCE 37-02. Those new sections are included at the end of individual chapters and are labeled “(New Section).”

## **SCOPE**

This document modifies, clarifies, and provides guidance for using SEI/ASCE 37-02 to include D&D design. All sections of ASCE 37-02 apply to D&D, if not modified or excluded herein. This document is applicable to all DOE sites.

The intent of writing this guidance document is to provide clearer guidance to D&D design engineering, to make D&D engineering efforts and field applications more cost effective, and to ensure the safety of D&D personnel.

Note: If there is an interruption or suspension to a D&D project, it is recommended that administrative controls and engineering evaluations be performed to ensure that the facility(s) are

left in a safe configuration. The continued applicability of this guidance document may then be reevaluated on a case-by-case basis, considering future occupancy and use.

## GUIDANCE

Modify Chapters 1 through 6 of SEI/ASCE 37-02, as stated below. All other parts of SEI/ASCE 37-02 apply to D&D, if not modified or excluded herein.

### 1.0 GENERAL

**Modify this chapter, as follows.**

Replace the word “construction” with the following:

“decontamination and decommissioning (D&D)”

### 1.2 Scope

**Modify this section, as follows.**

Replace the first sentence of this paragraph with the following:

“This standard addresses structures that have been designated for imminent D&D and are considered unoccupied (except for D&D personnel).”

### 1.3 Basic Requirements

#### 1.3.1 Safety

**Modify this section, as follows.**

Replace the paragraph in this section with the following:

“The design loads shall provide for a level of safety (for partially demolished and temporary structures) that protects D&D personnel from danger and that is generally comparable to the level of safety of completed structures.”

#### 1.3.2 Structural Integrity

**Modify this section, as follows.**

Replace the word “construction” with “D&D” and the word “completed” with “demolished.”

## COMMENTARY

### C1.0 GENERAL

**Modify this chapter, as follows.**

Replace the word “construction” with “D&D.”

#### C1.3.1 Safety

**Modify this section, as follows.**

First sentence, no change. Add second sentence, as follows:

“Some design load factors may be reduced, based on the definability and variability of the load over time, which is much different for a structure undergoing demolition. Reduced load factors do not pose an increased safety hazard to personnel.”

#### C1.3.2 Structural Integrity

**Modify this chapter, as follows.**

Replace contents of this section with the following:

“When a structure is undergoing D&D and some portion of that structure must remain standing to accommodate future work, structural integrity shall be provided for the remaining structure to avoid creating vulnerable, partially demolished portions of the structure.

This can be accomplished (1) by leaving the lateral support system untouched as the dependent portion of the structure is demolished, (2) by providing suitable temporary lateral bracing, and (3) by avoiding conditions that result in loads that exceed the capacity of structural elements.”

**1.3.3 Serviceability****Modify this section, as follows.**

Replace the paragraph in this section with the following:

“The effects of D&D loads or conditions shall not adversely affect the serviceability or performance of portions of the facility that will be needed to further the D&D process, or that will remain in place after D&D is completed.”

**1.3.6 Analysis****Modify this section, as follows.**

Replace:

“Load effects on incomplete structures, on temporary structures”

with

“Load effects on partially demolished structures, on temporary D&D structures”

**1.4 Definitions (New Section)****Add this as a new section.**

“The following definitions apply to this document:

**Decontamination and decommissioning (D&D):** The process of removing structures or facilities from service. The D&D process may include erecting temporary structures. It also may involve activities related to radiological and chemical decontamination, disposal, and demolition

**Temporary:** Duration of the D&D project.”

**REFERENCES****Add these references to this section.**

ANSI/ASCE 7-05, “Minimum Design Loads for Buildings and Other Structures.”

SEI/ASCE 37-02, “Design Loads on Structures During Construction.”

**2.0 LOADS AND LOAD COMBINATIONS****Modify this chapter throughout, as follows.**

Replace the word “construction” with “D&amp;D.”

