Organization of the dataset

This report is an auxiliary document to the dataset. If using the data please cite:

Hoult, R. D., **A Universal Plastic Hinge Length for Reinforced Concrete Walls.** *Submitted to ACI Structural Journal,* 2021.

This dataset is compilation of numerical and experimental reinforced concrete walls and corresponding parameters used for a plastic hinge analysis. The plastic hinge length (L_p) is the primary focus of this research. Two Microsoft Excel files contain all the information for the numerical and experimental wall parameter values and resulting L_p values. A pdf file contains all of the reference list corresponding to the experimental wall specimens used for this research. MATLAB files are available for reproducing the figures produced in the research paper.

The **Abstract** of the corresponding paper is given below:

When using a plastic hinge analysis, an estimate of the ultimate displacement capacity of reinforced concrete structural wall buildings is highly dependent on the assumed plastic hinge length. A plastic hinge length equal to 0.5 times the wall length has typically been regarded to provide a safe and lower bound estimate and has subsequently been used in building codes internationally. Recent numerical and experimental research has shown that a plastic hinge length of 0.5 times the wall length can give an overestimate of the actual length, which would provide a false indication of the ultimate displacement capacity of the wall. The many empirical plastic hinge length expressions available have been derived using a limited range of design parameters or specific wall sections. This research uses a large database of planar and non-planar experimental and numerical research results with a wide range of design parameters to investigate the plastic hinge length and efficacy of some of the empirical expressions that exist in the literature. It is shown that a plastic hinge length of 0.5 times the wall length largely overestimates the actual length found from the database of walls. A simple expression is derived here that can be used by designing engineers to calculate a conservative estimate of the plastic hinge length of planar and non-planar reinforced concrete walls.

Organization of the data

All of the experimental data can be downloaded from a publicly accessible platform Zenodo, at DOI: 10.5281/zenodo.4321917.

Each of the files and main folders are explained below.

1. **"Numerical_Wall_Database.xlsx"**

This is a Microsoft Excel file that contains all of the numerical research results on RC walls used in the database and the corresponding research investigation focusing on plastic hinge lengths. The "Wall Type" column indicates the cross-sectional shape of the wall. An excel "comment" indicates what the letters correspond to. The "Database" column indicates the peer-reviewed research paper (i.e., citation) corresponding to the numerical results. The full reference list can be found in a subsequent file, "Reference_List.pdf". The other parameters in this Excel file are given in the Appendix.

2. **"Experimental_Wall_Database.xlsx"**

Similar to the previous file, this Microsoft Excel file contains all of the experimental research results on RC walls used in the database and the corresponding research investigation focusing on plastic hinge lengths. The parameters given here are defined in the Appendix.

3. **"Reference_List.pdf"**

This file contains the peer-reviewed reference list to all the experimental and numerical results used for this research investigation.

4. **Folder "MATLAB"**

This folder contains the MATLAB files needed to reproduce the figures produced for the corresponding research paper. The output figures can be found in the "Images" subfolder. The two MATLAB files (.m) produces the figures. The three-comma separate variable (.csv) files contain all of the variable values and plastic hinge length values from the experimental and numerical research results, which are read by the MATLAB files to produce the figures.

APPENDIX

r	Secondary cracking ratio ($\rho_{wv}/\rho_{wv.min}\leq 1.0$)
L_w	Wall length (mm)
$M/(V.L_w)$	Aspect ratio
H_e	Effective height (mm), or shear span ratio (M/V)
ALR	Axial load ratio ($ALR=P/f'_c A_w$)
v	Shear stress demand parameter ($v=Vmax/A_w\sqrt{f'_c}$)
L_p	Plastic hinge length (mm)
t_w	Wall thickness (mm)
h_s	Full height of wall specimen (mm)
d_{bl}	Diameter of longitudinal reinforcement bars (mm)
ρ_{wv}	Longitudinal reinforcement ratio
f'_c	Concrete compression strength (MPa)
f_t	Concrete tensile strength (MPa)
f_y	Yield strength of longitudinal steel bars (MPa)
f_u	Ultimate strength of longitudinal steel bars (MPa)
d_{bt}	Diameter of transverse reinforcement bars (mm)
n_t	Number of transverse reinforcement layers
s_t	Spacing of transverse (shear) reinforcement (mm)
Δ_y	Nominal yield displacement (mm)
Δ_u	Ultimate displacement (mm)
F_y	Nominal yield force (kN)
F_u	Ultimate force (kN)
ε_{su}	Ultimate strain capacity of longitudinal steel bars (mm/mm)
$\varepsilon_{su,cyc}$	Ultimate cyclic capacity [=(3/8)ε_{su}]
ε_{cu}	Ultimate compression strain capacity of concrete (unconfined and confined)
Φ_y	Nominal yield curvature (rad/mm)
Φ_u	Ultimate curvature (rad/mm)
$\rho_{wv.min}$	Minimum longitudinal reinforcement ratio (see *Hoult et al.* 2018a)
$\Delta_s / \Delta f$	Shear-to-flexure deformation ratio