Volume
3

… Oser: le progrès est à ce prix…

[Victor Hugo, Les Misérables, III, I, II]

… Progress is the realisation of Utopias…

[Oscar Wilde, Soul of Man under Socialism.]

Testing

EXPLOITATIONS AND COMMUNICATIONS

Testing

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General Index

Chapter 1

COMPARISON BLIND-TEST RUSSIA AND BLIND TEST-INDIA

Evaluation of a traditional outsourcing process

FOREWORD

The objective of the CaribCAD project, sponsored by the EU in its fourth framework (INCO-DC) is to develop the technical basis, human capacity and protocol required for the distribution (outsourcing) of Computer Aided design/Drafting (CAD) workloads between engineering companies in Europe and specialised companies in Developing Countries. The project seeks to achieve this objective by taking a broad perspective which will enable Developing Countries to become participants in the future global co-operative engineering community and to instigate competitiveness amongst EU firms. The project is nearing completion (December 1999) and results need to be disseminated to a wider potential users public (CAD engineering companies) and similar such research groups. This will be done by organising a seminar and industrial workshop in June 2000.

This is an evaluation document which reports on the results of comparisons made between two blind-tests carried out by the TUD on 12th April 1999, and which derives from two documents relating to a Russian test (Blind-Test Russia Report) and an Indian test (Blind-Test India Report).

The main goal was:

To examine the results of Outsourcing in the usual way.

The specific objectives were:

To test the resulting material (cad files) to compare it with the original paper-based drawings.

To analyse the adequacy of the resultant vectorized drawing.

To research the issues.

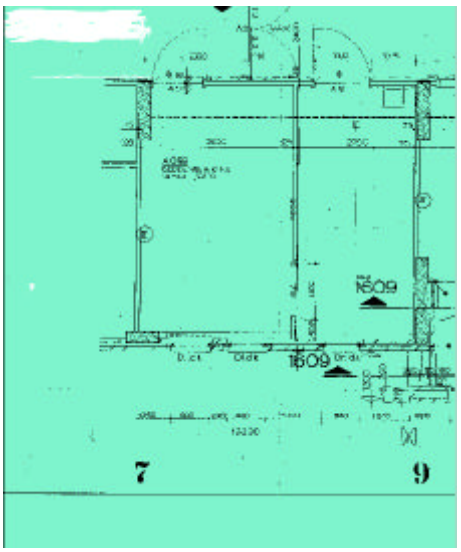
On the basis of:

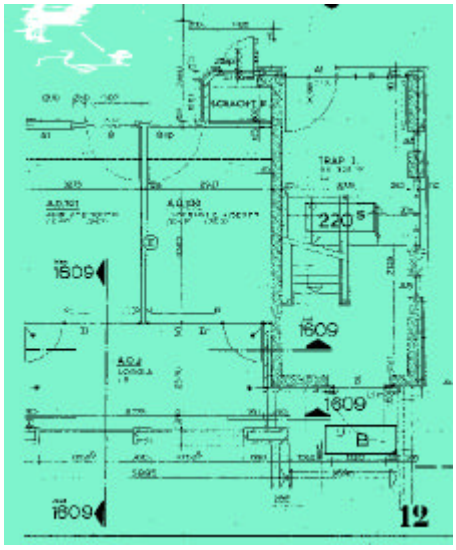
1. the same building project

The subject of both tests was a section of a Dutch hospital.

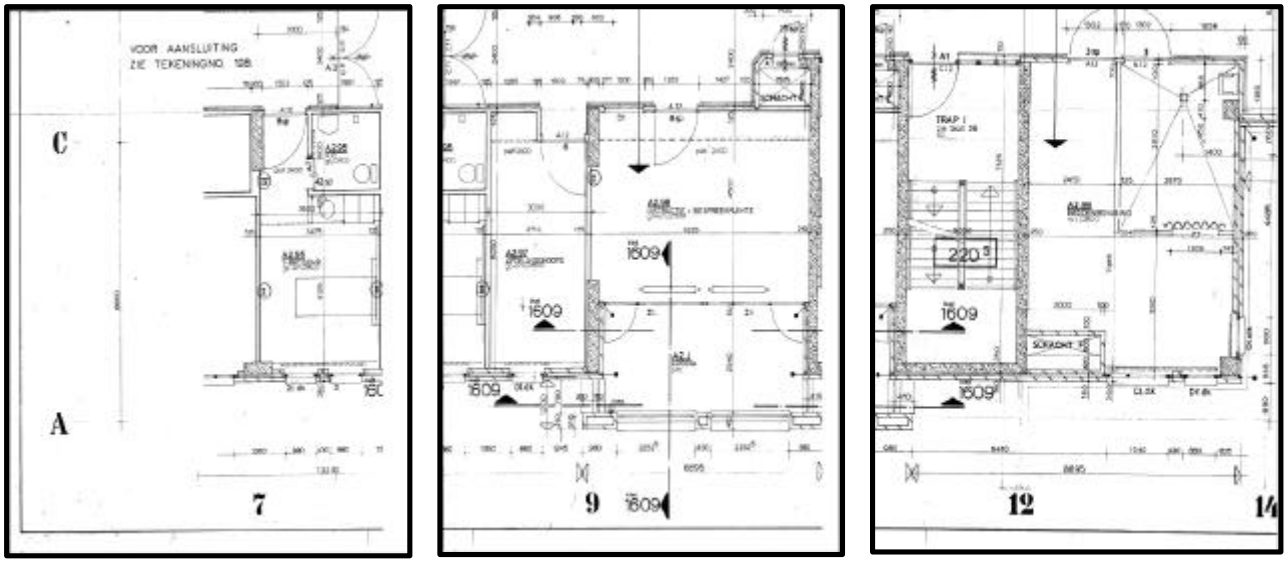
2. the same kind of sent material

In both cases the material dispatched was a set of five A4 scanned drawings in which the two architectonic object plans, were subdivided.
A very small part of the ground floor plan was subdivided into the tek1-1 and tek1-2 tiff. Files, as follows:





The same section of the building, but on the second floor has been subdivided into the following tek2-1, tek2-2 and tek2-3 tiff. files:



3. <u>the same drawing procedure</u>

The TUD did not ask for particular procedures or ways of doing things to be followed, and it has not been asked to produce specific results. It therefore follows that without any requirements or drawing conventions stipulated, the vectorized drawings are simply the result of a blind outsourcing process which could be, maybe the drafting way usually adopted by the outsourcing partner, or which could perhaps amount to a general misunderstanding of the original drawings.

<u>The drafting results turned out to be completely different.</u>

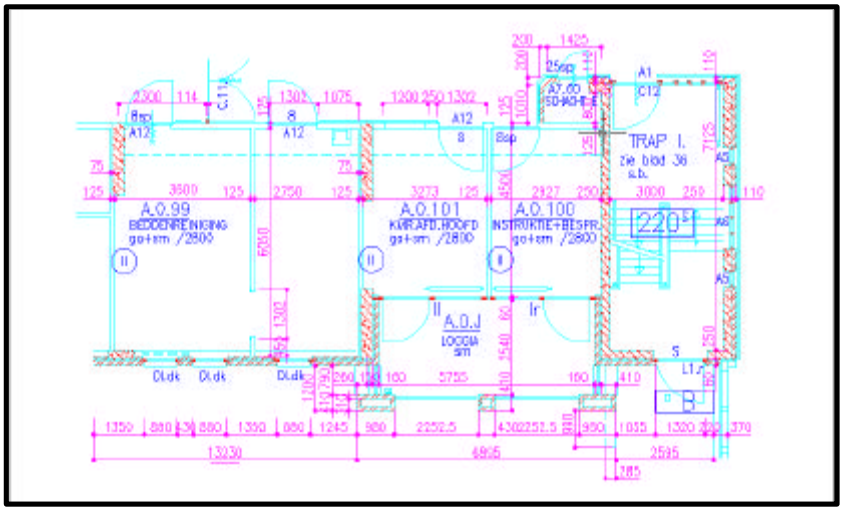
	RUSSIA	INDIA
DIMENSIONS	**Inaccuracy** All the dimensions that are explicitly drawn, and which refer to the control dimensions, are accurate. The other dimensions, which are not given directly but are obtained from the scanned drawing, are difficult to verify, and if possible, not always correct. The outsourcing partner did not ask for any further specifications. It is possible that he solved certain probable doubts by making some approximations, or that there were no doubts (only problems discovered later on!). Anyway the TUD partner did not receive any questions; not did he find any highlighted areas or annotations that communicated doubts or problems.	
USE OF LAYERS, LINE, COLOURS, HATCHING INFORMATION	**Incorrect** The layers used to compose the drawing are not named; they simply have a colour. That means that every line has no thickness. The line type is in every case, a “bylayer”, and the line type scale 1.00. At the same time, there is no rigid relationship between the layers and every single architectonic element; just a relationship between the colours and the different draft parts composing the drawing. To explain this the layers used are detailed here below: RED LAYER: the layer used to define and draw everything: foundations, masonry, doors, windows. YELLOW LAYER: the layer used to define and draw all the texts GREEN LAYER: the layer used to define and draw all the dimensions given to control the accuracy of the building dimensions. CYAN LAYER: the layer that used to draw all the hatching. The hatched parts,	**Missing** It was used just and only the layer “0”. Every line has no thickness, no colour, and the linetype scale is in every case 1.00. From this follows that there is no relationship between the layer and the architectonic elements. Foundations, masonry, doors, windows…are not elements of an architectonic whole, but just pieces of a drawing. The hatched parts, representing the same object, have been subdivided into small pieces of hatching, thus giving some difficulties.

	representing the same object, were subdivided into small pieces of hatching, thus giving some difficulties. In other situations instead of using hatching, objects or different AutoCAD entities have been used.	
DRAWING TECHNIQUE	**Troublesome** In both cases, normal point to point single lines, have been used. This method can lead to problems if, for example, the trimmings or constructions lines used are not erased and so still compose the drawings. The convention would be to use a polyline, which is closed. Such a polyline allows the area that has to be filled easily or simply calculated.	
USE OF BLOCKS	**Missing** Blocks may be essential when it comes to making the content of the final drawing reusable. For example, if all doors are drawn as blocks and if future refurbishment is to replace all doors in the building, then this will facilitate easy substitution.	
INFORMATION	**Unwanted or missing** This is information that has either been left on, or omitted from the drawing by the CAD technician. It may involve construction lines, just plain errors that should not be there, or some detail that has not been drawn. Through the use of blocks, this procedure becomes easily checkable, instead of being a time-consuming visual checking against the original scanned image.	

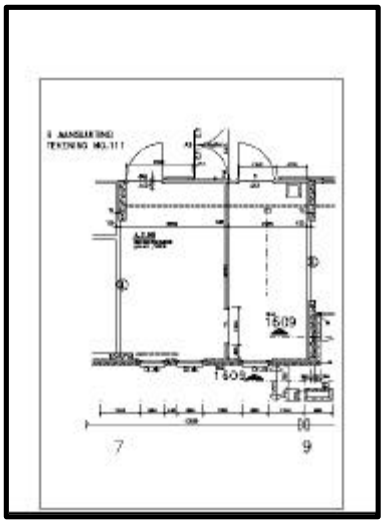
Comparison:

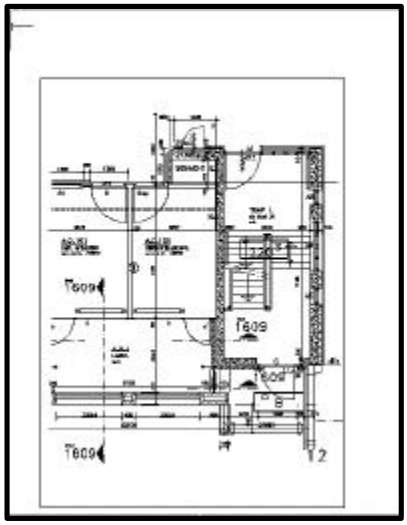
The differences mainly revolved around the ability of the Russian team to conceive that an architectonic drawing as represents architecture, while the Indians considered such a drawing to be just a graphical representation.

1. The Russians recognised that even when divided into different A4 sheets, the drawing remained one, while the Indians gave each A4 sheet separately… [SIC]
   The following are the drawings obtained by outsourcing the ground floor plan to Russians and Indians, according to the tek1-1 and tek1-2 files.



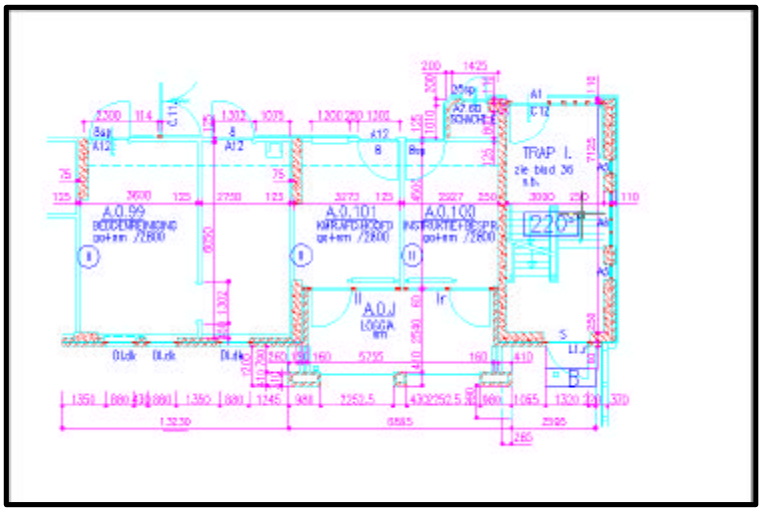
Russian Outsourcing



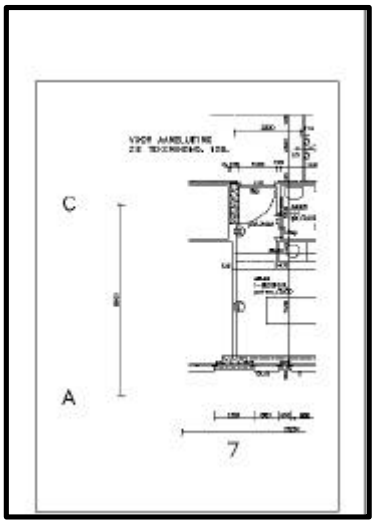


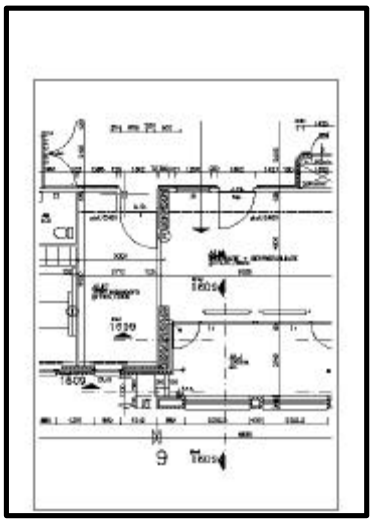
Indian outsourcing

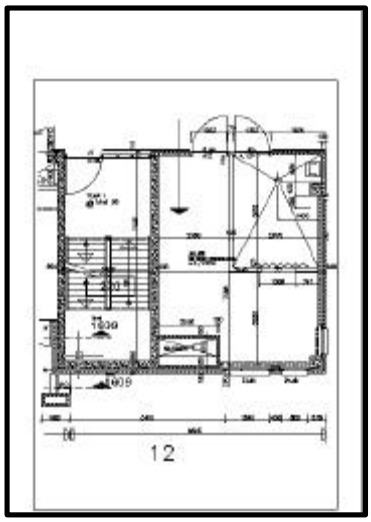
The following are the drawings obtained by outsourcing of the second floor plan to Russian and Indian, in accordance with the tek2-1, tek2-2 and tek2-3 files.