**C1.3.3 Serviceability****Modify this section, as follows.**

Replace the paragraph in this section with the following:

“An example of this would be demolishing a roof and letting it fall, thus structurally damaging a floor that may be needed to support other demolition equipment at a later date.”

**C2.0 LOADS AND LOAD COMBINATIONS****Modify this chapter throughout, as follows.**

Replace the word “construction” with “D&amp;D.”

## 2.1 Loads Specified

**NOTE:** *The designation “C” (as used in ASCE 37-02 loads nomenclature) has been replaced throughout this document with DD (indicating a D&D load).*

### Modify this section, as follows:

Replace Section 2.1 with the following:

“D&D structures that are within the scope of this guidance document shall resist the effects of the following loads and combinations thereof:

Final loads—see Section 3

D – dead load

L – live load

D&D loads—see Section 4

Weight of temporary structures, components, shoring, or bracing

DD<sub>D</sub> –D&D dead load, include in dead load (D)

Material loads

DDFML – fixed material load

DDVML – variable material load

D&D procedure loads

DDP – personnel and equipment load

DDH – horizontal D&D loads

DDF – erection, fitting, and demolition forces

DDC – lateral pressure of concrete or similar materials

DDR – equipment reactions

DDEI – dynamic/impact factor

Lateral earth pressures—see Section 5

DD<sub>EH</sub> – lateral earth pressures

Environmental loads—see Section 6

W – wind

T – thermal loads

S – snow loads

E – earthquake

R – rain

I – ice”

(The remaining paragraph remains unchanged.)



**2.2.1 Additive Combinations**

**Modify this section, as follows.**

Delete this section and replace with the following.

“Use the load combinations presented in Sections 2.2.3 and 2.3.1 to develop the loading. All loads present during the D&D activity shall be considered in the load combinations.

Any changes to the loading conditions on the structure during D&D activities shall be reinvestigated.”

**2.2.2 Load Factors**

**Modify this section, as follows.**

Delete arbitrary point-in-time values with D&D load factors.

Replace the load factors table found in Section 2.2.2 with the following D&D table:

**D&D Table 2.2.2**

Load	Load Factor (cmax)	Description	See Section
D	0.9 (when counteracting wind or seismic activity) 1.4 (when combined with only D&D and material loads) 1.2 (for all other combinations)	Dead load	3.1
L <sup>a</sup>	1.2 (for well-defined loads) 1.6 (for less-defined or variable loads)	Live load	3.2
DD <sub>FML</sub>	1.2	Fixed-material load	4.2
DD <sub>VML</sub>	1.4	Variable-material load	4.2
DD <sub>P</sub>	1.2 (for well-defined loads) 1.6 (for less-defined loads and variable loads)	Personnel and light equipment load	4.3
DD <sub>H</sub>	1.6	Horizontal D&D loads	4.4
DD <sub>F</sub>	2.0 (1.4, if proven by analysis)	Erection, fitting, and demolition forces	4.5

**C2.2.1 Additive Combinations**

**Modify this section, as follows.**

Delete this section and replace with the following.

“Design should be based on the load combination causing the most unfavorable effect.

In D&D, the load paths should be clearly defined so that the load combinations account for all loads on the structure during the D&D phases.”

**C2.2.2 Load Factors**

**Modify this section, as follows.**

This section remains the same, except where the load factor for a given load differs from ASCE 37-02. Then refer to the specified section shown in Table 2.2.2 for information. Otherwise, use the existing commentary.

D&amp;D Table 2.2.2 (continued).

