FEMA
DISASTER ASSISTANCE POLICY

I. TITLE: Welded Steel Moment Frame

II. DATE: NOV 5 2007

III. PURPOSE:

To establish the eligibility of costs for inspecting, evaluating and repairing welded steel moment frames of building structures damaged by earthquakes.

IV. SCOPE AND AUDIENCE:

This policy is applicable to all major disasters declared on or after the date of publication of this policy. It is intended for personnel involved in the administration of the Public Assistance program, including applicants.

V. AUTHORITY:

Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5121-5206, and 44 CFR § 206.226.

VI. BACKGROUND:

A. The Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, (Stafford Act) and implementing regulations in 44 CFR § 206.228(a)(2)(ii) provide an administrative allowance (sometimes called the sliding scale) to reimburse applicants for extraordinary costs incurred when requesting, obtaining, and administering Federal disaster assistance grants. This allowance, which is based on a fixed percentage of the cost of eligible repairs, is intended to include the applicant's costs for evaluating the extent of damage to eligible facilities. The Stafford Act specifies that the cost of field inspections is part of the administrative allowance. However, the costs associated with inspecting welded steel moment frame connections seem to go beyond the type of work contemplated by the administrative allowance provision of the Stafford Act. For this reason, these costs may be eligible for reimbursement outside of the administrative allowance, as detailed in this policy.

B. FEMA recognizes the unique situation presented by the inspection of welded steel moment frame connections that potentially have brittle fractures. These connections are typically covered with architectural finishes and are occasionally protected with asbestos or other fire retardants. These coverings complicate the inspection of connections. Because of the numerous incidents of structural damage to welded steel moment frame connections caused by

the Northridge Earthquake, FEMA established a policy in order to determine the eligibility of funding for inspecting, evaluating, and repairing such damage.

C. A multi-year study of the welded steel moment frame fracture issue resulted in recommended criteria to the technical community for:

1. The evaluation of welded steel moment frame buildings affected by strong earthquake ground shaking to determine if they have been damaged, and to what extent;

2. The identification of those buildings that have been so severely damaged that they constitute a safety hazard; and

3. The repair of damaged structures such that they may be restored to long-term occupancy.

D. These results are published in *Recommended Postearthquake Evaluation and Repair Criteria for Welded Steel Moment Frame Buildings*, Federal Emergency Management Agency, *FEMA 352*, June 2000. *FEMA 352* is the technical basis for this policy. Free copies of this document may be obtained by calling the FEMA distribution warehouse at 1-800-480-2520 or www.fema.gov/plan/prevent/earthquake/pdf/fema-352.pdf.

VII. POLICY:

A. This policy provides eligibility criteria for the unique inspection problems posed by brittle fracture damage to welded steel moment frames. Only eligible facilities constructed with steel framing connections subject to brittle fracture, such as those constructed prior to 1995 using the prescribed detail of section 2710 (g) B of the 1991 Uniform Building Code or its equivalent, are eligible for FEMA reimbursement under this policy.

B. This policy is intended to prescribe the eligibility of postearthquake damage inspection and evaluation costs pursuant to *FEMA 352*.

C. **Reimbursement for Preliminary Postearthquake Assessment**

1. Screening. The initial screening process described in Chapter 3.2 of *FEMA 352* will help to rapidly identify buildings that are likely to have sustained significant damage to welded steel moment frame connections, based on the probable ground motion experienced at the building site. Screening is typically performed by building department officials immediately following an earthquake to determine if a building needs further evaluation. Costs incurred in the process of Preliminary Screening are not eligible for FEMA assistance.

2. Preliminary Evaluation. The preliminary evaluation method described in Chapter 3.3 of *FEMA 352* is used to determine, on a preliminary basis, whether a building has sustained either structural or nonstructural damage that results in a hazardous condition. Preliminary evaluation includes (all parenthetical references are to FEMA 352):

a. A general review of the building's construction characteristics to determine its structural system and vulnerable features (Section 3.3.2),

b. A visit to the building site to observe its overall condition and note obvious signs of damage (Section 3.3.3), and

c. A determination of an appropriate posting category for the building, on the basis of the preceding results and engineering judgment (Section 3.3.4). Posting categories are described by the following designations (see Table 3.2):

i. Green. Little or no damage. Poses no immediate threat.

ii. Yellow. Structural or nonstructural damage. Limited or localized safety hazard.

iii. Red. Significant damage to structural elements. Significant safety hazard.