Russian Outsourcing

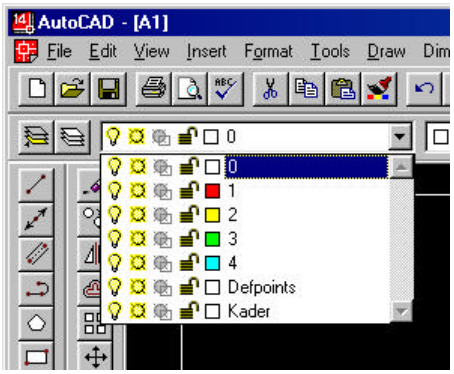




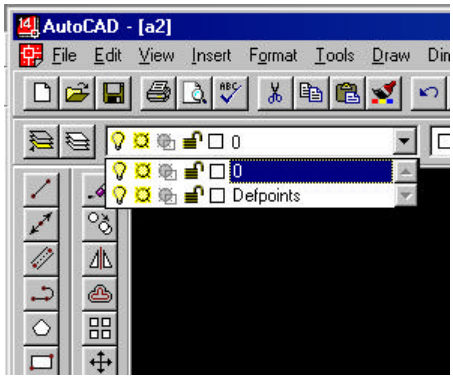


Indian outsourcing

2. The Russians understood that an architectonic drawing is composed of different elements an so they represented them by using different layers and colours, though they were just graphical colours, while the Indians gave all the elements the same layer and colour.



Russian Outsourcing



Indian outsourcing

3. With the present limited assignment, it turned out to be easier to check and modify the Russian drawing than the Indian drawing.

Conclusions:

From the previously tests studied it turned out that some problems arising were usual problems for a traditional outsourcing process.
Because of the fact that the information that was retained or omitted, e.g. construction lines, just plain errors that should not have been there, or some detail that had failed to be drawn, the drawing method used should be an overlaying. Nevertheless, the inaccuracy of the dimensions would suggest that maybe not an overlaying but rather a redrawing process had been used.
Such tests give an idea of the adequacy of a traditional process when it comes to redrawing existing paper drawings but they are not exhaustive with respect to the subject; we therefore invite you to read our further publications.

The usual problems with a traditional outsourcing process are in short:

1. Difficulty checking the correctness of the drawing.
2. Difficulty checking its adequacy.
3. Loss of time from trying to:
   - Understand a blind drawing with all its symbols.
   - Guess missing information.
   - Represent undefined information (that resulting in wrong representations)
   - Check the resulting complete vectorized drawing.
   - Possibly in adjust and clean lightly wrong drawings.
4. The needs to define very strict formal representation methods.

5. The needs to define very detailed methods to check the quality of the drawings.

The outsourcing results obtained show that, traditional outsourcing does not guarantee for an office practice:

– That a digital drawing will always be suitable where differences in projects are concerned.
– That a digital drawing will always be suitable where possible drawing's applications are concerned.
– That a digital d0rawing will always be suitable where the formal representation methods are concerned.

For an engineering company that leads to:

– Loss of time when checking, adjusting and cleaning the digital drawing due to the project, the applications and the drawing.
– A loss of time in each and any outsourcing process!

To avoid suffering a loss of time in any outsourcing process the engineering company has to:

– foresee the differences in projects, the possible applications for drawing and the formal representation methods
– and thus define detailed conventions that will always suit the work, and instruct the performer beforehand.

It is clear that such strict and detailed definitions would be impossible in a normal office practice! To allow outsourcing to be successful, it is necessary to answer the following questions emerging from these tests:

- What is the precision of paper-based drawings?
- What do we mean by quality-assurance?
- What is the accepted quality with respect to the starting media's precision?
- What are the possible applications for the digitised paper-based drawings?
- How can be find out what are the client's possible applications?
- What is the quality tolerance level with respect to the foreseen uses?
- What is the most economic way to perform?
- What is the most easy and effective way to check the results?
- How can communication be effected?
- How can the quality of the drawn material be checked before it is sent off?
- Will there be a loss of quality during transmission?
- What are the smallest possible elements? (From the point of view of drawing-elements and from the point of view of transmission.)
- How can "drawings" be made up?
- What are the conventions about layers, element details, hatching, line thickness and size of text?

As a research project, CaribCAD examined all the previous issues needed to effect the distribution (outsourcing) of Computer Aided drawing/drafting.

Chapter

2

WORK FLOW

Evaluation report of different procedures in outsourcing

FOREWORD

The objective of the CaribCAD project, sponsored by the EU in its fourth framework (INCO-DC) is to develop the technical basis, human capacity and protocol required for the distribution (outsourcing) of Computer Aided design/Drafting (CAD) workloads between engineering companies in Europe and specialised companies in Developing Countries. The project seeks to achieve this objective by taking a broad perspective which will enable Developing Countries to become participants in the future global co-operative engineering community and to instigate competitiveness amongst EU firms. The project is nearing completion (December 1999) and results need to be disseminated to a wider potential users public (CAD engineering companies) and similar such research groups. This will be done by organising a seminar and industrial workshop in June 2000.

Definition:

- a state-of-the-art technical basis to support internet-based co-operation,
- state-of-the-art methods to develop opportunities, methods and facilities in support of co-operative working styles and communication systems on which digital processes can be effectively based,

the following tests have been done:

1. To examine the results of a traditional Outsourcing processes two blind-tests were done with a Russian outsourcer and an Indian one. The reports derived from those outsourcing processes are presented in the document:
   Evaluation of a traditional outsourcing process.
   Comparisons blind-tests done in Russia and India.

   The results of that outsourcing, giving an idea of the adequacy of one traditional process when it comes to redrawing existing paper drawings, are not exhaustive of the subject. It was the need to discover all the redrawing/digitising processes and to define their adequacy and quality in supporting efficient internet-based co-operation, which led to the development of a completely digitised process analysis.

2. The first results of the complete analysis of different procedures in outsourcing, supported by five quality tests made in June 1998 at the TU Delft, were presented to the CaribCAD members during a Workshop held in Delft in June 1998. The present document provides an evaluative report of those different outsourcing procedures.

Table of Contents

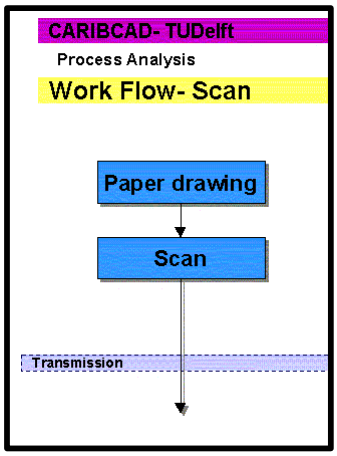
The main goals of the process analysis/tests are:

- To define all the different work flow possibilities for setting up a digital drawing made from a paper drawing
- To check the quality of the digitised results in order to determine what is the best solution for digitising.

1. PROCESSES

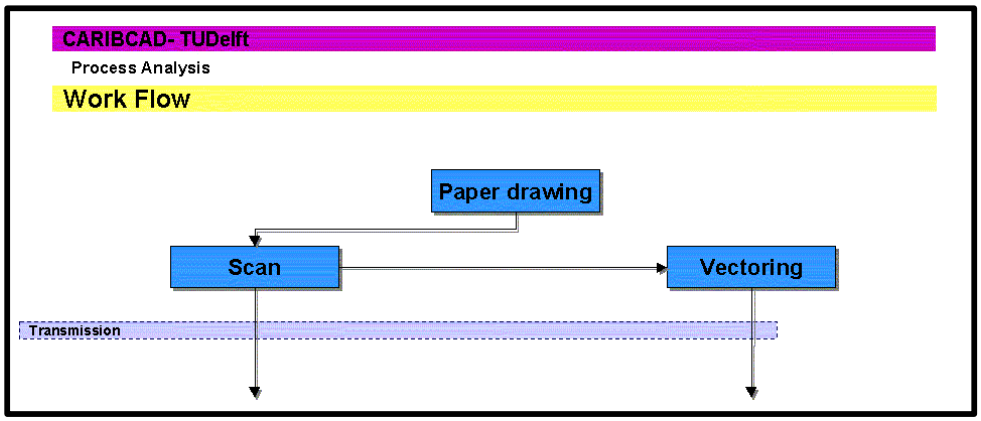
Starting out from a paper based drawing, as is usual in architectural practice; all the Computer Aided Design processes required for setting up a digital drawing were analysed.

1.1. In each and every outsourcing case the plans started with paper-based drawings and the first step was to scan the paper-based drawing.



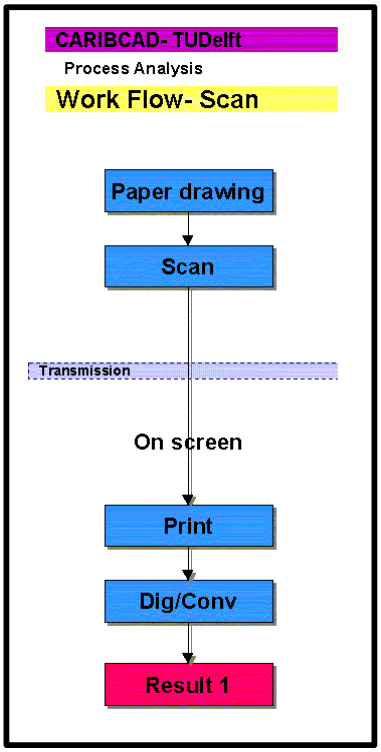
1.2. After scanning the drawing can be:

1. directly transmitted as a Raster image
2. vectored and then transmitted.



1.2.1. When directly transmitting the scanned drawing the draftsman should

Print the drawing:
in this case the possible digitised process involves drawing again. The draftsman then has to establish what are and add the necessary conventions, by using a software program such as AutoCAD.



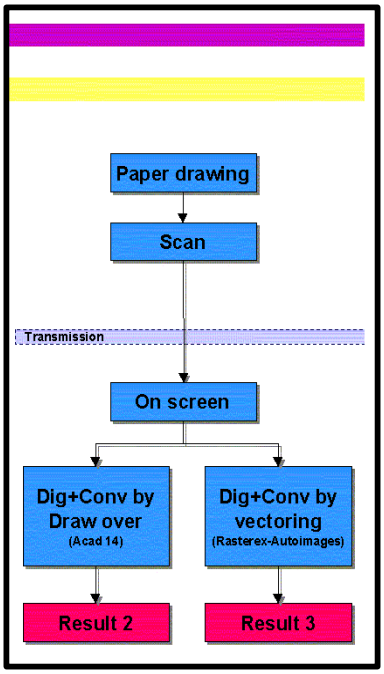
Working/Drawing directly onto the screen:

in such cases there are two possible digitised processes:

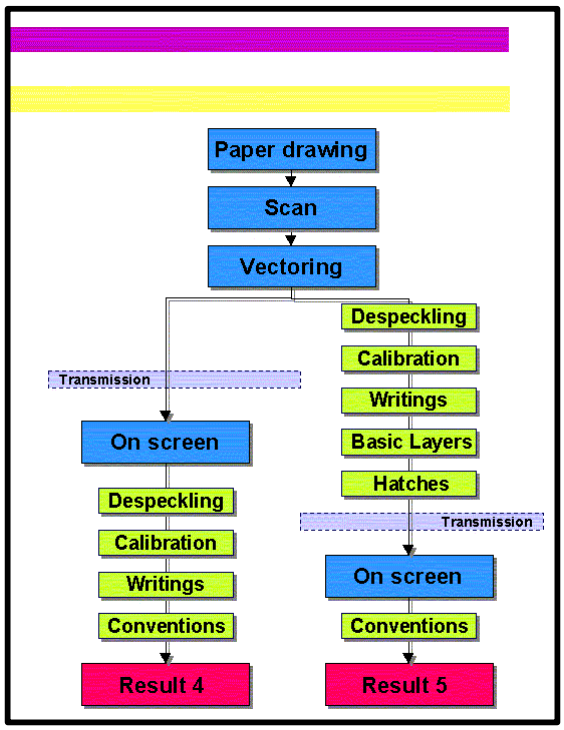
a. Directly digitise the received scanned drawing by Overlaying

b. Directly convert the received scanned drawing into a digital format by Vectoring

In both cases the conventions must be determined and added.