Load	Load Factor (cmax)	Description	See Section
DD <sub>C</sub>	1.3 (full head) 1.5 (otherwise)	Lateral pressure of concrete	4.2.1
DD <sub>R</sub>	1.2 (for well-defined equipment reactions) 1.6 (for less-defined equipment reactions)	Equipment reactions (applies only to heavy equipment)	4.6
DD <sub>EI</sub>	1.3 (minimum)	Dynamic/impact load	4.6.4
DD <sub>EH</sub>	1.6	Lateral earth pressures	5.0
W	1.3	Wind	6.2
T	1.4	Thermal	6.3
S	1.6	Snow	6.4
E	1.0	Earthquake	6.5
R	1.6	Rain	6.6
I	1.6	Ice	6.7

a. The live load will rarely be used in load combinations for D&D activities. The D&D procedure loads (Section 4) are likely to be used in most cases. For further explanation, see Section C3.2.

### 2.2.3 Basic Combinations

Modify this section, as follows.

Replace the load combinations with the following D&D load combinations. All other requirements or guidance shall be followed.

$$1.4D + 1.2DD_{FML} + 1.4DD_{VML} \quad (2-1)$$

$$1.2D + (1.2L \text{ or } 1.6L) + 1.6DD_{EH} + 0.5(S \text{ or } R) \quad (2-2)$$

$$1.2D + 1.2DD_{FML} + 1.4DD_{VML} + (1.2DD_P \text{ or } 1.6DD_P) + (1.2DD_R \text{ or } 1.6DD_R) + 1.6DD_H + 0.5L \quad (2-3)$$

$$1.2D + 1.2DD_{FML} + 1.3W + 1.4DD_{VML} + 0.5DD_P + 0.5DD_R + 0.5L \quad (2-4)$$

$$1.2D + 1.2DD_{FML} + 1.0E + 1.4DD_{VML} + 0.5DD_P + 0.5DD_R + 0.5L \quad (2-5)$$

$$0.9D + (1.3W \text{ or } 1.0E) \quad (2-6)$$

$$1.2D + 1.2DD_{FML} + 1.4DD_{VML} + (1.2DD_P \text{ or } 1.6DD_P) + (1.2DD_R \text{ or } 1.6DD_R) + 0.5(S \text{ or } R) \quad (2-7)$$

### C2.2.3 Basic Combinations

Modify this section by adding the following to the beginning of this section.

“The basic combinations are similar to ASCE 7-95, except that load combinations consider D&D loads.”

### 2.3.1 Additive Combinations

Modify this section, as follows.

Replace the load combinations with the following D&D load combinations. All other requirements and guidance found in this section of the standard shall be followed.

$$D + DD_{FML} + DD_{VML} \quad (2-8)$$

$$D + DD_{FML} + DD_{VML} + DD_P + DD_R + DD_H + L \quad (2-9)$$

$$D + DD_{FML} + W + DD_{VML} + DD_P + DD_R + L \quad (2-10)$$

$$D + DD_{FML} + 0.7E + DD_{VML} + DD_P + DD_R + L \quad (2-11)$$

$$D + (W \text{ or } 0.7E) \quad (2-12)$$

$$D + DD_{FML} + DD_{VML} + DD_E + DD_{EI} + (S \text{ or } R) \quad (2-13)$$

## REFERENCES

Add these references to this section.

ANSI/ASCE 7-05, "Minimum Design Loads for Buildings and Other Structures."

SEI/ASCE 37-02, "Design Loads on Structures During Construction."

## 3.0 DEAD AND LIVE LOADS

Modify this chapter throughout, as follows.

Replace the word "construction" with "D&D."

### 3.1 Dead Loads

Modify this section, as follows.

Replace Section 3.1 with the following.

"For the purposes of this guidance document, dead load (D) is the weight of the permanent structure in place at the particular sequence under consideration in the analysis or evaluation. The weight of temporary structures, shoring, and bracing shall be included during the time period that they are in place. The weight of the permanent structure in place does not include D&D material loads or D&D equipment loads. These are considered in Chapter 4."

### 3.2 Live Loads

Modify this section, as follows.

