PERFORMING A RAPID VISUAL SCREENING

OVERVIEW

This rapid visual screening procedure is intended to be a first step in a tiered assessment process, as outlined in FEMA 452, *Risk Assessment, A How-to Guide to Mitigate Potential Terrorist Attacks Against Buildings*. In a tiered approach, a series of successively more refined analyses are performed, and additional effort is expended, when more detailed information is needed. This trade-off between level of effort and level of refinement allows an assessment to meet a variety of benefit/cost considerations for different buildings.

As a first step in an overall process, rapid visual screening is intended to be a quick and simple tool for obtaining an initial risk assessment rating for a building or group of buildings. As such, there are practical limitations on how much information can be considered in performing the rapid assessment, accompanied with a corresponding level of uncertainty in the results. In general, rapid visual screening procedures are most often used to obtain a basic understanding of the risk, and to prioritize more detailed assessments over the entire inventory of buildings considered. More detailed assessments, such as FEMA 452 Tier 1, Tier 2 or Tier 3 assessments, are usually needed to confirm results on any one building, although some building-specific vulnerability information can be obtained using this screening procedure. In this context the rapid visual screening procedure is a *Pre*-Tier 1 tool for assessment.

The information gathered as part of this screening procedure is designed to support and facilitate higher level assessments by expert investigators performing building-specific evaluations of consequences, threat, and vulnerability using FEMA 452, or other similar risk assessment methodology.

This chapter gives an overview of the screening procedure. Subsequent chapters provide detailed information on evaluating a building to determine the risk score.

RAPID VISUAL SCREENING PROCEDURE OVERVIEW

The rapid visual screening procedure involves the following sequence of activities:

- Understand the rapid screening framework;

- Assemble the assessment team;
- Understand the risk scoring procedure;
- Organize and mobilize necessary resources ;
- Collect and record assessment data
  (i.e., assess Consequences, Threat Rating and Vulnerability);
- Complete the Risk Scoring Worksheet; and
- Interpret and use results.

Each of these activities is described in the sections below.

UNDERSTANDING THE RAPID SCREENING FRAMEWORK

FEMA 452 identifies three tiers of assessment, which are summarized in Table 1.

Table 1 Summary of FEMA 452 Tiered Assessment Levels

Tier	Description	No. of Screeners	Duration	Building Types
1	Screening Evaluation	1-2	Up to 2 days	Majority of standard commercial office buildings and other non-critical facilities and infrastructure
2	Full On-Site Evaluation	3-5	3-5 days	Most high-risk buildings, iconic commercial buildings, government facilities, schools, hospitals and other designated high value infrastructure assets
3	Detailed Evaluation	8-12	Several days to weeks	High value or critical infrastructure assets.

In FEMA 452, Tier 1 is characterized as a screening phase that identifies primary building vulnerabilities and involves a "quick look" at the site perimeter, building, core functions, infrastructure, drawings, and plans. The approximate level of effort consists of one-to-two experienced professionals for up to two days. A FEMA 452 Tier 1 assessment is usually considered a sufficient level of assessment for most commercial buildings and other non-critical facilities.

Buildings identified as having an unacceptable level of risk based on a Tier 1 assessment will require more detailed evaluation in a FEMA 452 Tier 2 assessment. This type of assessment requires more detailed information about building characteristics and security features, and will require a multi-disciplinary team of experts to execute. A FEMA 452 Tier 2

assessment is usually considered a sufficient level of assessment for most moderate-risk facilities.

If additional information is needed, quantitative engineering analysis is performed in a FEMA 452 Tier 3 assessment of potential damage and casualties. This type of assessment requires a still larger group of experts and more time to execute, and is typically reserved for high-value or critical facilities.

This rapid visual screening procedure in the context of FEMA 452 is effectively a "*Pre*-Tier 1" assessment. Similar to a Tier 1 assessment it is designed to be conducted by one or two screeners, and depending on the level of effort, can be completed in 1-to-5 hours per building, depending on the level of desired accuracy and access to building information. Buildings identified as having an unacceptable level of risk using this rapid visual screening procedure can be reassigned directly to FEMA 452 Tier 2 assessment.