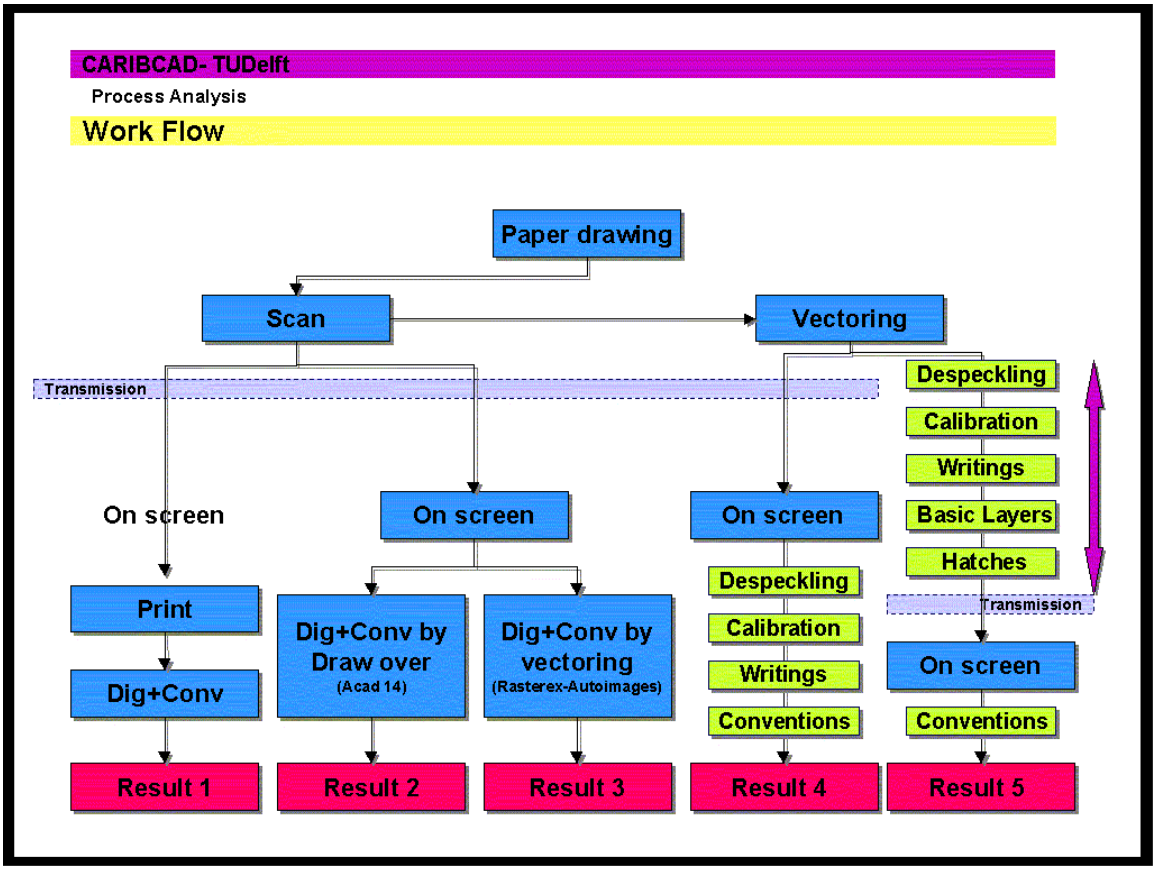


1.2.2. When directly vectoring, the drawing needs to be cleaned: it is necessary to despeckle, calibrate and rewrite all the pieces of text, and to add or transform basic layers and hatching.
That can take place either before of after transmission.



2. WORK FLOW

As in **1.** (Processes) here follows a total view of all the Computer Aided Design methods involved in setting up a digital drawing.



3. TOOLS

3.1. DIGITAL REFERENCE DRAWING

The test was set up solely with the use of a CAD system. In order to check the results easily and precisely and to ensure the accuracy of the original drawing, it was decided that a project already done in AutoCAD should serve as the original model. From now on this will be referred to as the Digital Reference Drawing**.**

Digital Reference Drawing

3.2. PRINT/PLOT- REDRAWING BY HAND

To obtain a paper-based drawing with which to start the tests the first step was to print the Digital Reference Drawing and to redraw it by hand.

In reality, the client will only manage and own paper-based drawings. He may have a printed or a plotted copy of missing CAD files [Author's note: though such cases will be very unusual!] but, more practically, he will normally have hand-made drawings. As it is clear that printed or plotted copies are definitely more accurate than hand-made drawings that was what we used for our tests.

Thus in the conviction that if less accurate drawings can be used, so reasonably are the printed and plotted ones.

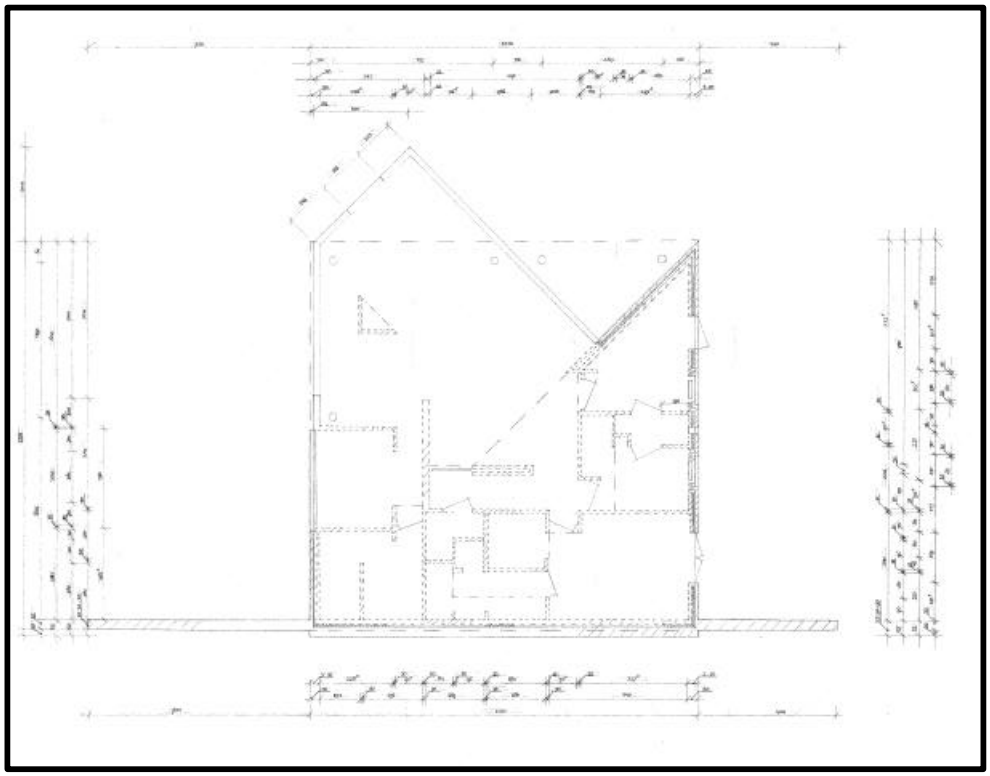
3.3. HAND-MADE DRAWING

The redrawn paper-based drawing has the following characteristics:

- It is based on the dimensions and directions of the original printed/plotted drawing, in much the same way as a genuine drawing
- Proper dimensions
- Dimensions in mm.
- It is pencil drawn

3.4. SCAN

To transmit the drawing to the performer, the hand-made drawing was scanned at 200 dpi.



Scanned hand-made drawing

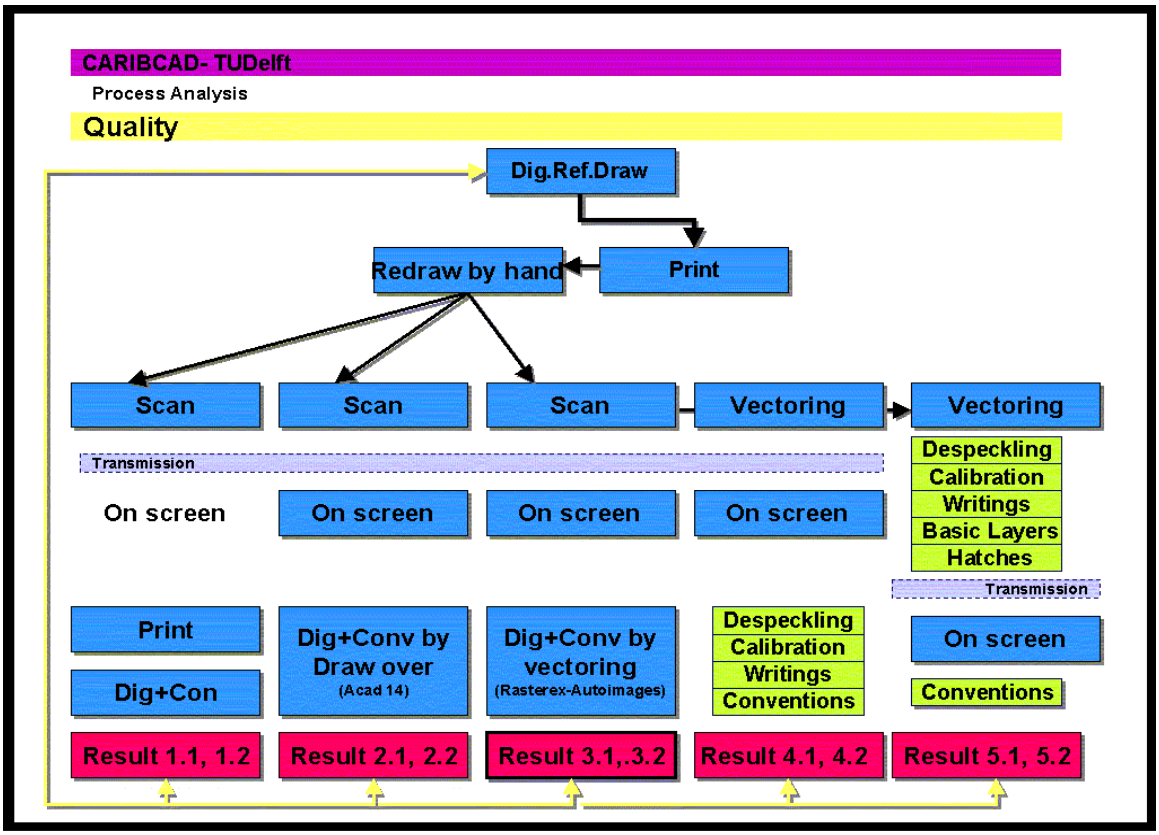
3.5. COMPARISON BETWEEN A HAND-MADE DRAWING AND A SCANNED DRAWING

The scanned drawing obtained was compared with the original one to detect the possible differences. The comparison led to the following observations:

- Lines are unstable
- Measured dimensions are not reliable
- Because of the line's thickness, it is difficult to establish the way measurements should be made: outside, inside of, or in the centre of the line?
- Deviation up to 2% (at 12 m¹, 1:50)

3.6. TRANSMISSION

After the hand-made drawing has been scanned it is transmitted from the client to the performer, who will receive it and see it on his screen.



4. ANALYSIS

It was stated beforehand that the CAD operator would only receive some scanned drawings without any requirements or drawing conventions. The obtained CAD drawings would be the result of the operator's drawing methods, conventions and capabilities. In line with the draftsman's methods, the comparison between digitised drawings and Digital Reference Drawing, and of the check-control process of the drawing's quality; the following points were considered and their suitability analysed.

4.1. ACCURACY OF THE DIMENSIONS.

If one states beforehand that the drawing dimensions are considered to be correct when the superimposition of the compared drawings coincides then one must accept that some mistakes will arise that will be due to the adopted process:

Deviations: deriving from the manipulation processes. In these tests the Digital Reference Drawing was printed, scanned and printed again after transmission from the CAD operator (three conversion processes) which meant that some deviations would definitely be generated.

Approximations: draftsmen do not usually ask for further specifications which means that they usually try to solve some dubious parts of the drawing, by making certain approximations.

4.2. USE OF LAYERS.

In this test layer usage was not requested. People were just looking for AutoCAD drawings, executed using AutoCAD as a drafting table, that could be compared with the Digital References. Using layers can be useful for the following reasons:Because in an architectonic project every draft element represents a real object with a specific function, it is therefore useful to use layers to represent all the various architectonic elements. As it is very difficult to check the adequacy of the final CAD drawing which is of many different elements it is not possible to reduce the number of entities to be checked. It would thus be necessary to check each line and each point etc. It is easy to understand that without any reference to how the different elements relate to each other becomes very easy to make big mistakes.

4.3. COLOURS

In order to be able to easily compare the digitised drawing with the referential one, it was decided that colours should not be used, so while the Referential Digital Drawing is always drawn in yellow-red, the test drawing has no colour (is drawn in white). It can be useful to use colours for the immediate recognition of each architectonic element. This relates strictly to the use of layers: a rigid relationship between layers, colours, and every single architectonic element was what led to an easy and precise control of the adequacy of the final drawing.

AutoCAD versions previous to the 2000 version needed different logical colours for each line thickness so that the lines could be print

ed/plotted in the right thicknesses.

4.4. LINES, THICKNESS, AND HATCHING INFORMATION

The lines, thickness, and hatching information selected will all depend on the draftsmen's drawing methods and capabilities. No convention has been established.

4.5. DRAWING TECHNIQUE

Normally the convention would be to use a polyline which is a closed line thus allowing the area that is bound to be easily filled or simply calculated. In this case no convention has been established.

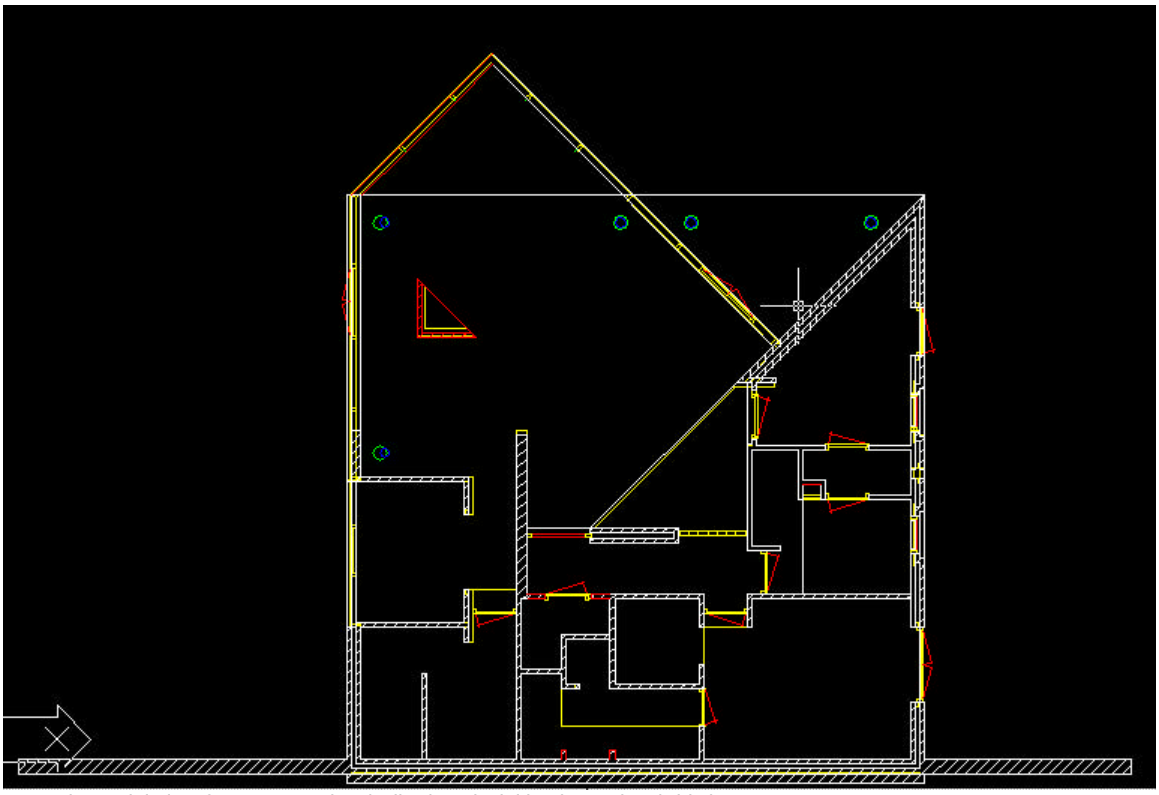
4.6. UNWANTED OR MISSING INFORMATION

This is information that has either been left in or omitted from the drawing by the CAD technician. This may be construction lines, just plain errors that should not be there, or some details that have not been drawn.