Replace Section 3.2 with the following:

"The live load factor (L) may be applied on a graded approach within the stated parameters of Table D&D 2.2.2 (see Section 2.2.2) if the magnitude and location of the loading is adequately defined and the variability of the load, over time, is predictable. For a load to be considered definable, the maximum magnitude of the load positioned at the worst case location

## C3.0 DEAD AND LIVE LOADS

Modify this chapter throughout, as follows.

Replace the word "construction" with "D&D."

### C3.2 Live Loads

Modify this section, as follows.

Replace Section C3.2 with the following.

"The live load will rarely be used in load combinations for D&D activities because prolonged occupancy or general use of the structure causing unforeseeable loadings are not likely. More often the loads and load durations are adequately defined. Therefore the D&D procedure loads (Section 4) are likely to be used in most cases. Additionally the existing live load rating established prior

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within the bounds of the operating area on the structure must be known. The live load factor for strength design shall be a minimum of 1.2 if:

- The magnitude of the load is well defined by the manufacturer, weighed in the field, or accurately determined by simple analysis and will not be exceeded and
- The operating area or area of analysis will be maintained throughout the duration of the D&D phase.

The live load factor for strength design shall be a minimum of 1.6 if:

- The live load is not clearly defined by the manufacturer, actual field weights cannot be taken, or the load cannot be accurately determined by simple analysis or
- The magnitude of the load is in question, the location of the load cannot be bounded, or a general area floor rating is needed to encompass future variable undetermined loading.

General area floor ratings intended to encompass several future undefined tasks or loadings generally fall under the live-load category. The floor rating would most likely be given in pounds per square foot.”

## COMMENTARY

to the D&D phase can be used until compromised by any D&D activities. The live load,  $L$ , is the load produced by the occupancy or use of a structure (see ASCE 7-05, Section 4.1, for a Definition of Live Loads).

Concentrated loads, and impact/dynamic loads caused by live loads shall be considered in the analysis (see Section 4.6.4 for Impact/dynamic loads, and ASCE 37-02, Section 4.3.3 and Commentary for Guidance on Concentrated Loads). The live load may vary during different stages of D&D and as it pertains to any specific piece of equipment or personnel. These variances should be considered and adequately bounded in the determination of live loading.

From ACI 318-05, “Building Code Requirements for Structural Concrete” the factor assigned to each load is influenced by the degree of accuracy to which the load effect usually can be calculated and the variation that might be expected in the load during the lifetime of the structure. For example, Dead loads, because they are more accurately determined and less variable, are assigned a lower load factor than live loads. Load factors also account for variability in the structural analysis used to compute moments and shears (see ACI-318-05, Chapter 9, and Section R9.2 Commentary).

A graded approach to the reduction in the live load factor for D&D activities is justified since many times the exact load is known, the loading areas are predetermined, the loading is temporary and the variation of loading over time is not a factor.

As further justification, from ASCE 37-02, load factors are intended to reflect the relative uncertainty in the particular action. This uncertainty can arise from (1) inherent or natural variability, (2) range of applications, and (3) possibilities for misuse or error. Per ASCE 37-02, it may therefore be reasonable to make certain modifications to load factors in the presence or absence of additional information (see SEI/ASCE 37-02, Section C2.2.2 Commentary).

A minimum live load factor of 1.2 is retained to account for any variability in the structural analysis used for computation, as well as to encompass the possibility of misuse or error.”

**REFERENCES****Add these references to this section.**

ANSI/ASCE 7-05, “Minimum Design Loads for Buildings and Other Structures.”

ACI 318-05, “Building Code Requirements for Reinforced Concrete.”

SEI/ASCE 37-02, “Design Loads on Structures During Construction.”

**4.0 D&D LOADS****Modify this chapter throughout, as follows.**

Replace the word “construction” with “D&D.”

**4.1.1 Definitions****Modify this section, as follows.**

Replace the definition of “construction loads” with the following:

**D&D loads:** Those loads imposed on the structure during and as a result of the D&D process. D&D loads include, but are not limited to, materials, personnel, and equipment imposed on the structure during the D&D process.