Reliability and confidence in the rapid visual screening results can be increased if structural, mechanical, and security features can be verified with further information from: (1) interior inspections with knowledgeable building representatives; (2) interviews with building security and other key personnel; and (3) review of additional building documentation, such as available building drawings and security operations manuals. If detailed interviews and substantial background materials are reviewed, this procedure can take up to two days per building. The more information that is considered during rapid visual screening, the more accurate the risk scoring process will be. To facilitate the process, it is strongly recommended that authorities, and building owners and operators be contacted prior to the commencement of assessment.

Successively fewer buildings are generally considered for each subsequent tier of evaluation. Note that for highly iconic one of-a-kind buildings (e.g., the Pentagon, White House), the rapid visual screening procedure is not appropriate, and a FEMA 452 Tier 2 or Tier 3 assessment is required.

ASSEMBLING THE ASSESSMENT TEAM

The rapid visual screening approach facilitates the prioritization of resources in the screening process, reserving the use of experts for the highest risk buildings that require more detailed assessment. It is recommended that teams include members who are comfortable with building sciences and security concepts. In some cases, stakeholders may decide to provide training for the screeners or to have an expert in

antiterrorism oversee the assessment process. In general, the more knowledgeable the screener is with the concepts presented in this document, the more accurate the assessment and potentially the better the reliability of the score.

Discussions about the rapid visual screening methodology with the team prior to implementation may help ensure consistency among assessments, high quality of collected data, and uniformity of decisions among screeners. Discussions should address building systems, including site design, architectural, mechanical, electrical, plumbing, and security systems. Other pertinent topics include: how buildings behave when subjected to extreme events; how to use the Data Collection Form, and the electronic database version; what to look for in the field; what to bring to the field; and how to account for uncertainty.

Teams can simultaneously consider and rate buildings of several different types and compare results early in the assessment process. This will serve as a "calibration" for the screeners and improve consistency of results.

UNDERSTANDING THE RISK SCORING PROCEDURE

The risk scoring procedure used in rapid visual screening is based on the risk assessment equation in FEMA 426, *Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings*, and FEMA 452, *Risk Assessment, A How-to Guide to Mitigate Potential Terrorist Attacks Against Buildings*. As shown in Equation 1, risk is defined as the product of three factors for a given threat scenario:

$$R = C \times T \times V \qquad (1)$$

where:

C = Consequences Rating
T = Threat Rating
V = Vulnerability Rating

Consequences is defined as a degree of debilitating impact that would be caused by the incapacity or destruction of an asset. To put this into the context of other risk assessment methodologies, sometimes consequences is referred to as "asset value". Assets refer not only to monetary value but also value to the community.

Threat is defined as any indication, circumstance, or event with the potential to cause loss of, or damage to, an asset.

Vulnerability is defined as any weakness that can be exploited by an aggressor to make an asset susceptible to damage.

The risk scoring procedure considers the variables listed in Table 2. Each of the three risk factors is evaluated through the collection of building data, considering key individual building characteristics across all building systems.

Table 2 Variables Considered in the Risk Scoring Procedure

Threat Types	a. Internal Attack b. External Large Scale Vehicle Borne Improvised Explosive Device c. External Large Scale Chemical Biological or Radiological (CBR) release using air-borne contaminants
High Value Target Types (in the proximity of the building)	a. Agricultural/Food Processing b. Banking and Finance c. Chemical Processing d. Commercial Key Assets e. Critical Manufacturing f. Dams g. Defense Industrial Base h. Emergency Services i. Energy j. Governmental k. Information and Telecommunications l. National Monuments m. Nuclear n. Postal and Shipping o. Public Health p. Transportation Systems q. Water Supply
Target Zones	a. Zone I – less than 100 feet from the building b. Zone II – more than or equal to 100 feet and less than 300 feet from the building c. Zone III – more than or equal to 300 feet and less than or equal to 1000 feet from the building
Threat Scenarios (in terms of threat type and target zone)	a. Internal Explosive Attack b. Internal CBR Release c. Other Internal Attack (Intrusion) d. External Zone I Explosive Attack e. External Zone II Explosive Attack f. External Zone III Explosive Attack g. External Zone I CBR Release h. External Zone II CBR Release i. External Zone III CBR Release
Occupancy Types	a. Group I – low risk b. Group II – moderate risk c. Group III – high risk
Building Systems	a. General b. Site c. Architectural d. Building Envelope e. Structural Systems f. Mechanical/Electrical/Plumbing Systems g. Security Systems