5. RESULTS

5.1. RESULT 1: DIGITISE BY REDRAWING

The scanned images resulting from the original paper drawings are sent, without further alteration, to the performer. As the performer prints the received scanned drawings, the digital redrawing process starts. If the client and the performer are using different CAD programs the performer must convert the files into the proper format.

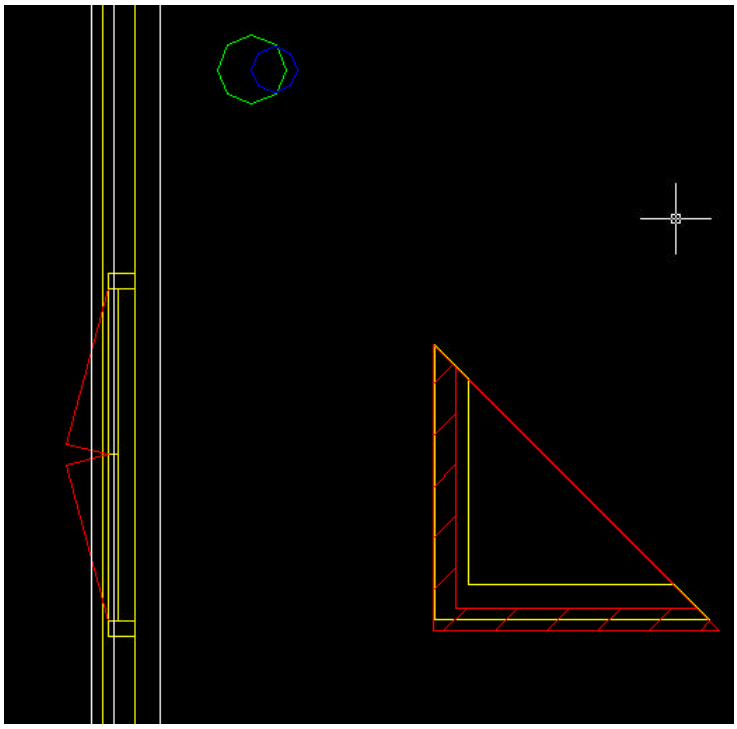


Comparison Digital Reference Drawing (yellow) and Digitised Drawing (white)

TESTING

The control process of the drawing's quality led to the following observations:

5.1.1. Incorrect dimensions. The inaccuracy of the dimensions is a result of deviations arising from the manipulation processes and approximations.



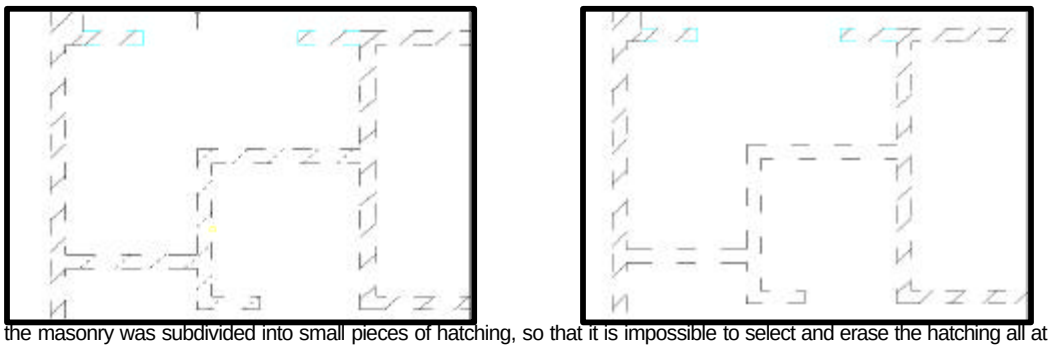
Comparison Digital Reference Drawing (yellow) and Digitised Drawing (white). Incorrect dimensions.

5.1.2. No layer has been used

5.1.3. Colour has been used just to represent columns, which are blue.

5.1.4. The lines do not have any thickness; the line type is in every case represented as a "bylayer", and the line type has a scale of 1.00.

5.1.5. Single architectonic elements were subdivided into small pieces of hatching.



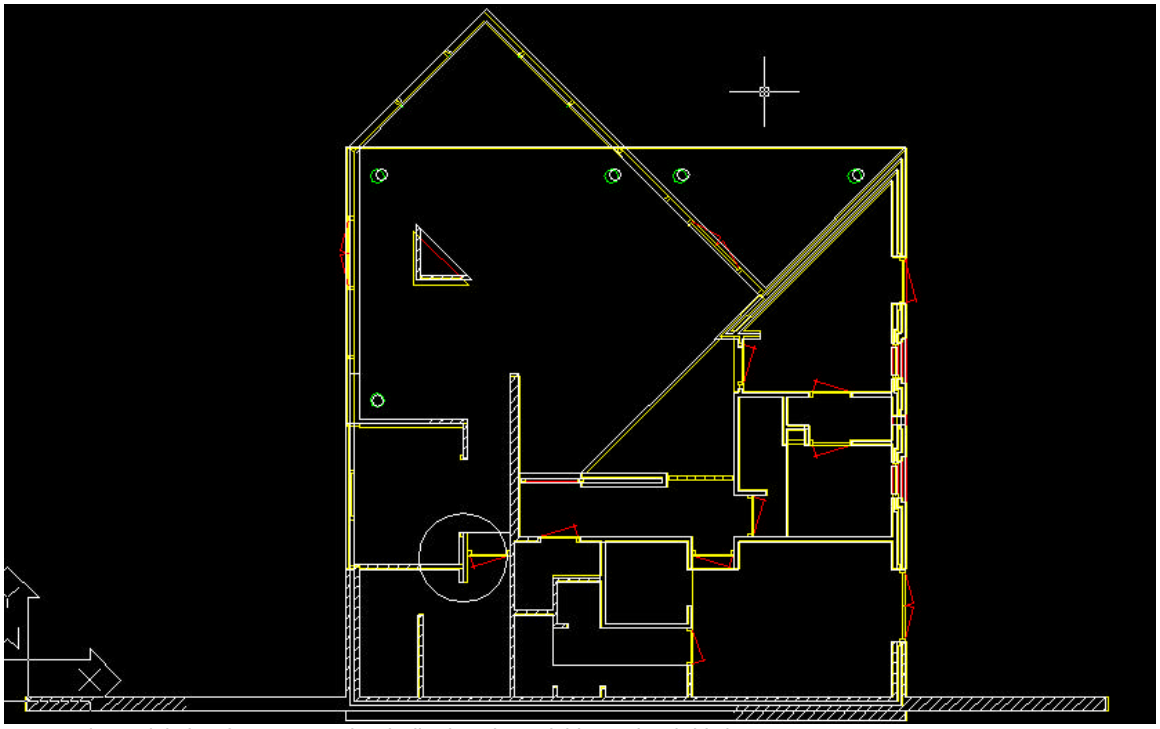
Detail: the masonry was subdivided into small pieces of hatching, so that it is impossible to select and erase the hatching all at once. This can only be done piece by piece.

5.1.6. Normal single line point to point drawing was used.

5.1.7. No unwanted or missing information is checkable.

5.2. RESULT 2: DIGITISING BY OVERLAYING

The scanned images resulting from the original paper drawings are sent, without further processing, to the performer. Then, by directly overlaying the images the digital redrawing process is able to take place. If required the files are converted into the proper format.

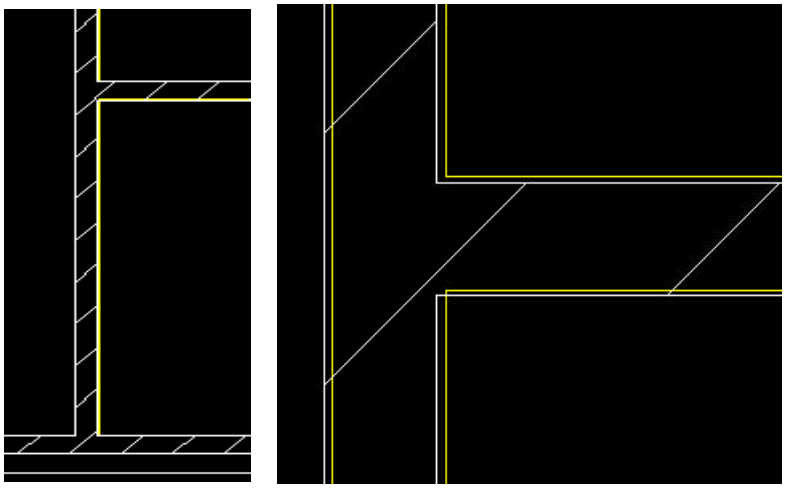


Comparison Digital Reference Drawing (yellow) and Overlaid Drawing (white)

The check-control process of the drawing's quality led to the following observations:

5.2.1. Inaccuracy of the dimensions. Two kinds of incorrect dimensions are checked: deviations derived from the process of printing and scanning and mistakes that, if they do not derive from the drawing over process, must for sure be draftsman's mistakes.

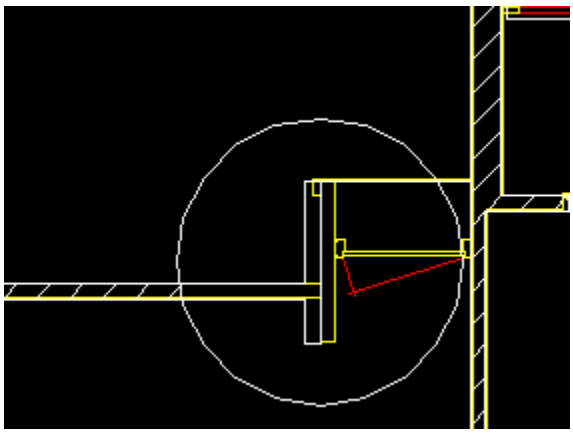
Deviations arising from the drawing over process. In an overlaying process the draftsman draws over the scanned drawing directly onto the screen. He does not have to look at the given dimensions (which are explicitly drawn). In some cases, if the hand-made drawing is not precisely drawn, the drawn dimensions (which are not directly given) are incorrect and so the overlaid drawing will be incorrect too.



Details of the comparison: Digital Reference Drawing (yellow) and Overlaid Drawing (white). Deviations.

Draftsman's mistakes.

In this test the hand-made drawing is presumed to be correct because it is obtained from the Digital Reference Drawing. The only way to explain the occurrence of the little mistakes checkable in the drawn-over drawing is by putting them down to draughtsman's errors.



Details of the comparison: Digital Reference Drawing (yellow) and Overlaid Drawing (white). Mistakes.

5.2.2. Three layers are available: one for the final drawing, one for the columns and one for the mistakes layer.

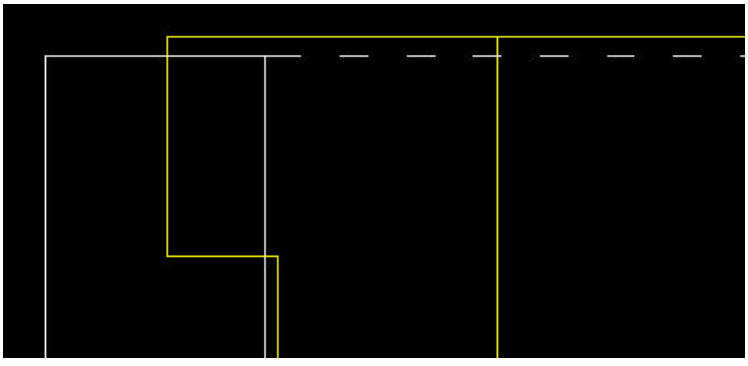
5.2.3. Only three colours are used in the overlaid drawing: yellow for the final drawing, blue for the columns and red to highlight any mistakes.

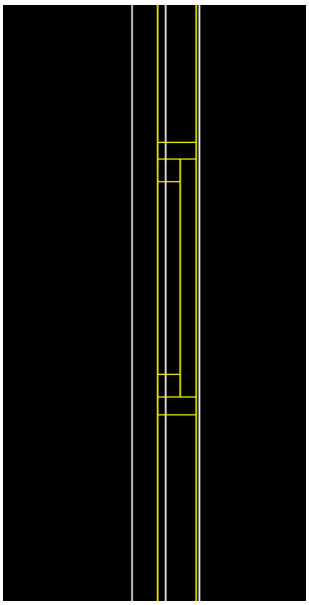
5.2.4. The lines do not have any thickness: the line type is in every case a "bylayer", and the line type scale is 1.00.

5.2.5. Single architectonic elements are subdivided into small pieces of hatching which is a process that brings with it some difficulties.