Remove the “construction dead load,  $C_d$ ” definition entirely.

**4.3.1 General****Replace this section with the following:**

The personnel and equipment load factor ( $DD_p$ ) (see Table D&D 2.2.2) may be applied on a graded approach within the stated parameters of Table D&D 2.2.2 if the magnitude and location of the loading is adequately defined and the variability of the load over time is predictable.

For a load to be considered definable, the maximum magnitude of the load positioned at the worst case location within the bounds of the operating area on the structure must be known.

The live load factor for strength design shall be a minimum of 1.2 if:

- The magnitude of the load is well defined by the manufacturer (for personnel, Table 1 of ASCE 37-02 is acceptable), weighed in the field, or accurately determined by simple analysis and will not be exceeded
- and
- The operating area or area of analysis will be maintained during the duration of the D&D phase.

The live load factor for strength design shall be a minimum of 1.6 if:

- The load is not clearly defined by the manufacturer, actual field weights cannot be

**C4.0 D&D LOADS****Modify this chapter throughout, as follows.**

Replace the word “construction” with “D&D.”

**C4.1.1 Definitions****Modify this section, as follows.**

Add the following commentary.

“D&D dead loads shall be included in dead load (D), as stated in Section 3.1.”

**C4.3.1 General****Modify this section, as follows.**

Add the following to this section.

“See Section C3.2, paragraphs 3 thru 6, for justification of load factor reductions from those listed in ASCE 37-02.

Equipment loading may include loads such as small vehicle loading (not including heavy equipment loading, see Section 4.6), tools, small motor-driven equipment, generators, and air movers. Concentrated loads and impact or dynamic loads caused by personnel and equipment loads shall be considered in the analysis (see Section 4.6.4 for impact or dynamic loads and ASCE 37-02, Section 4.3.3, and Commentary for guidance on concentrated loads).”

taken, or the load cannot be accurately determined by simple analysis  
or

- The magnitude of the load is in question, or the location of the load cannot be bounded.

#### 4.5 Erection and Fitting and Demolition Forces, $DD_F$

Modify this section, as follows.

Add the following to this section:

“The load factor shall be allowed to be reduced to 1.4 if an analysis is performed that accurately determines the resulting forces.”

#### 4.6 Equipment Reactions, $DD_R$

Modify this section, as follows.

**NOTE:** For D&D purposes, this section mainly applies to heavy equipment loading.

Add the following to this section.

“A minimum dynamic load factor, as specified in Section 4.6.4, shall be considered in the weight of all rated and nonrated heavy equipment to account for impact and/or dynamic effects caused by the operation of that equipment.

The heavy equipment load factor ( $DD_E$ ), may be applied on a graded approach within the stated parameters of Table D&D 2.2.2, as based on the definability of the load. The following two factors determine definability of the heavy equipment loading:

1. The accuracy to which the weight and equipment reactions can be bounded (i.e., rated vs. nonrated [see ASCE 37-02])  
and
2. That the task boundaries are clearly defined.

The live load factor for strength design shall be a minimum of 1.2 if:

- The equipment is rated (i.e., weight and equipment reactions, based on the intended loading of the heavy equipment, are well defined by the manufacturer) or an accurate weight (including reactions) is obtained in the field and
- The limits of the task, the location of the task, and the specific intended use of the equipment are clearly defined (i.e., the magnitude of the bounded load will not be exceeded, and the location of the equipment is kept within the area of analysis) during the duration of the D&D phase.

#### C4.6 Equipment Reactions, $DD_R$

Modify this section, as follows.

Add the following to this section.

“See Section C3.2, paragraphs 3 thru 6, for justification of load factor reductions from those listed in ASCE 37-02.

Refer to the commentary found in ASCE 37-02, Section C4.6 and subsections, for guidance on equipment reactions and load determination.

Task limitations and the specific use of heavy equipment shall be clearly defined and adhered to by all parties. With the passing of time, the likelihood of task variance or additional scope may occur. The equipment may then be used in a manner not intended by the original analysis. A periodic evaluation is recommended.