Building information is recorded on a Data Collection Form and building characteristics are scored using a discrete numerical scoring system, where the lowest value represents the lowest contribution of the building characteristic to risk, and the highest value represents the highest contribution. Results from the Data Collection Form are entered in the risk scoring worksheets to calculate the risk assessment score for the building (or calculated internally if the electronic database version of the Data Collection Form is used).

A numerical value is assigned for each of the 3-to-5 building attributes describing a building characteristic included on the Data Collection Form. Consistent with FEMA 452, the sum of the numerical values for the building characteristics that contribute to each risk factor and threat scenario range from 1 for the lowest risk contribution to 10 for the highest risk contribution.

A detailed description of the development of the risk scoring procedure is provided in Appendix C.

ORGANIZING AND MOBILIZING NECESSARY RESOURCES

Rapid visual screening of a building requires the collection and review of building and security data from a number of different resources. Efficient execution of a rapid visual screening requires a systematic and organized approach to data collection and field verification of information.

A summary of rapid visual screening activities, and when they should be performed in the rapid visual screening process, are provided in Table 3. As noted in the table, certain activities indicate elements of a more refined screening that would increase the anticipated level of effort and duration of the assessment. All other activities represent the minimum that is required for a rapid visual screening.

At a minimum, building information is obtained through publicly available sources and visual observation of the exterior. For more detailed screening, data for rapid visual screening may be obtained from private (building owner) resources, available building documentation, interviews with key personnel, visual observation of publicly accessible areas or a tour of selected interior areas. A sample list of key personnel to interview and relevant building documentation to review is provided in Table 4.

Table 3 Rapid Visual Screening Activities

Pre-field Activities	a. Identify key objectives of the screening from building stakeholders b. Select inventory of buildings to be included in study c. Identify screeners and discuss methodology (and provide training if needed) d. Complete the pre-field information on page 1 of the Data Collection Form as completely as possible including gathering publicly available information on buildings and potential high value targets in the vicinity e. Obtain and review available materials obtained from the building owner, including operations and security procedures, policies, and construction drawings (*) f. Make arrangements for access to the buildings
Field Visit	a. Take this Handbook to the field to refer to guidance on evaluating the various building characteristics b. Use the "Field Version" of the Data Collection Form to collect data at the site, as provided in Appendix B b. Verify information already obtained c. Tour exterior and publicly accessible areas of the building filling in Data Collection Form and photographing building characteristics. d. Interview stakeholders (*) e. Tour critical internal areas (*)
Post-field Activities	a. Transfer data from the Field Version of the form to the long form, or the electronic data base (preferred format) b. Calculate the risk score for each of the building, using the Risk Scoring Worksheet (this process is automated when using the electronic database version of the Data Collection Form) c. Review ratings and make appropriate adjustments based on additional materials reviewed and interviews performed (*) d. Interpret scoring e. Identify buildings requiring further analysis f. Prepare a written report summarizing findings

* Elements of a more refined screening that would increase the anticipated level of effort and duration of the assessment (see Table 4).

COLLECTING AND RECORDING ASSESSMENT DATA

The Data Collection Form has been developed to assist in gathering, recording, and scoring information on building features relevant to the risk assessment. Information gathered prior to and during the field visit to the building can be documented using the abbreviated Field Version of the Data Collection Form (Appendix B), which has been designed for use during the field visit to be later transferred to the long version of the form (Appendix A) or the electronic database version of the Data Collection Form (discussed in detail in Appendix E). The first page of the Data Collection Form is intended to document basic building identification and target density information, and is to be filled in prior to the on-site evaluation. The next 8 pages of the form (long-form version containing scores for the various attribute options) identify information to