5.2.6. Normal single line point to point drawing has been used.

5.2.7. Some pieces of information are omitted.

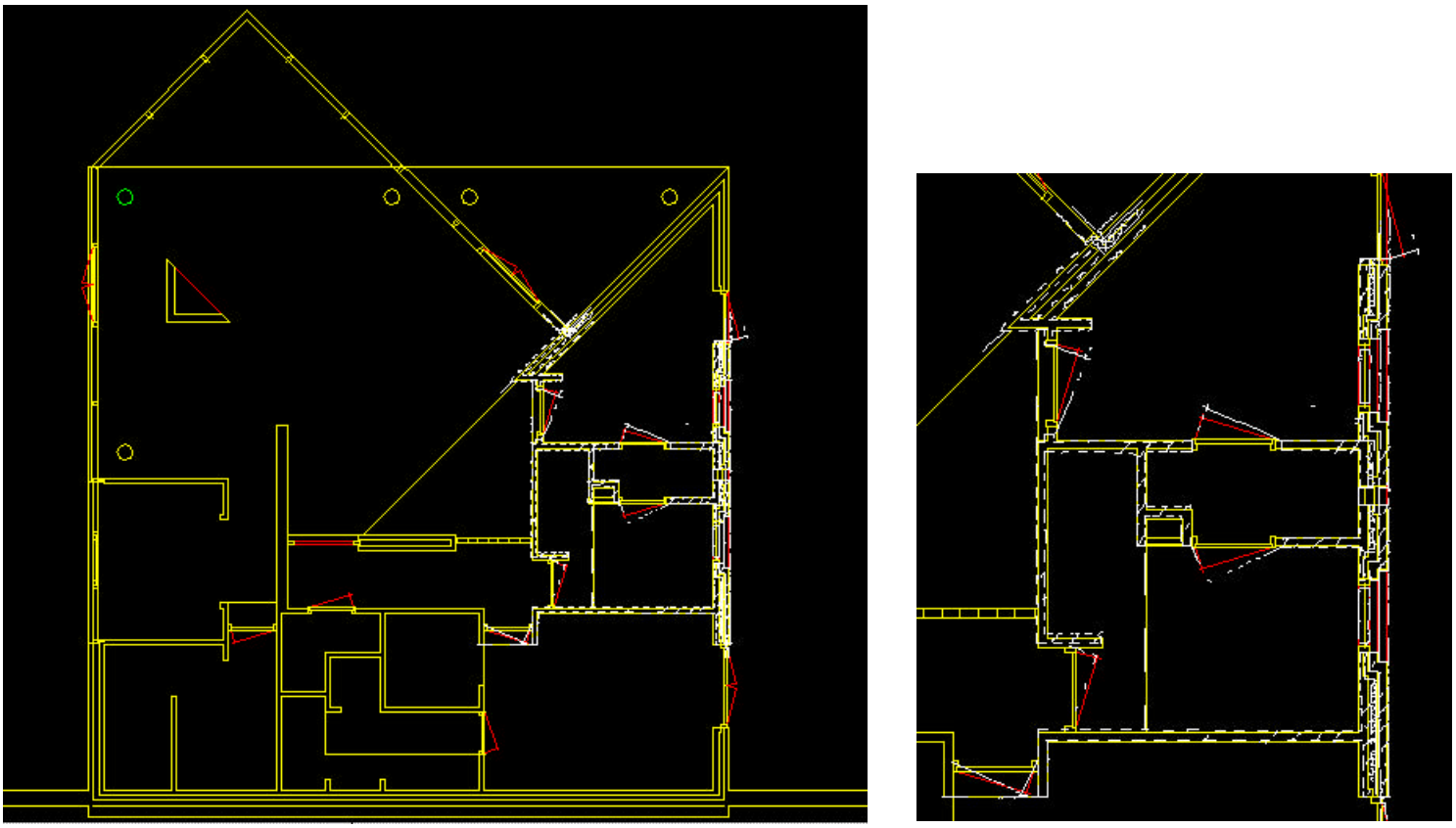




Detail of the comparison: Digital Reference Drawing (yellow) and Overlaid Drawing (white). Omitted information.

5.3. RESULT 3: DIGITISING BY VECTORING

The scanned images resulting from the original paper drawings are sent, without further alteration, to the performer. Then, by directly using programs like inamview2, adobe, vuepro32, scan2cad, as automated converting program, the images are transformed into CAD drawings. If necessary the files are converted into the proper format.



Comparison Digital Reference Drawing (yellow) and Vectorized Drawing (white)

Because of the inaccuracy of the drawing it is clear that this evaluation remains purely academic.

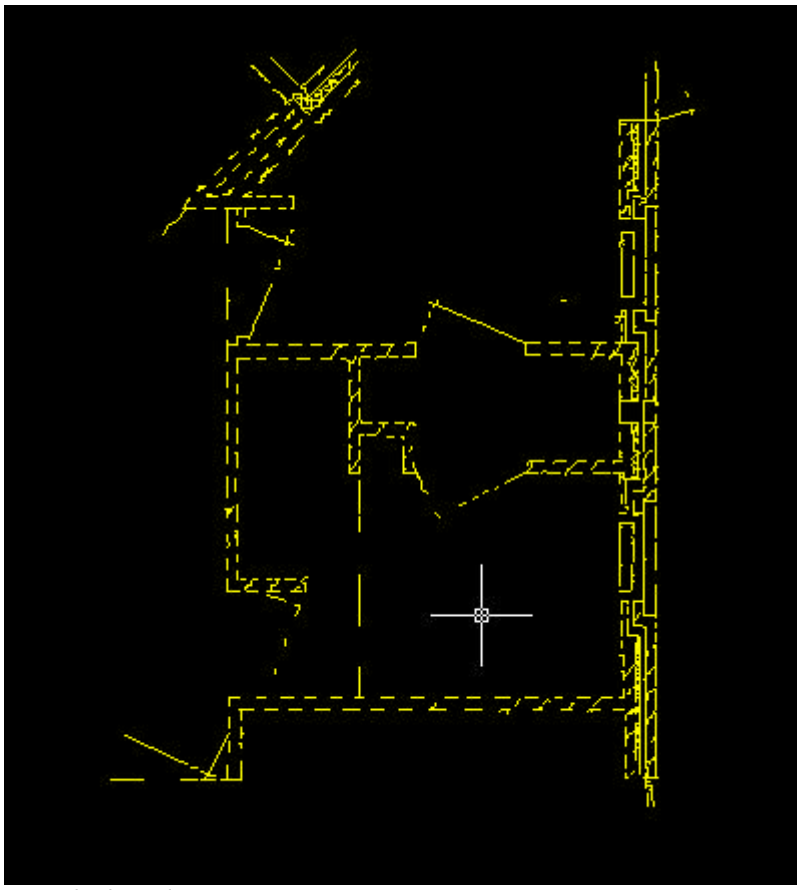
The check-control process of the drawing's quality led to the following observations:

5.3.1. Inaccuracy of the dimensions.

5.3.2. No use of layers.

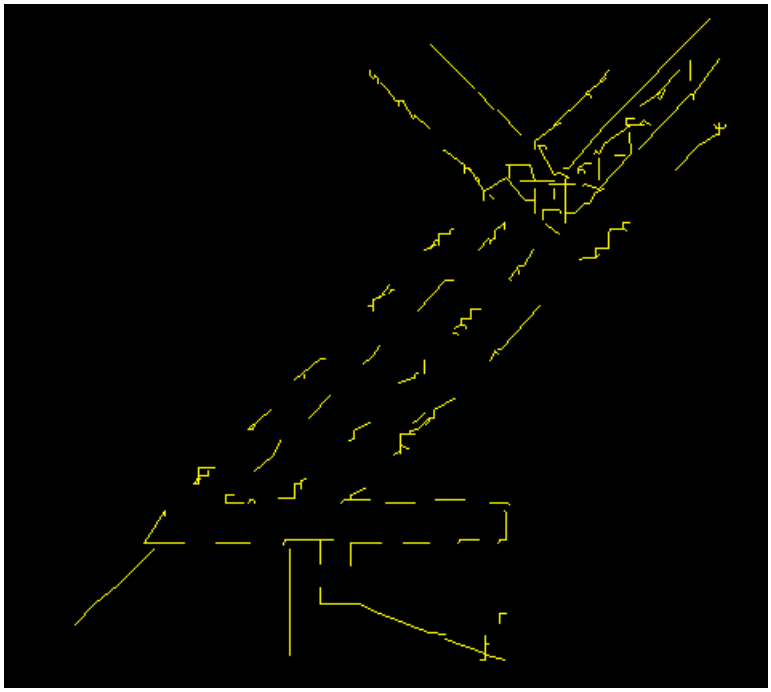
5.3.3. Inaccuracy of lines and hatching information.

5.3.4. Information has been left in or omitted from the drawing.



Vectorized Drawing

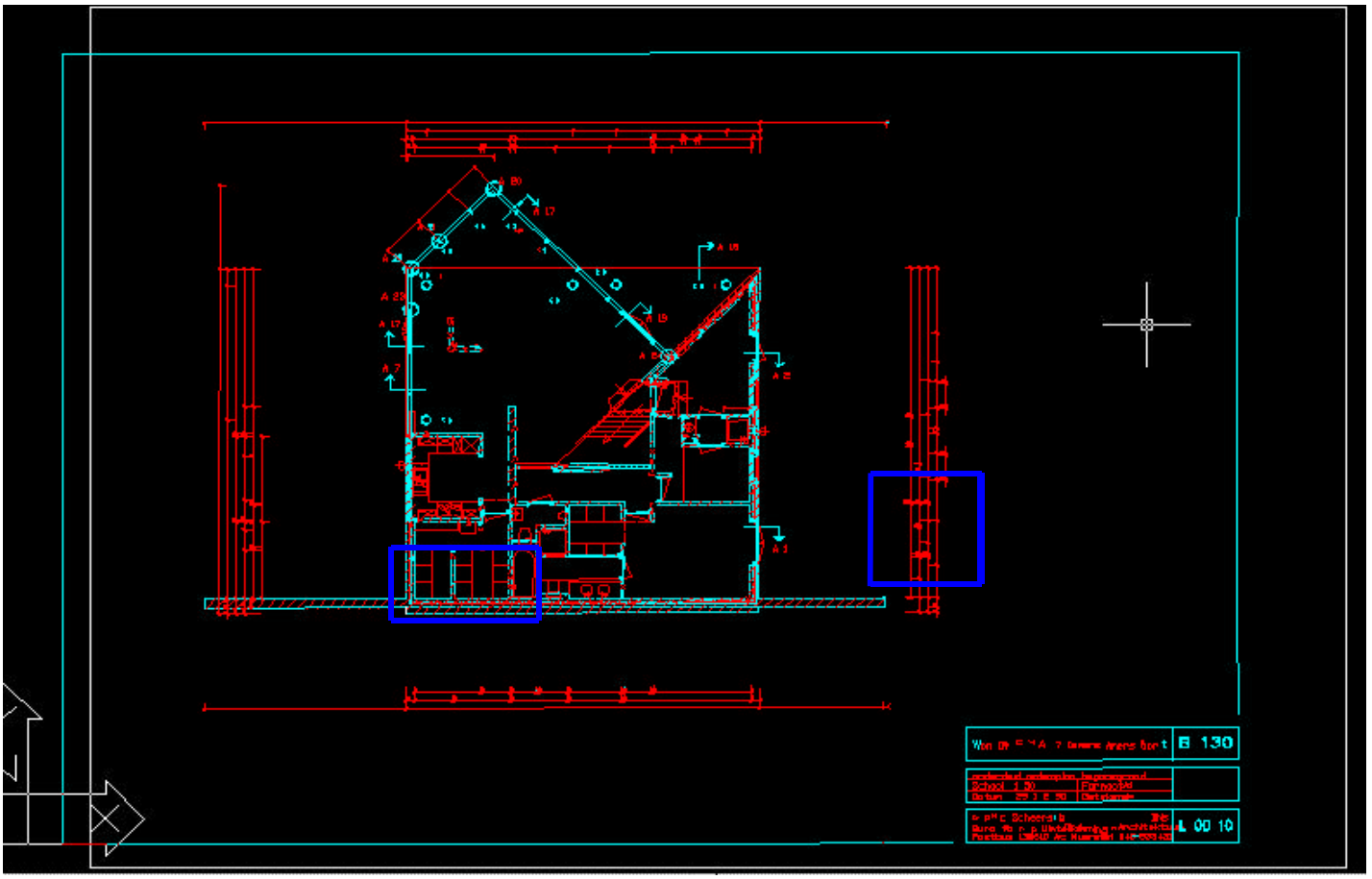
Detail of the Vectorized Drawing



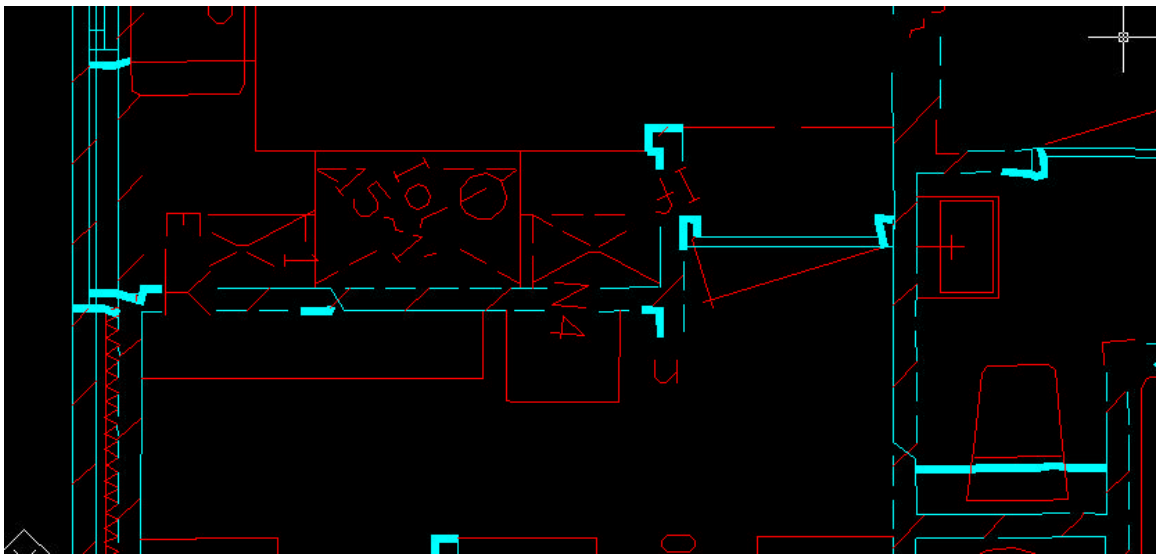
5.4. RESULT 4/5: DIGITISING BY MEANS OF PROFESSIONAL VECTORING

The scanned images resulting from the original paper drawings are transformed directly into CAD drawings by using an automated converting program. The choice is between:
Result 4: Immediately transmit the CAD files, as they are, to the performer. By using the proper programs he should be able to despeckle, calibrate and rewrite all the pieces of text, and adjust the drawings according to the relevant conventions. If need be the files will be converted into the proper format.
Result 5: Before transmitting, use the proper programs to despeckle, calibrate and rewrite all the pieces of text and add or transform the basic layers and hatching. Then send the CAD to the performer who only has to adjust the drawings in line with the conventions. If necessary the files can be converted into the proper format.

