"Good" close-range photogrammetry example from Ostia Antica, Italy. Note that the object (the temple) is framed tightly, and that all objects (both near and far) are in sharp focus.

When it comes to close-range photogrammetry, the difference between "good" photos and "bad" photos can be the difference between getting useful 3D information and having complete failure. There are many different variables contributing to success or failure of a project, but to help avoid the most common mistakes a photographer can follow the general guidelines outlined below.

Basic photographic concepts that, when followed, generally produce acceptable digital images:

Camera/lens Properties:
-Use a mid to high resolution camera (at least 12-15MP)
-Use a fixed (non-zoom) lens
-Tape the focus ring (and set to manual focus)
-If using a zoom lens, tape the zoom ring and use one focal length for the entire project

Camera Placement:
-Use a tripod and stable tripod head
-Frame the subject tightly, making use of the entire sensor area
-Maintain 60-80% overlap between photos
-Ensure all important areas of the object are visible in at least three images
-Be aware of camera geometry required by software (baseline, convergent angles)

Camera Settings:
-Use aperture priority mode (set to between f/8 and f/16)
-Use a timer or wired/wireless shutter release to minimizes motion blur
-Use mirror lock-up, if available, to further minimizes motion blur

A list of common mistakes made while capturing digital images for a close-range photogrammetry project:

Camera/lens:

"Bad" close-range photogrammetry
example. Note that the object (the temple)
is not framed tightly, and that most objects
are blurry and out of focus.

- Use of low resolution camera (8MP or less)
- Changing zoom (focal length) between images
- Use of loose/damaged lens
- Significant re-focusing due to varying distance from object

Camera placement:
- Handheld camera (no tripod)
- Insufficient overlap between images
- Inefficient use of sensor area (too far from subject)
- weak camera geometry (multiple images from one position, short baseline, overall poor network of image locations/orientations)

Camera settings:
- shallow depth of field (below f/8)
- manual shutter release (causes motion blur)

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Download a printable checklist in PDF format here.

Before you leave the office

- Check that the battery is charged (check spare battery if taking one)
- Copy images from past projects to a laptop if needed and format the card
- Attach the lens you plan to use
- Check the lens for excessive dust

Goals for each image you capture

- Use entire frame
- Sharp focus at all distances
- Good exposure throughout image

Camera setup for typical close-range project with DSLR

- Set to Aperture Priority mode
- Set aperture to between f8 and f16 (depending on DOF[1] needed)
- Set the camera to collect RAW and/or JPEG Large
- Configure other settings as needed
- Mount camera to tripod and frame the object for the first image
- Focus the camera on the object (using auto or manual), then turn the lens to manual focus and tape the focus ring so that it doesn't move
- If using a zoom lens, tape the zoom so that it doesn't move
- Set the camera to use a 2 second timer (or use wired shutter release)
- Set camera to use mirror lock-up (to avoid camera vibration)

Notes

[1] DOF stands for Depth of Field and is a term used to describe the depth of the scene that is in focus. Smaller apertures create more depth of field, though, at some point a small aperture will introduce blur due to diffraction. Learn more here at the dpreview.com glossary.
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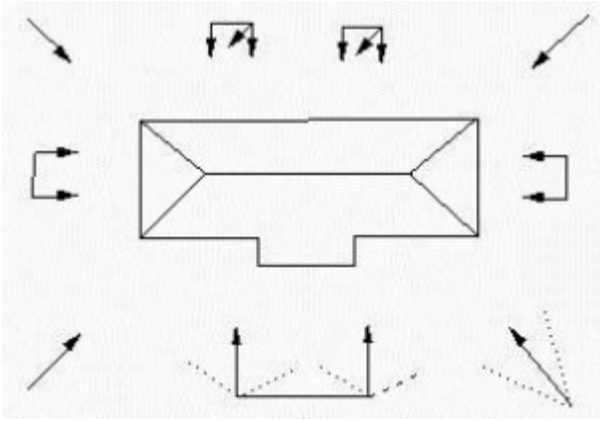
General Photography and Close-Range Photogrammetry Standards and Guides

Learn more about depth of field, bit depth, EXIF metadata, file formats, and more…

Glossary of terms found at Digital Photography Review website (dpreview.com)
http://www.dpreview.com/learn/?/Glossary/

ADS Guides to Good Practice

Learn more about the ADS Guides to Good Practice for close-range photogrammetric documentation...
Barnes, A; J. Cothren, K. Niven (2011) *Guides to Good Practice: Close-Range Photogrammetry*. Archaeology Data Service / Digital Antiquity: Guides to Good Practice.
http://guides.archaeologydataservice.ac.uk/g2gp/Photogram_Toc

Documenting Surfaces

An excellent guide for using close-range or aerial photogrammetry to document surfaces (e.g. rock art, trackways, surfaces prone to erosion).
Matthews, N. A. (2008) *Aerial and Close Range Photogrammetric Technology: Providing Resource Documentation, Interpretation, and Preservation*. Technical Note 428. National Operations Center, Denver, Colorado: U.S. Department of the Interior, Bureau of Land Management.
http://www.blm.gov/nstc/library/pdf/TN428.pdf

HABS/HAER/HALS

Learn more about architectural and engineering documentation for long term archival in the Heritage Documentation Programs collections in the Library of Congress.
National Park Services: Heritage Documentation Programs (HABS/HAER/HALS)
http://www.nps.gov/history/hdp/

Cultural Heritage Site Surveying

What makes a successful and useful survey of cultural heritage sites? Learn what to record, how to record it, and what performance indicators are important...
Bryan, P., B. Blake, J. Bedford, D. Barber, J. Mills, and D. Andrews (2009) *Metric Survey Specifications for Cultural Heritage*. English Heritage, Swindon.
http://www.english-heritage.org.uk/publications/metric-survey-specification/

English Heritage on Photogrammetric Survey of Historic Buildings

An extensive and detailed guide for the photogrammetric survey of historic buildings...
D'Ayala, D., and P. Smars (2003) *Minimum requirements for metric use of non-metric photographic documentation*, University of Bath.
PART 1: http://www.english-heritage.org.uk/publications/metric-use-of-non-metric-photographic-documentation/metricextraction1.pdf/
PART 2: http://www.english-heritage.org.uk/content/publications/publicationsNew/metric-use-of-non-metric-photographic-documentation/metricextraction2.pdf

Intro to Architectural Photogrammetry

A nice introduction to close-range photogrammetry and methods for architectural photogrammetry...
Hanke, K., and P. Grussenmeyer (2002) *Architectural Photogrammetry: Basic Theory, Procedures, Tools.* September 2002, ISPRS Commission 5 Tutorial, Corfu.
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