FEMA will reimburse the costs of preliminary evaluations only when conditions resulting in the designation of Yellow or Red (as described in Table 3.2) are found.

D. **Reimbursement for Detailed Postearthquake Evaluations**

1. Strong Likelihood of Significant Welded Steel Moment Frame Damage. All buildings determined to have potential welded steel moment frame fractures, as identified in the preliminary assessment and designated with a Yellow or Red posting (see Table 3-2, Chapter 3), should be subjected to detailed evaluation. Eligible costs may include the reasonable evaluation of the effects of the identified significant connection damage to the future performance of the building structure. To be eligible, this evaluation should be limited to the recommendations in *FEMA 352*, Chapter 4. Generally, FEMA will not fund detailed analytical or experimental studies or Level 2 evaluations as described in *FEMA 352*, Chapter 5. Funding of such evaluations is eligible only if a Project Worksheet (PW) based on a specific scope-of-work and cost estimate is approved in advance.

a. The costs of visual bottom flange connection inspections performed at locations selected in accordance with *FEMA 352*, Chapter 4, Method 2 (Inspection of a Sample of Connections) are eligible for reimbursement.

b. Section 4.4.2, Method 2 provides guidance for the inspection of a sample of the total welded steel moment frame connections in the building. If certain types of damage are discovered, additional visual inspection of bottom flange connections and/or top flange connections at locations recommended by *FEMA 352*, Chapter 4, will also be eligible for reimbursement, but only after FEMA has been informed of the frame damage already discovered, and after the PW has been modified to include the follow-on inspection.

c. A modified PW is required to authorize nondestructive testing if the visual inspections indicate a significant potential of concealed damage.

d. The eligible cost of inspecting connections includes only:

i. Removal of necessary architectural finishes, such as plaster/drywall,

ii. Removal of fire retardants in the inspection area of the connection,

iii. Visual inspections, and

iv. Nondestructive testing as appropriate, necessary and approved by FEMA. Testing may include liquid dye-penetrant testing or magnetic particle testing, but not ultrasonic testing.

2. Little Likelihood of Significant Welded Steel Moment Frame Damage. In circumstances where a building is not required to undergo a Preliminary Assessment or where a Green Posting is assigned according to Table 3-2 of *FEMA 352*, FEMA will reimburse the costs of visual inspections only for those connections where significant damage associated with the declared earthquake disaster is found. Significant connection damage is defined in *FEMA 352*, Chapter 4 as *dj* 3, where *dj* signifies connection damage index (see Table 4-1a: Connection Damage Indices).

a. Visual inspection of additional connections (at locations recommended by *FEMA 352*, following the discovery of damaged connections) will also be eligible for reimbursement, but only after FEMA has been informed of the frame damage already discovered, and a PW for the follow-on inspection has been approved. The PW may also authorize nondestructive testing if the visual inspections indicate a significant potential for concealed damage.

3. No Significant Welded Steel Moment Frame Damage. Except as provided above, any costs related to inspections that do not yield discovery of significant connection damage attributable to the earthquake are not eligible for FEMA reimbursement.

E. **Reimbursement for Repairs.** Recommended repair strategies for various degrees of documented damage are found in Chapter 4.4.2.7. The cost to repair the damaged connections to their pre-earthquake design in accordance with Chapter 6 of *FEMA 352* will typically be eligible for reimbursement. Repairs to the architectural finishes and fire retardants removed in the area of the connection damage are eligible. Funding of repairs is eligible only if a PW based on a specific scope-of-work and cost estimate is approved in advance.

VIII. ORIGINATING OFFICE: Disaster Assistance Directorate (Public Assistance Division).

IX. SUPERSESSION: This policy supersedes Recovery Division Policy 9524.1 Policy on the Eligibility of Welded Steel Moment-Frame Inspections, published on October 17, 2003, and all other previous guidance on this subject.

X. REVIEW DATE: Three years from date of publication.

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