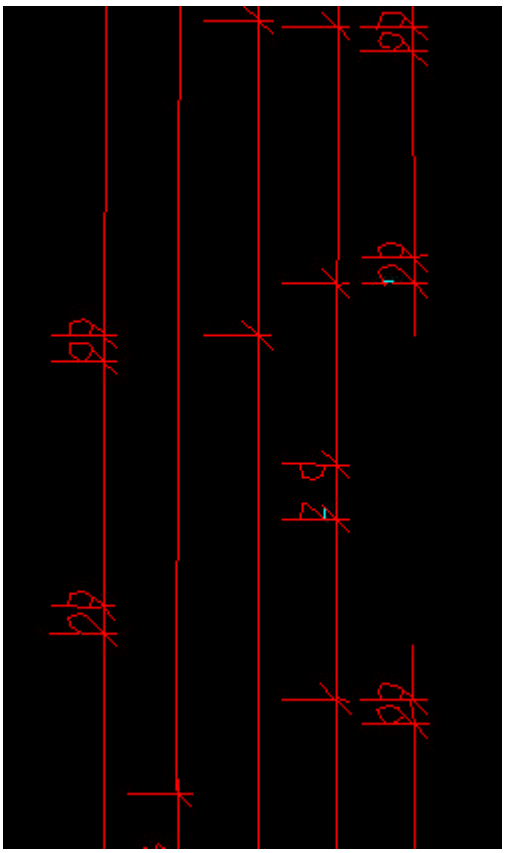
The results of this professional vectoring make it clear that if good quality is to be achieved in the final digital drawing it is essential to despeckle, calibrate, rewrite and add information or transform the drawing obtained. This immediately and clearly demonstrates how much more difficult and how much more expensive it is to attain high standards, which is why it has been decided that this test should be abandoned.



Professional Vectorized Drawing



Detail of the Professional Vectorized Drawing



Detail of the Professional Vectorized Drawing

6. CONCLUSIONS

The following points emerge from the test analysis:

- A normal vectoring process does not necessarily guarantee that the digital drawing obtained by adopting such a process will be adequate for professional use.

- Compared with normal vectoring processes, professional vectoring processes provide better results. Still, when compared with an overlaying method or an AutoCAD digitised drawing, it becomes clear that the professional vectoring process requires more time, efforts and money before the same results as those emanating from the two processes mentioned above can be achieved.

- Digitise by drawing again using the necessary conventions and by using a software program like AutoCAD and/or an overlaying conversion and this will offer a higher guarantee of professional results.

It is clear that in determining the best solution for digitising it will only be necessary to compare the process of digitising by using CAD software and the process of overlaying conversion by using a suitable program.

It is clear that both are suitable for:

- Use of layers

- Use of colours

- Line, thickness, hatching information

- Approximations

Employing layers can be useful for the following reasons:

Because in an architectonic project every draft element represents a real object with a specific function. It is therefore useful to use layers for the purposes of representing all the architectonic elements.

Since it is very difficult to check the adequacy of the final CAD drawing which is composed of many different elements in cases when it is not possible to reduce the number of entities to be checked, it becomes necessary to check each line and each point etc.

It is easy to understand that without any reference of the elements to each other is very easy to have severe mistakes.

In digital processing the client should always be looking for layers and that, in turn, leads to the necessity to establish certain conventions.

It can be useful to use colours for the immediate recognition of each architectonic element.This is strictly related to the use of layers: a fixed relationship between layers, colours, and every single architectonic element leads to the easy and precise control of the suitability of the final drawing.

AutoCAD versions previous to the 2000 version needed different logical colours for each line thickness so that the lines could be printed/plotted at the right thickness.In a digitised process the client may always ask for colours to be used that will lead to the necessity to establish some conventions.

Line, thickness, and hatching information is essential in an architectonic drawing for the purpose of representing each individual element and to produce the necessary drawing information. It is extremely difficult to check whether lines, thickness and hatching have been used correctly, but having a fixed relationship between those drawing elements and layers, it will be easier to more precisely check if everything has been done correctly in line with the need to have a drawing. It is then useful to specify some conventions.

The problem of approximations should also be solved according to specific conventions: draftsmen do not normally ask for further specifications, they usually try to solve certain dubious aspects of the drawing themselves by making approximations. The suggestion is, in case of doubt, always make further inquiries. To communicate doubts or problems both the client and the performer may highlight unclear areas or make some annotations.

This will lead to more Internet communication transmissions.

In the event of deviations arising from the manipulation processes and dimension mistakes arising, the two processes offer different possibilities:

– Overlaying:

  In an overlaying process the draftsman draws over the scanned drawing directly onto the screen. He does not have to look at the given dimensions (which are explicitly drawn) which means that, if the hand-made drawing is not precisely drawn or if the number of manipulating processes is very high, the drawing dimensions will be incorrect and so will the overlaid drawing.

  It is easy to conclude that if one is to obtain a precise and accurate drawing with an overlaying conversion then the original drawing must be precise and accurate as

well. This is not the case though in most common architectonic practice.

– Digital conversion, by means of using a software program like AutoCAD

  In a real situation it can be foreseen that:

  – the number and quality of manipulating processes will be huge and unforeseeable

  – the hand-made drawing will usually have missing or incorrect dimensions

A good solution is only foreseeable if the hand-made/scanned/printed drawing is redrawn without making measurements on it directly but rather by looking instead at the control dimensions (which are the ones explicitly drawn or given). This means that the client has to put in an explicit request with the performer

To conclude all the above-mentioned analyses one may suggest that it is possible to consider ***a digital conversion by redrawing*** to make it optimal with less/fewer:

– mistakes,

– effort,

– time

– money consumption,

and suitable for any further development of opportunities, methods and facilities in a co-operative remote working approach.

Chapter

3

TUD Procedure

1. Forewords:

CaribCAD defined three different procedures for three different workflows:

1. **A preliminary and probing approach to outsourcing consisting in:**
   - Sending to the potential future performer an instruction set;
   - Letting him understand, evaluate it and decide if it is compatible with his usual operating way.
2. **A preliminary testing of the performer abilities consisting in:**
   - Asking him to perform a simple test.
3. **A real outsourcing based on:**
   - The evaluation of points 1 and 2;
   - A contractual definition of all the aspects.

Moreover, the model defined and used for testing was strictly sequential, while a normal practice is following an a-sequential, multi disciplinary, multi tasking and co-operative approach. The following pragmatic procedure is the outcome of a practical viewpoint, decided and held by TUD, and has also been confirmed as a result of further testing.

Although the present manual is a conclusive, shortened and comprehensive version of the one previously mentioned, it is advised to re-define and use it according to one's requirements for an eventual outsourcing process:

1. The following Direct Link box refers to documents that have been pasted in this text to make reading easier. Actually they should be separated links of the procedure.
2. In a real outsourcing, it is advised to use the version with several documents instead of this one.
3. It is clear that its being made by self-referring pieces of procedure allows easy changes, while in the present approach every occasion that a new project takes place, it is necessary to check the whole text and eventually rewrite parts of it.

07 Pre Test September

TUD and PUCMM carried out this Test from August till the 25th of November of 1998.

Its original meaning was to use the outcomes of it to

model and develop the definitive Pilot 1, supposed to happen between EGM and TECAM.

Two universities: TUD, in the person of V. Curti, and PUCMM, in the person of A. Tejada, held it.

- V. Curti, took care of testing the CaribCAD Technical Standards Manual, as worked out in its last version

- Tejada, as performer, unless not a professional AutoCAD draftsman, she is an Architect.

Object of the test

It was the project named B130, a project by Ir. P.M.C. Scheers, for a private residential unit. The purpose was not to develop the complete project, but just to test the parts of it needed to revise the manual. That is why the choice was made to draw gridlines, concrete elements (foundations and main bearing structure), masonry at level 0.00, masonry at level 1 (first floor), stairs and standard elements (doors, windows and sanitary facilities).

As previously said the main goal of the test were:

- Use the Pre-Test to develop several items to be re-tested several times before the final Pilot1.

- Lead to the creation and implementation of a system.

- Lead to the implementation of the final Pilot 1.

On a very elementary level, the items to be tested were:

- How to build up a manual?[1]

- How to test the performer's ability?[2]

- Very specific cad items and issues[3]. They will be listed below.

Of course, an important item was that of providing the performer with enough instructions to make him able to gain results, and achieve a different quality standard.

The CAD items to be tested were:

- How to diminish size of drawing?

- How to have no redundancy?

[1] Useful to clarify to the performer how the clients wants the drawings to be done, giving him all the necessary information without being disturbed a lot during the process, in short how to give clear instructions;
[2] So that it could be possible to know in advance if a DC CAD firm will or not be able to cope with EU CAD firm's requirements;
[3] In short they were: transmission of the hand made drawings, the ability to read hand made drawings, the production of CAD drawings, the transmission of the digitised drawings and the control of the drawings (both hand made and digital) by the performer and the client.

- How to reuse already drawn elements?
- What were the possibilities of easy quality control?
- How to set up the flow of the drawings?
- How to give remarks in relation to the quality control?
- What could the problems with the sent material be?

Catalogue:

The use, power and necessities for a catalogue will be explained in the Volume 04 - Outsourcing Manual of this Manual, what follows is the copy of the catalogue used during the test, and giving a reasoned history of the situation.

Workflow Status / Catalogue - **Test 07** - Pre Test September

File	Extension	Remarks	Date	Sent file size	Received size
Testtiff.zip			? ? ?	? ? ?	
L04_01_AT	DWG	**V. Curti: Can you please fill in the date and size of it?**	? ? ?	? ? ?	
L04_01_AT	DXF	**V. Curti: Can you please fill in the date and size of it?**	? ? ?	? ? ?	
L04_01_AT	DWF	**V. Curti: Can you please fill in the date and size of it?**	? ? ?	? ? ?	
L01_01_AT	DWG	**V. Curti: Can you please fill in the date and size of it?**	? ? ?	? ? ?	58 Kb
L01_01_AT	DXF	**V. Curti: Can you please fill in the date and size of it?**	? ? ?	? ? ?	[-]
L01_01_AT	DWF	**V. Curti: Can you please fill in the date and size of it?**	? ? ?	? ? ?	10 Kb
		Process: Gridlines	**17/Sep/98 00:00**		
L04,09_01_AT	DWG	**V. Curti: Can you please fill in the size of it?**	26/Oct/98 10:30	? ? ?	26 Kb
L04,09_01_AT	DXF	**V. Curti: Can you please fill in the size of it?**	26/Oct/98 10:30	? ? ?	18 Kb
L04,09_01_AT	DWF	**V. Curti: Can you please fill in the size of it?**	26/Oct/98 10:30	? ? ?	1 Kb
		Process: Gridlines			
L04,09_02_AT	DWG	**V. Curti: Can you please fill in the size of it?**	28/Oct/98 16:00	? ? ?	28 Kb
L04,09_02_AT	DWF	**V. Curti: Can you please fill in the size of it?**	28/Oct/98 16:00	? ? ?	19 Kb
L04,09_02_AT	DXF	**V. Curti: Can you please fill in the size of it?**	28/Oct/98 16:00	? ? ?	2 Kb
		Process: Gridlines			
L04,09_03_AT	DWG	**V. Curti:** **According to the procedure:** >1. Draw two vertical parallel lines at a distance of meters 12,300. **OK but not in scale 1:1** >2. Draw two horizontal parallel lines crossing the two above mentioned lines at a distance of meters 12,300. **OK but not in scale 1:1** >3. Trim the previously drawn lines at a right angle to each other. **OK** >4. Obtain a perfect square, with right angles. **OK** >5. From the upper right corner draw a diagonal line at 45 degrees to the downer left corner. **OK** >6. From the center of it draw a diagonal line at 45 degrees to the downer right corner. **OK** >7. From the upper left corner draw a diagonal line at 45 degrees to the right upper direction. **OK** >8. Extend and trim both lines, the last drawn and the vertical right line to obtain an upper right corner to 45 degrees. **OK** >9. Select all and assign to the above mentioned lines layer name: according to previously given instructions, colour: cyan, line style: dotted line. **OK** >10.Save it according to previously given instructions but WITHOUT ADDING OTHER ELEMENTS THAN the grid layer! Formats DWG, DWF, DXF and WMF. **OK but 1. the other layers should have been frozen or set off,** **2. the WMF extension is missing** >11. All savings should be mentioned into the catalogue according to their size before sending. **OK but missing WMF**	05/Nov/98 16:00	29 Kb	29 Kb

File	Extension	Remarks	Date	Sent file size	Received size
		>This grid will be a reference for you to execute the further steps! **These were the remarks I wrote last time:** > >Always draw in scale 1:1 >linings and survey are ALSO in scale 1:1 but do not fit as external limits of the CAD drawing being of a smaller dimension respect to the one of the building in a 1:1 scale! >=> Draw Linings A1 in scale 1:1 [1.189 x 841 drawing units in A0 format, 841 x 594 drawing units in A1 format] and >FREEZE their layers, so that they will not be useable as reference or disturb the drawing process. all the elements C26 object of the drawing must be drawn according to the rule one meter is equal to 1.000 millimetres [drawing units] into the CAD drawing => Always remember to transform measures in meters in drawing units... Do not use the standard AutoCAD grid -if not expressly required- but follow the set up instructions for grids,> ...Omissis... >To go on with the test: >Redraw the grid lines following the previous remarks and proposals. You will be finding, attached to this mail, the new Gridlines process Perform again steps in the process and store In catalogue: all the agreed information (ask Ricardo) ...Omissis... >FOR EACH PROBLEM, EVEN THE SIMPLEST ONE, PLEASE WRITE ME BACK, OR USE A FASTER TOOL TO YOUR CHOICE! ...Omissis... **Some of the remarks I am doing now had already been done by me!**			
L04,09_03_AT	DXF	**The same as above**	05/Nov/98 16:00	20 KB	20 Kb
L04,09_03_AT	DWF	**The same as above**	05/Nov/98 16:00	2 KB	2 Kb
L04,09_03_AT	**WMF**	**Missing**	**[-]**	**[-]**	**[-]**
L04,09_03_VC	**DWG**	**This is the way we wanted it**	10/Nov/98 14:00	29 Kb	28.8 Kb
		Process Brickworks	**10/Nov/98 00:00**		
L00,04,09,21,22,28_01_AT	DWG	**V. Curti:** **According to the procedure:** 1. Into the modified grid lines, use them as a reference for the measures. **OK but the upper right corner should have been at the intersection** 2. Draw all and only the brickwork's according to the scanned drawing you should already have. **OK but columns and hatchings were not required**	11/Nov/98 18:00	49 Kb	49 Kb