Table 4 Key Personnel and Relevant Building Documentation

Key Personnel	a. Building Owner b. Building Manager c. Chief of Engineering d. Chief of Information Technology e. Emergency Manager f. Security Director g. Major tenant representatives h. Local law enforcement, fire and emergency medical services representatives i. State or county representatives j. Local utility, telecommunications and other service representatives k. Critical function representatives
Relevant Building Documentation	a. Security assessments b. Emergency response and disaster recovery plans c. Security inspection results d. Hazmat plans e. Policy and legal requirements f. Federal, state, and local law enforcement threat assessments g. Drawings for original design and any implemented modifications h. Historical reports i. Local zoning ordinances j. Information on the facility systems operations capability k. Information on agreements with the surrounding community and federal agencies l. Population statistics m. Manpower surveys n. Emergency notification o. Emergency evacuation p. First responder access and routing q. Shelter-in-place strategies r. Designated shelter capacities and travel routes s. Off-site rally point and roll call t. Emergency engineering systems shutdown u. Portable protective equipment v. Personal protective equipment w. Exercise of plans

be gathered during the on-site or field evaluation, beginning with features visible from the exterior, transitioning to features observable in publicly accessible internal areas, and finally other internal areas that may only be accessible with permission or an escort (the 6-page abbreviated Field Version of the form identifies the same building characteristics and attribute options as the long form, but excludes the scores for each attribute option).

When using the long-form version of the form, the Risk Scoring Worksheet (Appendix A) is used to determine risk ratings.

When using the electronic database version of the Data Collection Form, the data from the Field Version of the form are transferred to the electronic version, where computation of the risk ratings is automated, eliminating the use of the Risk Scoring Worksheet. Every effort should be made to collect

and document the assessment information as completely and accurately as possible to obtain an accurate risk score. The two methods for obtaining risk scores are summarized in Table 5

Table 5 Risk Scoring Methods

<table>
<tr><th>Step</th><th>Method 1
(Hand Method)</th><th>Method 2
(Electronic Database)</th></tr>
<tr><td>Pre-Field</td><td colspan="2">Fill in Page 1 of the Field Version of the Data Collection Form</td></tr>
<tr><td>Field</td><td colspan="2">Complete pages 2-6 of the Field Version of the Data Collection Form</td></tr>
<tr><td rowspan="2">Post-Field</td><td>Transfer data to long version of the Data Collection Form</td><td rowspan="2">Transfer data into the electronic database</td></tr>
<tr><td>Complete Risk Scoring Sheet</td></tr>
</table>

The data collection process is designed to collect and store information on each of seven building systems: general; site; architectural; building envelope; structural systems; mechanical, electrical and plumbing systems; and security systems (see Table 2). This grouping of systems has been distilled from the 13 building systems contained in the FEMA 452 Vulnerability Checklist. The building characteristics identified for each building system cover the most dominant and visually observable factors governing the overall risk to a building given a terrorist attack. Additional information obtained from other sources may also be used to provide more refined scoring. The entire rapid visual screening procedure is designed with expert knowledge embedded into the scoring selected for each building attribute option so as to limit the information needed by the screener.

Page 1 of the Data Collection Form is shown in Figure 1. Note that Page 1 of the Data Collection Form is identical to Page 1 of the Field Version of the form. It provides space to document basic building information, including name, address, year built, number of stories, total floor area, and other identifying information prior to the field visit. It also provides space to document target density information. Additional information may be attached to the form (or entered into the electronic database). Some useful publicly accessible websites for building information include: http://earth.google.com and www.emporis.com. It is important to ascertain and document the information identified on Page 1 of the form as completely as possible before visiting the facility to obtain an accurate scoring. Some of the information may be directly used to respond to specific building characteristics contained on other pages of the Data

FEMA 455 DATA COLLECTION FORM, PAGE 1 **GENERAL BUILDING INFORMATION**

PRE-FIELD INFORMATION

This page of the form is to be completed *before* the field visit from available documentation or from a knowledgeable site representative.

