

CASE STUDY
RELATING BLAST EFFECTS TESTS
TO THE
EVENTS OF APRIL 19, 1995
ALFRED P. MURRAH FEDERAL BUILDING
OKLAHOMA CITY, OKLAHOMA

UTILIZING:

TEST RESULTS FROM:
ARMAMENT DIRECTORATE
WRIGHT LABORATORY
EGLIN AIR FORCE BASE

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TABLE OF CONTENTS

| | |
|---|-----|
| TABLE OF CONTENTS | i |
| TABLE OF ILLUSTRATIONS | iii |
| INTRODUCTION | 1 |
| TEST STRUCTURE CONSTRUCTION | 3 |
| THE BLAST EFFECT TEST SERIES | 7 |
| ANALYSIS OF THE FIRST BLAST EFFECT TEST | 11 |
| RELATING THE EGLIN TEST DATA TO THE MURRAH FEDERAL BUILDING | 15 |
| CONCLUSION | 19 |
| APPENDIX "A" PRESSURE/LOCATION CALCULATION TABLES | A-1 |
| APPENDIX "B" WRIGHT LABORATORY MEMORANDUM AND ENCLOSURES | B-1 |

TABLE OF ILLUSTRATIONS

| | |
|--|----|
| 1. THE EGLIN TEST STRUCTURE LAYOUT | 3 |
| 2. EGLIN TEST STRUCTURE PRIOR TO BLAST EFFECT TESTING | 4 |
| 3. MK-82 TEST RESULT | 8 |
| 4. 250 LB. PENETRATING WARHEAD TEST RESULT | 9 |
| 5. TEST ONE, AIR COUPLED BLAST EFFECT TEST | 12 |
| 6. PRESSURE MAP OVERLAY OF THE FIRST BLAST EFFECT TEST | 13 |
| 7. CROSS SECTION OF THE MURRAH FEDERAL BUILDING | 17 |
| 8. FLOOR PLAN OF PREDICTED THIRD FLOOR DAMAGE | 18 |

INTRODUCTION

This study has been undertaken and this report has been prepared in order to develop parametric data for use in analyzing the event of April 19, 1995 in which the Alfred P. Murrah Federal Building was destroyed by a terrorist attack utilizing explosive compounds.

Due to a limited amount of information in the public domain regarding blast effects against structures, a study was undertaken in which photographic data combined with known test parameters was analyzed to provide baseline data for estimating the effectiveness of explosive devices against reinforced concrete structures. The maximum potential blast pressure is used as the determinate factor in establishing resistance to blast and overall blast effect.

A study was conducted to map the pressure regions on a vertical face wall of a reinforced concrete test structure to provide baseline data. Data for the study was obtained from General Benton K. Partin, USAF (Ret). This information was supplied to him at his request by the Armament Directorate, Wright Laboratory, Eglin Air Force Base, Florida. A copy of this memorandum can be found in Appendix B.

Utilizing data from this study various conclusions can be drawn about the nature and components of the event of April 19, 1995 at the Murrah Federal Building.

This report is limited in scope to providing basic data and furnishing certain limited conclusions about the events in Oklahoma City and is being produced as part of a larger more detailed study of the events which occurred there.

TEST STRUCTURE CONSTRUCTION

The test structure constructed at Eglin Air Force Base while not as large as the Alfred P. Murrah Federal Building in Oklahoma City has many similarities and therefore provides an excellent source for data.

The Eglin Test Structure (ETS) was constructed of reinforced concrete and had a footprint of 80 feet in length and 40 feet in width. The ETS was comprised of

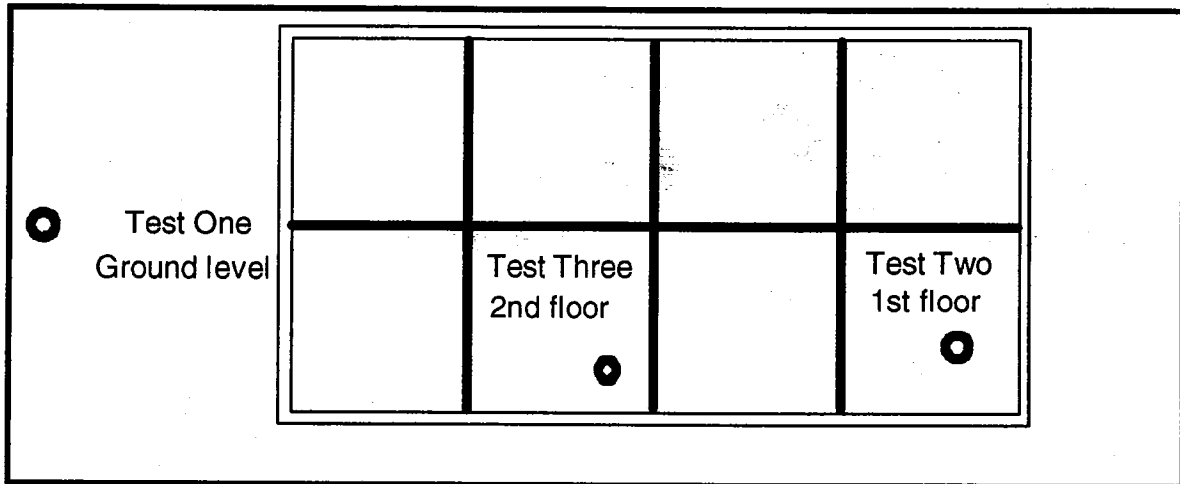


Figure 1 The Eglin Test Structure layout

three stories with a total height of 30 feet. The ETS is similar to Murrah in its basic layout with three rows of columns in the long axis and a series of narrow bays in the shorter axis. The ETS was constructed of six inch thick concrete panels similar to the six inch thick floor panels of Murrah. In addition a series of 14 inch square columns supported the panels in the corners of each room and at the edge of the floor panels. This configuration bears a similarity to the Murrah buildings system of columns, T-beams and floor panels.

The ETS does not appear to have the extensive series of piers that the Murrah Building had for its' foundation. The ETS appears to be built on a spread footing which would be consistent with the design in the area of Eglin Air Force Base. The walls and columns are monolithically poured one story at a time. On top of the column the next floor and edge beam combination is formed then poured and then the next story is formed and poured on top of this. The building appears to have several cold joints in the walls thereby producing a structure that has diminished strength. The normal concrete strength utilized in this type of construction and in this area of the country is 3,000 psi. The Murrah building was constructed with 4,000 psi concrete and it would be reasonable to expect that the Murrah building concrete would have tested in the area of 4,500 psi or above on April 19, 1995.