File	Extension	Remarks	Date	Sent file size	Received size
		3. Select the drawn elements and give them layer name: according to previously given instructions, colour: green, **OK but columns and hatchings, not asked for, has been given a colour not defined in this process** line style: continue line. **OK but columns and hatchings has been given a line style not defined in this process** 4. Save it according to previously given instructions with the grid layer frozen! Formats DWG, DWF, DXF and WMF. **OK but WMF format is missing** 5. Mention the savings into the catalogue before sending. **OK but WMF format is missing**			
L00,04,09,21,22,28_01_AT	DXF	**The same as above**	11/Nov/98 18:00	85 Kb	85 Kb
L00,04,09,21,22,28_01_AT	DWF	**The same as above**	11/Nov/98 18:00	6 Kb	6 Kb
L00,04,09,21,22,28_01_AT	**WMF**	**Missing**	**[-]**	**[-]**	**[-]**
L21,22_01_VC	**WMF**	**This is the way we wanted it**	13/Nov/98 18:00	4.37 Kb	**?**
		Process Stairs	**13/Nov/98 00:00**		
L24,34_AT	DWF	**V. Curti:** **According to the procedure:** 1. Modify and correct your drawing according to the remarks. **How can I check it? It has not been sent back to us.** 2. Freeze all the other layers except L21 and L22. **Ok** 3. Go back to the original drawing [the scanned one received by you in August when Meijnardt was there]. 4. Draw only the internal stairs divided in separate layers: **Ok but the stairs were not quoted, that means that it was impossible to draw them! Questions?** L24 is the layer to be used for stairs [and ramps], L34 for balustrades. **Ok** colour: green, **Ok** line style: continue line. **Ok** 5. Freeze all the other layers except L24 and L34. **Ok** 6. Make wblock of the stairs. **Ok** 7. Give to the wblock the name: L24,34_AT.dwg. **Ok** 8. Close the drawing and open the new created block L24,34_AT.dwg. **Ok** 9. Save it as: L24,34_AT.dwf and L24,34_AT.dxf and L24,34_AT.wmf. **Ok** 10. Mention the savings into the catalogue before sending. **Ok** >FOR EACH PROBLEM, EVEN THE SIMPLEST ONE, PLEASE WRITE ME BACK, OR USE A FASTER TOOL TO YOUR CHOICE!	19/Nov/98 11:30	**3 Kb ???**	1 Kb ! ! !

File	Extension	Remarks	Date	Sent file size	Received size
		The procedure was very simple, this time, too simple, because we wanted to have questions, now the correction to your work can be find in the block I will place in the Newcastle Server			
L24,34_AT	DXF	**The same as above**	19/Nov/98 11:30	**17 Kb ???**	16 Kb ! ! !
L24,34_AT	DWG	**The same as above**	19/Nov/98 11:30	**29 Kb ???**	27 Kb ! ! !
L24,34_AT	WMF	**The same as above**	19/Nov/98 11:30	**3 Kb ???**	1 Kb ! ! !
		Process Sanitary + Text	**22/Nov/98 00:00**		
		Process Measures	**22/Nov/98 00:00**		
		Process Insulation	**22/Nov/98 00:00**		
L24,34,remarks_VC	**DWG**	**It contains all the remarks about L24,34_AT**	24/Nov/98 19:20	13 Kb	
L24,34_02_AT	DWG	**It contains all the remarks and questions**	27/Nov/98 11:30	80 KB	80 KB
L24,34_02_AT	DXF	**The same as above**	27/Nov/98 11:30	119 KB	119 KB
L24,34_02_AT	DWF	**The same as above**	27/Nov/98 11:30	8 KB	8 KB
L24,34_02_AT	WFM	**The same as above**	27/Nov/98 11:30	27 KB	27 KB
L00,01,21,22,24,34_AT	DWG	**It contains all the remarks and questions**	27/Nov/98 11:30	175 KB	175 KB
L00,01,21,22,24,34_AT	DXF	**The same as above**	27/Nov/98 11:30	515 KB	515 KB
L00,01,21,22,24,34_AT	DWF	**The same as above**	27/Nov/98 11:30	17 KB	17 KB
L00,01,21,22,24,34_AT	WFM	**The same as above**	27/Nov/98 11:30	62 KB	62 KB

Report

In accordance with the Technical Standards Manual 04th of February 1999, we have only been:

- drawing in Model Space Tiled, in a scale 1:1,
- using the DWG format, original and standard format by AutoCAD,
- sending material by normal mail by scanning the original paper based drawings,
- using the higher presentation level according to execution drawings in a scale 1:50

As a result of the check-control process of the drawing's quality, the following check points are considered and their adequacy analysed.

Accuracy of the dimensions.

All the lines have been drawn referring to the control dimensions that are explicitly drawn. In case of inaccuracy of the given dimensions, to avoid some approximation, the performer partner made the choice to resolve it through correspondence, in this particular case by ICQ, with the other partner asking for more specifications. In case of particular drawing questions the performer has preferred to highlighted the dubious areas writing remarks and annotations to communicate some dubious or problems.

Incorrect use of layers, line, colours, hatching information.

The layers, which are used to compose the drawing, are not named, they have just a colour. That means that every line has no thickness, the line type is in every case in the way "bylayer", and the linetype scale 1.00. At the same time there is no rigid relationship between the layers and every single architectonic element, just a relationship between the colours and the different draft part composing the drawing.

The hatched parts, representing the same object, have been subdivided into small pieces of hatching, thus giving some difficulties. In other situations instead of using hatching, objects or different AutoCAD entities have been used.

Drawing technique

The normal convention would be to use a polyline, which is closed. This allows the area that they bound to be filled easily or calculated simply. In this case normal single lines point to point have been used. An example of the problems given by this system result after trimmings or use of construction lines that if not erased, still compose the drawing.

Unwanted or missing information

This is information that has been left on, or missed off, the drawing by the CAD technician. It may be construction lines, just plain errors that should not be there, or some detail that has not been drawn. Through the use of blocks, this is easily checkable, instead of time consuming visual checking against the original scanned image.

Evaluation

It is very difficult to check the adequacy of the final cad drawing, as it is necessary to check each and any line, each and any point etc. Moreover it is easy to understand that without any reference of the elements one to each other is very easy to have severe mistakes.

To modify the same element in each drawing becomes a trouble: it has to be modified every time in every drawing.

That also means that it's impossible to create a library of the elements (blocks) usually needed to compose a drawing.

Every time it is necessary to start again a new drawing process!

The layers are just coloured lines, without name or thickness. So that it is necessary to rename them all and change their thickness.

The drawing made in this way will not give any architectonic information when plotted.

What has been obtained is just a "nice" drawing, not an architectonic project in which every draft element represents a real object with a specific function!

It is necessary to develop a system for outsourcing preferably by internet du to the easier way of communication

The CaribCAD Approach to Cad Production

By trying to solve the above mentioned problems/questions, together with a close look to various professional practices and to the new developments of CAD software companies, it has been thought the following solutions:

1. Trying to make the redesign independent as far as possible by the mistakes of its original;
2. Trying to reduce to the minimum necessary, all the quality assurances; Considering as acceptable the representation, as is or as built, of what is represented on the drawings themselves, but without forgetting that some pieces of information can be easily extrapolated by the normal architectonic practice;
3. Developing a system independent by the possible future uses of CAD;
4. Deciding for a standard "de facto" in CAD software, but constantly looking to the other systems and most of all their reciprocal compatibility;

5. Accepting just re-drawings with very low tolerance precision, due to the definition itself of CAD;
6. Defining the most economic way to perform as that which is requiring less nitty-gritty in-house work by highly-skilled designers, thus freeing valuable resources for high skilled and really creative tasks; this in the perspective of step-by-step bringing DC partners to Western levels;
7. Checking the drawings the minimum as possible without real checks on the paper, but by simple and minimal elements self referring and thus easily self checkable;
8. Communicating with a functional and well assorted combination of easy, user-friendly, effective, almost immediate tools, such as the new generation of communicating tools offered often for free by the WWW, and also through normal e-mail and more traditional tools; for sure in a continuous way, almost at the beginning or in key moments;
9. Checking the drawn elements with the same easy self referring quality assurance procedure as the client;
10. Depending on the used tool, there will just be misunderstandings, delays, not loss of data, except in special cases: like attachments bigger than the amount set up and then accepted by the mail server/program of the client/performer; crashes in the servers; etc. mainly, if using a synchronous systems for key information or safer systems in which you directly can check the results, would not give any problem;
11. X-referring each drawing to the small, atomic elements composing it, does effectively reduce the size of elements drawings to its possible minimum;
12. The drawing should be composed as closest as the Client office practice does it, but always based on the system of x-refs, that allows all of the previously quoted advantages;
13. Theoretically they should be quite well defined, but depending on the office practice, that could be a discovery while outsourcing, as not all the offices have already a well organised and complete library of standards, symbols, procedures, ways of, etc.; it is moreover proposed to organise the Depot on a 3dimensional, cube database based layout so that it can be perfectly used for the future.

The Depot:

The Depot is a sort of “supermarket” of drawings where the X-refs composing the final drawings as well as the final drawings themselves are stored. It is useful to be able to create new drawings starting from the idea that the elements can be divided in generic, almost generic, more specific, specific and very specific. It is showing the state of the art in CAD techniques introducing the concept of Presentation Levels used as a better alternative to scales. It is also possible to come back later on to the scales at the moment of printing. This system is a predecessor of the new AutoCAD 2000

Input				Depot			
Input levels		Input of objects/elements	Definition of presentation level	Presentation levels: Design level	Contract level	Implementation level	Details
Drawing scale		**1:1**		**1**	**2**	**3**	**4**
				Generated by			
							Manual
Plot scale area				1:200 **1:100** **1:50**	1:100 **1:50**	1:50 **1:20**	**1:10** **1:5** **1:1**
Generic **All works** **All drawings**	• Paper formats • Linings • Headings • Etceteras	**Client library**		**x-refs** **x-refs**			
Almost generic **Particular work** **Most drawings**	• Grid lines • Drawing names • Structural Elements • Etceteras	**Performer (DC)**					
More specific **Particular work** **Some drawings**	• Internal Walls • Stairs • Finishing • Etceteras	**Perrformer (DC)**	**Software library**				
Specific **Some works** **Some drawings**	• Frame-work • Sanitary elements • Furniture • Elevators • Etceteras	**Performer (DC)**	**Software library**				
Very Specific **All works** **Specific drawings**	• Electricity • Drainage • Heating • Etceteras	**Performer (DC)**	**Software library**				

The red boxes are the X-refs: a column of different red boxes – X-refs, normally composes a final drawing.

Scope-oriented or practical follow-up testing:

All of the previous were the reasons for trying to develop a new, different and global method, thus defining and performing further testing.

The present document addresses just two of them. The first, a Dominican partnership, proved to be a failure and the second, the partnership during a real architectonic assignment a success. Both were based on the same procedure, standards, and pieces of information. TUD didn't ask for particular procedures or ways of doing things, and the performers were not asked for specific results, just to follow the given material to their discretion but to provide a result of optimal quality [as is]. Both partners were given two different, but almost of the same difficulty, sets of raster images:

- The former five A1 scanned drawings, representing ground-floor plan, details and plan of the concrete elements of the architectonic object, namely a building project of a private villa. As an extra, zoom-ins not in scale and not inserted in any paper format together with pictures of interiors and exteriors were provided for.
- The latter several A4 scanned drawings, representing urbanistic plan, concrete elements, ground- first and second floor plans, details, sections and façades of the architectonic object, namely a building project for a standard housing block.

The dispatched material was, then, sent together with the procedure, the manual and extra instructions on how to exchange the material with the client, and obviously the request to have it back as final CAD.

The drafting results have then been completely different:

	DOMINICAN REPUBLIC	ARCHITECTONIC ASS.
DIMENSIONS	Inaccuracy	Accuracy
	All the dimensions that are explicitly drawn, referred to the control dimensions, are accurate. The other dimensions, which are not directly given but just obtained from the scanned drawing, are difficult checkable, and if possible, not always correct.	
	The outsourcing partner didn't ask for more specifications, it is possible that he solved some probable doubts by making some approximations, or that there were no doubts (but that resulting in problems later on!). Anyway the TUD partner did not receive any questions and did not find any highlight areas or annotations to communicate some doubts or problems.	The outsourcing partner didn't always ask for more specifications, but due to his architectonic ability and or the personal research in the Dutch architectonic standards, he solved some probable doubts by making some approximations based on materials used in the construction. For things not completely clear, mainly details, questions were proposed to the client.

USE OF LAYERS, LINE, COLOURS, HATCHING INFORMATION	Inaccurate or incorrect	To be improved or adapted
	The layers used to compose the drawing are named, given a linetype, colour etc. but not always in the correct way. At the same time there is no rigid relationship between the layers and every single architectonic element, just a relationship between the colours and the different draft part composing the drawing. To explain this see explanations above for Blind test Russia. The hatched parts, representing the same object, have been subdivided into small pieces of hatching, thus giving some difficulties. In other situations instead of using hatching, objects or different AutoCAD entities have been used. Drawings are very, very rough or more often completely wrong, especially in key points as stairs, conjunction details, partitioning.	Layers were used properly, even if logical colours sometimes had to be changed to give more eye-catching appearance during plotting. Easy job as every layer composing an element has the same name or is related to the element through the use of a special geometric entity, etc. The hatched parts, representing the same object, have been subdivided into small pieces of hatching, and connected according to the represented element. Still the final drawing was not immediately suitable for a particular office practice and needed some adjustments.
	Troublesome	
DRAWING TECHNIQUE	Normal point to point single lines, have been used. An example of the problems given by this system result after trimmings or use of construction lines that if not erased, still compose the drawing. The normal convention would be to use a polyline, which is closed. This allows the area that they bound to be filled easily or calculated simply.	Polylines, multilines, basic geometries, other entities have been used where thought to be necessary, still the process needed some adjustments to reflect the office practice.
	Missing or inaccurate	Accurate
USE OF X-REFS	Blocks and use of multiple X-refs to compose the drawing is essential in making the content of the final drawing reusable. The draftsman not always and not as accurately as required drew those elements.	Use of blocks, multiple X-refs and final drawings composed by superimposing different/multiple x-refs.
	Unwanted or missing	None
INFORMATIONS	Inaccurate, left on, or missed off pieces of information. But thanks to the use of blocks, this is easily checkable. Still, too many mistakes, idleness, lack of time, imprecision.	