Building Name/ID _____

Address: _____

Cross Streets: _____

Year Built: _____

Year(s) of major retrofits: _____

Retrofit Description _____

Type of Glass: _____

Number of Floors/Building Height: _____

Occupants _____

Total Area (sq ft): _____

Footprint Area (sq ft) _____

Occupancy Use: _____

(Critical Infrastructure and Key Resources [CI/KR] Sector and Sub-Sector Info)

Hazardous Material Kept on Site: _____

Replacement Value: _____

Target Potential to this Facility _____

Target Potential to this Facility Type: _____

Historic Registry Listing _____

TARGET DENSITY

Number of potential *high value* targets within vicinity of subject building.

Facility Type (CIKR Sector):	Distance		
	< 100 feet	≥100 ft and < 300 ft	≥ 300 ft and ≤ 1000 ft
Agriculture and Food			
Banking and Finance			
Chemical			
Commercial			
Critical Manufacturing			
Dams			
Defense Industrial Base			
Emergency Services			
Energy			
Government Facilities			
Information Technology			
National Monuments/Icons			
Nuclear			
Postal and Shipping			
Public Health and Healthcare			
Telecommunications			
Transportation Systems			
Water Supply			
TOTAL =			

Figure 1 Page 1 of Data Collection Form.

Collection Form and some of the information on this page will enable the screener to make a more educated decision regarding the appropriate attribute option to select. All the information contained on this page of the Data Collection Form, should be verified in the field, if possible.

Although the information on Page 1 of the Data Collection Form does not directly affect the risk rating, it is used for identification, interpretation, and validation of the scoring. It also provides initial information useful for higher level (Tier 2 or Tier 3) assessments.

Pages 2 through 8 of the Data Collection Form (see Figure 2) address the three factors needed to determine the risk assessment score: *consequences* rating (C), *threat* rating (T), and *vulnerability* rating (V). These portions of the Data Collection Form are completed by selecting the most appropriate response, or attribute option. When using the long-form version of the Data Collection Form (Figure 2 and Appendix A), the associated numerical value for each selected attribute option is transferred to each of the boxes on the right hand side of the form, which is not filled with gray; if an attribute is not relevant to determining the consequences, threat, or vulnerability rating for a particular threat scenario, the box is shaded, and no score is entered; in this way, the numerical values are assigned only to those threat scenarios that are affected by that building characteristic.

Space is provided at the bottom of the rating section for each factor (*consequences*, *threat*, and v*ulnerability*) to summarize scores for characteristics that contribute to that rating factor for one or more threat scenarios. This information is then transferred to the Risk Scoring Worksheet (Appendix A) to compute risk ratings for the building, as described below.

Note that the attribute scores have been omitted from the Field Version of the form for easy use during the field visit. Instead of scoring on the right hand side of the field version of the form, there is a "red flag" and a "comments" column. The red flag column may be checked for those items that require further follow-up research or verification. The comments

