TEST CASE DOCUMENTATION AND TESTING RESULTS

TEST CASE ID CESE-VAL-2.1

Shock Wave Diffraction Around a 90° Corner

Tested with LS-DYNA $^{\textcircled{R}}$ v
980 Revision Beta

Friday 1^{st} June, 2012



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Author(s) Iñaki Çaldichoury, Zeng Chan Zhang				
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1 Introduction

1.1 Purpose of this Document

This document specifies the test case CESE-VAL-2.1. It provides general test case information like name and ID as well as information to the confidentiality, status, and classification of the test case.

A detailed description of the test case is given, the purpose of the test case is defined, and the tested features are named. Results and observations are stated and discussed. Testing results are provided in section 4.1 for the therein mentioned LS-DYNA[®] version and platforms.

2 Test Case Information

Test Case Summary				
Confidentiality	external use			
Test Case Name	Shock Wave Diffraction Around a 90° Corner			
Test Case ID	CESE-VAL-2.1			
Test Case Status	Case Status Under consideration			
Test Case Classification Validation				
Metadata	SHOCK WAVES			

Table 1: Test Case Summary

3 Test Case Specification

3.1 Test Case Purpose

The purpose of this validation test case is to study the diffraction of a shock wave around a 90° corner.

3.2 Test Case Description

The diffraction of shocks around planar walls is very well understood which makes it a good validation test case. During the 18^{th} International Symposium on Shock Waves held on July 21-26, 1991 in Sendai, Japan this test case was chosen in order to compare various CFD schemes which are used for simulating shock wave phenomena [1]. Two figures were requested as computational outputs one compulsory and one optional. A sketch of the output format for the compulsory figure can be seen on Figure (1).



Figure 1: Diffraction of a shock wave around a 90° corner [1]

3.3 Model Description

Figure (2) offers a view of the geometry and mesh used while Table (2) and (3) give some information on the mesh and the parameters used.



Figure 2: Test Case Geometry and Mesh

Model information				
Total number of nodes	27400			
Total number of elements	55522			

Table 2: Test Case Mesh information

Model physical parameters				
Specific heat at constant volume	1.0566357			
Specific heat at constant pressure	1.47929			
Incoming velocity in the x-direction	2			
Incoming velocity in the y-direction	0.0			
Pressure	1.2893			
Density	1.5157			

Table 3:	Test	Case	Parameters
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4 Test Case Results

4.1 Test Case observations

Figure (3) shows the good agreement at different times between the numerical and experimental results.





References

- [1] M. V. DYKE, An Album of Fluid Motion, The Parabolic Press.
- [2] O. I. K. TAKAYAMA, Shock wave diffraction over a 90 degree sharp corner, Posters presented at 18 th ISSW, (1991).