Concentrated loads caused by heavy equipment loading shall be considered in the analysis (see ASCE 37-02, Section 4.3.3, and Commentary for guidance).”

**NOTE:** *It is recommended that a periodic evaluation be performed to ensure that the limits of the task and the intended use of the equipment have not changed from the original scope of the analysis.*

The live load factor for strength design shall be a minimum of 1.6 if:

- The equipment is nonrated (i.e., the weight of the heavy equipment [or the equipment reactions] are not clearly defined or bounded by the manufacturer)
- or
- Actual field weights cannot be taken
- or
- The intended use of the equipment is not clearly defined.”

#### 4.6.4 Impact/Dynamic Effect Factor

**Modify this section, as follows.**

Add the following to this section.

- Additional consideration of forces on structures, caused by impact, shall be given to falling debris. Forces caused by impact on structures may also be mitigated.
- It is recommended that a minimum dynamic factor of 1.3 be applied to all moving loads or vibrating equipment.
- It is recommended that a minimum impact/dynamic factor of 1.3 be applied to all heavy equipment loads.
- Independent impact or dynamic factors need not be assumed to act simultaneously.
- A larger impact or dynamic factor may be applied at the discretion of the responsible engineer, based on evaluation of the activity to be accomplished.”

## REFERENCES

**Add these references to this section.**

ANSI/ASCE 7-05, “Minimum Design Loads for Buildings and Other Structures.”

ACI 318-05, “Building Code Requirements for Reinforced Concrete.”

SEI/ASCE 37-02, “Design Loads on Structures During Construction.”

## 5.0 Lateral Earth Pressure

(No changes to this chapter – see Commentary)

#### C4.6.4 Impact/Dynamic Effect Factor

**Modify this section, as follows.**

Add the following to this section.

Heavy objects falling from heights (e.g., falling concrete or steel beams) can cause large-impact loads that should be considered. Mitigating these loads could consist of placing impact-absorbing material (e.g., soil) on structures being impacted.

(For further guidance, ASCE 7-05, Section 4.7, recommends a 20% increase for light machinery—shaft- or motor-driven—and 50% for reciprocating machinery or power-driven units. SEI/ASCE 37-02 is used as the basis for a 30% minimum increase).

## C5.0 Lateral Earth Pressure

**Modify this chapter throughout, as follows.**

Replace the word “construction” with “D&D.”

**REFERENCES****Add these references to this section.**

ANSI/ASCE 7-05, “Minimum Design Loads for Buildings and Other Structures.”

SEI/ASCE 37-02, “Design Loads on Structures During Construction.”

**6.0 Environmental Loads****Modify this chapter throughout, as follows.**

Replace the word “construction” with “D&D.”

**6.5 Earthquake****Modify this section, as follows.**

Add the following after the first sentence of Section 6.5:

“Additionally, seismic analysis shall be considered on partially demolished structures that will remain standing while other work is occurring where personnel are working nearby (i.e., within the fall zone of the partially demolished structures).”

**6.5.1 Applicability****Modify this section, as follows.**

Revise the second paragraph, as follows.

“Demolition of lightly framed buildings (about the size of detached one- and two-story family dwellings), not exceeding two stories in height, are exempt from these seismic requirements.”

**REFERENCES****Add these references to this section.**

ANSI/ASCE 7-05, “Minimum Design Loads for Buildings and Other Structures.”

SEI/ASCE 37-02, “Design Loads on Structures During Construction.”

**C6.0 Environmental Loads****Modify this chapter throughout, as follows.**

Replace the word “construction” with “D&D.”

**C6.5 Earthquake****Modify this section, as follows.**

Add the following after the first sentence of Section C6.5.

“Partially demolished structures that remain standing must be stable. The stability of the building during each stage of demolition must be considered if personnel are present within a zone where the building could collapse.”