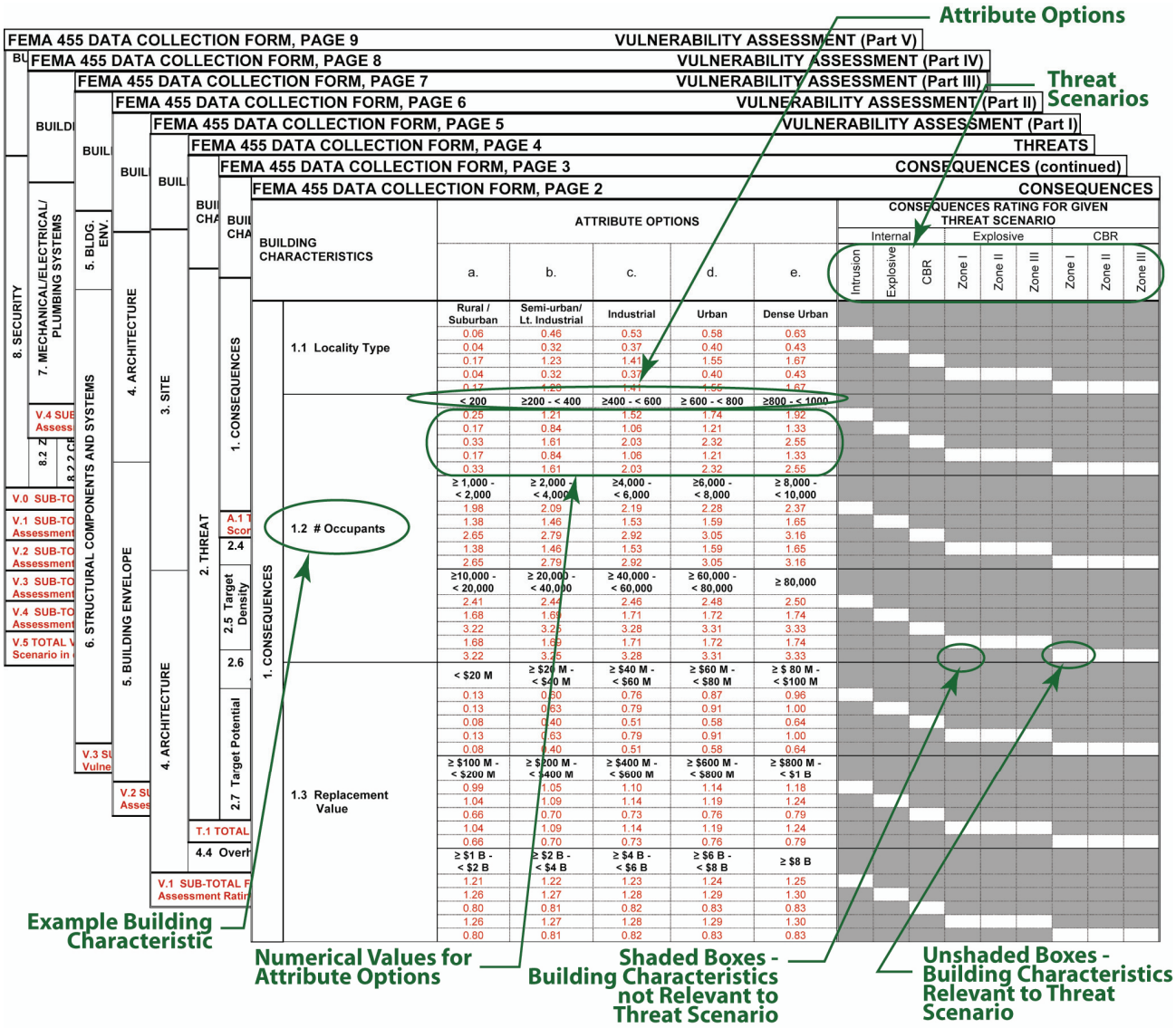

Figure 2 Pages 2 through 9 of Data Collection Form. Full-sized versions of each page are provided in Appendix A.

column may be used to provide more detail regarding the building characteristic and/or the red flag issue that requires resolution. This handbook should be brought to the field as a reference guide. Of particular use in the field are the tables in the next three chapters, which provide useful information to help the screener select the most appropriate option. The information from these tables has also been included in the electronic version for use in post-field verification of selected options.

The following chapters provide general guidance on how to determine the consequences rating, threat rating and vulnerability rating, respectively, using the Data Collection Form. Below is some general guidance for troubleshooting some overarching issues that may arise.

SCORING WHEN A BUILDING CHARACTERISTIC IS UNKNOWN OR NOT APPLICABLE

The correct application of the risk scoring procedure in rapid visual screening relies on accurate and thorough completion of the Data Collection Form. The risk scoring procedure uses results from pages 2 through 9 of the Data Collection Form (long-form version) to determine the overall risk rating for the building. Therefore, it is imperative that an attribute option be selected for each applicable building characteristic, and every attempt should be made to complete the form in its entirety.

Lack of selection of an attribute option for one or more of the building characteristics can be interpreted as “unknown”, “not applicable”, “none”, or it may be that the issue or building characteristic has been skipped by mistake. The screening procedure has been designed to minimize these situations, but they will inevitably occur. Screeners should err on the side of recording too much information, making liberal use of any free space on the form and attaching extra sheets if necessary to document additional comments (and documenting this information in the electronic version, if used).

Basic options for accounting for unknown information include:

- Estimating the value based on a pre-defined correlation with other known information such as selecting the building envelope to be precast concrete based on the modular character of the exterior.
- Making an educated guess based on engineering judgment.

- Using a pre-determined default score, such as the average of the lowest and highest values assigned to that building characteristic.
- Selecting the most common attribute for that building characteristic, based on knowledge of other similar buildings in the region.
- Eliminating one or more building characteristics from consideration for all buildings in the study, such as for a study that only includes exterior observation (eliminating all building characteristics that may only be identified by internal inspection).

The goal of this rapid visual screening procedure is to identify buildings as having either relatively high or relatively low levels of potential risk, and to identify those buildings that should undergo further study. The uncertainty inherent in the selection of an attribute option should not incorrectly identify buildings as having high or low risk just because the relevant information is not known.

In the situation where two or more attribute options for a given building characteristic could be selected, the dominantly occurring attribute option should be used. In the case of two or more possible attribute options in which one is not clearly dominant, or an educated guess is not possible because the relevant information is not known, then the highest risk option (which corresponds to the largest numerical value) for the building characteristic under consideration should be selected. This approach may lead to a few buildings being incorrectly identified as high risk. The number of times a screener makes an assumption due to unknown information should be kept to a minimum. Particular care should be given to the option selected for building characteristics that are identified as being "heavily" weighted (see chapters on Threat and Vulnerability Assessment). For these building characteristics, guessing will significantly impact the risk scoring and will distort results.

COMPLETING THE RISK SCORING WORKSHEET

Results from the Data Collection Form are tabulated on the Risk Scoring Worksheet (Figure 3) to determine a single overall risk assessment score for the building, or to evaluate the risk contributed by each of the nine threat scenarios or three threat types (see Table 2). Note that the Risk Scoring Worksheet is located at the end of the Data Collection Form (Appendix A)

Once the building characteristics have been recorded in the Data Collection Form, the risk factors are evaluated by summing the scores entered for each building characteristic contributing to Consequences (*C*),

Threat Rating (T), and Vulnerability Rating (V) for each of the nine threat scenarios, and entering the sums on the Risk Scoring Worksheet. The risk rating for each threat scenario is computed by multiplying the three factors C, T, and V for the given scenario. An overall total risk rating for the building encompassing all nine scenarios is determined by using an equation that considers the risk rating for each threat scenario and a scaling factor and power-summation formulation that controls the limit of the total risk rating. Details of this formulation are provided at the beginning of the chapter entitled, "Risk Assessment Rating."

Use of the electronic database version of the procedure will permit seamless inputting of data during the on-site evaluation and automatic calculation of scoring. See Appendix E for more information.

FEMA 455 RISK SCORING WORKSHEET

THREAT SCENARIO		Consequences (C)	Threat Rating (T)	Vulnerability Rating (V)	Threat Scenario Risk Rating (C x T x V)
Internal	Intrusion				
	Explosive				
	CBR				
Explosive	Zone I				
	Zone II				
	Zone III				
CBR	Zone I				
	Zone II				
	Zone III				
A. TOTAL RISK RATING FOR BUILDING					

Figure 3 Risk Scoring Worksheet.

USE OF SCREENING RESULTS

Because the procedure is quick and relatively simple to perform, it is designed to be performed routinely as part of the security operations of the building. It is recommended that as a baseline, a screening is performed during peak occupancy times, and that the procedure be used routinely during periods of high threat alert, when the facility or the facility type has been threatened.

Results of the rapid visual screening process can be used for a wide variety of applications: (1) prioritization of buildings for further evaluation; (2) establishing building inventories that characterize a community's risk to

terrorist attack; (3) developing emergency preparedness plans in the event of a high threat alert; (4) planning post-event mass evacuation, rescue, recovery and safety evaluation efforts; (5) prioritizing a community's (or agency's) mitigation needs; and (6) developing building-specific vulnerability information for purposes such as insurance rating and decision-making during building ownership transfers.

The results can also be used on a building-specific basis as a prioritization tool for more detailed study, verification of results, and development of mitigation measures that will reduce the risk rating value to levels that are more acceptable to the building owner or other stakeholders.