Conclusions:

From the tests mentioned at the beginning, it turned out some usual problems in a traditional outsourcing process. The method developed by CaribCAD TUD, based on a Depot of elements represented as single x-refs or by a combination of x-refs of the same element in all its locations, allows respect to the problems already exposed before the following:

1. Depending on a redrawing of every single element, based on the control-dimensions, it is possible to have mistakes, but more rare than with other systems, being the control-dimensions usually quite correct.
2. Easiness to check the correctness of the drawing, due to the crossed control of small x-refs on other small correct x-refs and on the final drawing/s itself.
3. Easiness to check its adequacy, immediately appearing by the correct use/check of layers, entities, x-refs.
4. Speed in:

- Understanding a blind drawing by using a quite exhaustive Depot with all its symbols, or through a library of different "How to", constructed during the years and through the replies to the performer's questions, it is also useful to instruct new employers without loosing too much time;
- Retrieving missing information that are not eager to be guessed by simply communicating and being in touch with the client, by using fast communication programs, tools;
- Just representing defined information and asking for the undefined;
- Checking small and handy pieces of drawing: x-refs;
- Eventually adjusting and cleaning lightly wrong pieces of drawings.

5. No needs to define very strict formal representation methods. Just needed in case the final drawing does not have to be modified or if those rules are already stated.
6. No needs to define very detailed methods to check the quality of the drawings. Because by checking simple parts of a drawing, x-refs, it is easier for draftsmen not known with the project to understand and correct the real meanings of the drawn material.

The only foreseen disadvantages are:

1. A loss of time at the very beginning of an outsourcing to test and instruct the performer, check in depth the results of his job and to define the office practice, standards, methods, quality assurances, etc.;
2. Still at the very beginning the necessity to devote some common time with overseas partners during the same working times to be easily retrieved in case of necessity, thus allowing time savings on asynchronous e-mail exchanges.
3. The necessity to connect the Depot and library to very rational databases, to allow easy browsing/retrieval of the stored pieces of information;

For an engineering company that leads to:

- Not much loss of time in checking, adjusting and cleaning the digital drawing;
- Not much of a loss of time in each and any outsourcing process;

The conclusion is that the system is suitable for improving the quality, or for reducing costs and execution times!

Workflow Status - **Task 1** Outsourcing Process – THE REAL PILOT1

Step	Recipient	Response	Comment	Started / Sent	Viewed	Completed
Start	Started by: GeorgiaTech			08/11/99 05:06:12 AM		08/11/99 05:06:12 AM
Outsourcing process started	TUD			08/11/99 05:06:12 AM	08/11/99 10:28:39 AM	08/11/99 05:06:12 AM
Review documents!	TECAM	More information needed!		08/11/99 05:06:12 AM	08/11/99 05:37:13 AM	08/11/99 05:39:17 AM
Need more information!	TUD	Requested information sent!		08/11/99 05:39:17 AM	08/11/99 10:33:41 AM	08/11/99 17:36:18 PM
Information as requested	TECAM	Still more information needed!		08/11/99 17:36:51 PM	08/11/99 19:51:05 PM	09/11/99 18:19:52 PM
More info				09/11/99 18:19:54 PM		09/11/99 18:19:54 PM
Need more information!	TUD	Requested information sent!		09/11/99 18:19:54 PM	09/11/99 18:52:54 PM	09/11/99 19:39:37 PM
Information as requested	TECAM	Still more information needed!		09/11/99 19:39:39 PM	09/11/99 19:51:37 PM	09/11/99 22:00:12 PM
More info				09/11/99 22:00:13 PM		09/11/99 22:00:13 PM
Need more information!	TUD	Requested information sent!		09/11/99 22:00:13 PM	09/11/99 23:41:49 PM	10/11/99 00:27:52 AM
Information as requested	TECAM	Documents accepted! Continue process!		10/11/99 00:27:54 AM	10/11/99 01:36:05 AM	10/11/99 14:49:49 PM
Test accepted by performer! Make decision!	TUD	Continue! Launch task 2!		10/11/99 14:49:51 PM	10/11/99 15:53:44 PM	10/11/99 16:07:10 PM
End Task 1/Start Task 2	<<2>>			10/11/99 16:07:12 PM		10/11/99 16:07:13 PM
	TECAM				10/11/99 16:11:58 PM	
	TUD				10/11/99 16:07:27 PM	
End Task 1/ Start Task 2		End Task 1/ Start Task 2		10/11/99 16:07:13 PM		10/11/99 16:07:13 PM

Legend:

The programmer of the present model named the fields Step and Response.

Times format: DD/MM/YY
hh:mm:ss (format 24 hours) + PM or AM

Time: Server time + 1, GMT 1 (Amsterdam, Brussels, Berlin, Rome)

Task	Folder Definition	Folder Support Docs	Folder Approvals
Information as requested	comm [TUD] 1.txt - Initial Task Definition	Outsourcing.exe - Environment	- - -
Contents:	Nov 8: (TUD) Download Outsourcing.exe, double click its icon on the folder it has been downloaded into. It will auto-extract on C:\... Once extracted, open a MS-explorer session, and start surfing into the extracted folders: The Client Folder contains instructions, procedures, etc. The "Pilot1CAD [drawing assignment]" folder contains the scans and should be containing the x-refs... N.B. In this test, the folders as we defined them, haven't been implemented, in the WF environment. Even if we invite, for further testing, to apply this layout, which is more comfortable and that avoid mixing breads and fishes... We will have to solve the problems with attachments of remarks, DWG etc. during this test.	▪ Depot ▪ Working Environment ▪ Standards ▪ Procedure ▪ Instructions	
Need more information!	commTECAM1.txt - First questions about TASK 1	- - -	- - -
Contents:	November 9 1999, 12:24 AM (TECAM) Task 1 Questions: 1) Referred to naming files in drawing process; what do L, C, A mean in complete drawings? 2) In the drawing process it refers to some info documents; Where we can find the gridlines.doc? 3) What kind of different text dimensions we need for the complete drawing? Is it 3.5 mm for all the text (points of references, dimensions, etc)? 4) In the case we don't have some drawing dimensions in the scanning, what do you suggest us to do? 5)We need drawing details at a greater scale (types of columns, walls, structural elements, windows, doors, etc)		

Task	Folder Definition	Folder Support Docs	Folder Approvals
Information as requested	Comm [TUD] 2.txt - Replies about TASK 1 as requested	naming conventions_EP-01.doc - Information about Question 1	- - -

Contents: November 9 1999, 07:00 PM (TUD)

Replies to questions:

1) In file naming_conventions_EP-01.doc, at paragraph 2.1 the replies is given, for sure not really in detail, but clear enough for further drawing.

To clarify it some more, it is a Dutch way of standardising in architecture according to the NEN norms [NEN stands for NEderlandse Normen, Dutch Norms]. If a client implemented the NEN practice in his/her practice, he will then ask for that expressly giving more details.

2) The gridlines.doc, was a task specifically meant to represent some missing pieces of info of the drawings: they were not based on any visible or immediately clear gridline, thus it explicated those missing info.

We think that it is not useful to define it on this project, but it will given expressly if You would require it, by not immediately or clearly understanding the module on which this project is based.

3) It is 3.5 for the smaller texts [namings, measures, room numbers, legenda, etc]

5.0 for the medium sized texts [sections ciphers, points of references]

10.0 for the bigger texts

4) There is only one way, if you can get them by some other drawings representing more in detail the same element, use those information and draw it, otherwise, ask for more information, possibly at once by redlining or pointing out clearly the requested information.

5) We will let You know something more, soon, for the moment, based on what we will require You to draw, we do not think that more details are necessary, but we will see!

To have some naming conventions in this Pilot1 it is useful to determine and to state the next items:

1. Working environment
2. Project name
3. Complete drawings
4. X-Refs
5. Sub-X-Refs
6. Layers
7. Catalogue

Need more information!	commTECAM2.txt - More questions about TASK1	- - -	- - -

Contents: November 9 1999, 4:50PM (TECAM)

Task	Folder Definition	Folder Support Docs	Folder Approvals
	1) Precisely, We were referring to that paragraph in our previous question. We still don't understand the meaning of the letters (L, C and A) and we think this is because we are not sure what is meant by "paper drawing cartouche". We think that the "cartouche" is the drawing's "card" but we have examined all 6 drawings (tiff images) and we don't see any of these letters. 2) We asked about this document (gridlines.doc) because in the document "Pilot1-CAD-Procedure" that we had before, there was a reference to it. The document Pilot1-CAD-Procedure" established the process to make the drawings, if this file won't be used anymore, (it was not included in the outsourcing.exe file we downloaded yesterday), What will rule the process from now on? Do we have to wait for instructions from the server about the order of the elements to be drawn? 3) OK, we understand but when we draw any text using the 3.5-mm dimension, this text is really very little compared to elements of the drawing. We are assuming the dimensions in the TIFF files are in mm, Is that so? 4) OK 5) OK		
Information as requested	comm [TUD] 3.txt - Replies about more questions November 9 1999, 00:30 AM (TUD) Replies to questions: 1) To try to solve any misunderstanding as we have previously said: "If a client implemented the NEN practice [sorry, meaning standards] in his/her practice, he will then ask for that expressly giving more details. In this case, the drawings are not originally from EGM, or at that period the NEN standards were not already used by the office, so that is why the scans do not have them on it. Right, the cartouche is the English for drawing's "card" or in Italian, "cartiglio". 2) OK, right, still the file Pilot1-CAD-Procedure will be the process to make the drawings but, as previously said, the former file gridlines.doc just contained instructions such as	- - -	- - -

Task	Folder Definition	Folder Support Docs	Folder Approvals
	"draw two vertical lines to a distance of... etc. etc." We are sure that if we will be asking to You to draw gridlines during the present test, You will be able to understand according to the given drawing, what are the gridlines of such drawings. If not we will give them to you. 3) Right, the dimension on the raster images is 3.5, 5.0 and 10.0 mms, but, as all the CAD drawings we require are created using as basic unit the millimetres, in scale 1:1, for sure text drawn using dimension 3.5, 5.0, 10.0 mms is too small. At this moment, not being at my usual PC, I do not have the original file, but to solve the problem, just follow the normal architectonic practice to draw texts in such an enlarging scale as the one for the plotted/printed final drawings. As we think not to ask for texts, the problem is moreover solved at the beginning. Conclusions: as far as we know, this Task 1 is just for understanding and getting acquainted with the entire process, but we will check it. In case it is not like that and You are not able to start drawing, just ask what you need.		
Test accepted by performer. Make decision!	**TUD - Continue! Launch task 2!**	- - -	- - -

Workflow Status - **Task 2** Outsourcing Process – THE REAL PILOT1

Step	Recipient	Response	Comment	Started / Sent	Viewed	Completed
Start	Started by: GeorgiaTech			11/11/99 16:33:21 PM		11/11/99 16:33:21 PM
Performance test started	TUD			11/11/99 16:33:21 PM	11/11/99 17:15:21 PM	11/11/99 16:33:23 PM
Review test documents	TECAM	Documents accepted! Continue!		11/11/99 16:33:23 PM	11/11/99 16:58:52 PM	11/11/99 20:28:21 PM
Accepted!	TUD			11/11/99 20:28:22 PM	12/11/99 01:15:31 AM	11/11/99 20:28:25 PM
Performance test in progress	TECAM	Additional information needed!		11/11/99 20:28:25 PM	11/11/99 20:28:45 PM	11/11/99 20:47:12 PM
Additional information required				11/11/99 20:47:12 PM		11/11/99 20:47:12 PM
Accepted!	TUD			11/11/99 20:47:12 PM	12/11/99 01:17:57 AM	11/11/99 20:47:14 PM
Performance test in progress	TECAM	Additional information needed!		11/11/99 20:47:14 PM	11/11/99 20:52:47 PM	11/11/99 20:53:08 PM
Additional information required				11/11/99 20:53:08 PM		11/11/99 20:53:08 PM
Accepted!	TUD			11/11/99 20:53:08 PM	12/11/99 01:18:43 AM	11/11/99 20:53:09 PM
Performance test in progress	TECAM	Test declined!		11/11/99 20:53:09 PM	11/11/99 20:54:53 PM	12/11/99 04:45:45 AM
Test declined by performer		Test declined by performer		12/11/99 04:45:46 AM		12/11/99 04:45:46 AM
Explanation by performer	TUD	Done		12/11/99 04:45:46 AM	12/11/99 13:02:31 PM	12/11/99 14:03:59 PM
End of flow	<<2>>			12/11/99 14:04:00 PM		12/11/99 14:04:04 PM
	TECAM				12/11/99 15:26:54 PM	
	TUD				12/11/99 14:06:46 PM	
Flow ended by performer		Flow ended by performer		12/11/99 14:04:04 PM		12/11/99 14:04:04 PM
Start	Started by: TECAM			12/11/99 05:07:17 AM		12/11/99 05:07:17 AM
Performance test started	GeorgiaTech			12/11/99 05:07:17 AM	12/11/99 15:28:23 PM	12/11/99 05:07:19 AM
Review test documents	TECAM	Documents accepted! Continue!		12/11/99 05:07:19 AM	12/11/99 05:11:06 AM	12/11/99 05:13:00 AM
Accepted!	GeorgiaTech			12/11/99 05:13:01 AM	12/11/99 15:28:34 PM	12/11/99 05:13:03 AM
Performance test in progress	TECAM	Test declined!		12/11/99 05:13:03 AM	12/11/99 14:01:26 PM	12/11/99 17:40:18 PM
Test declined by performer		Test declined by performer		12/11/99 17:40:20 PM		12/11/99 17:40:20 PM
Explanation by performer	GeorgiaTech	Done		12/11/99 17:40:20 PM	12/11/99 17:57:56 PM	12/11/99 17:58:03 PM
End of flow	<<2>>			12/11/99 17:58:04 PM		12/11/99 17:58:04 PM
	GeorgiaTech				12/11/99 17:58:21 PM	
	TECAM				12/11/99 18:03:58 PM	
Flow ended by performer		Flow ended by performer		12/11/99 17:58:04 PM		12/11/99 17:58:04 PM

Workflow Status - **Task 2** Outsourcing Process – THE REAL PILOT1

Step	Recipient	Response	Comment	Started / Sent	Viewed	Completed
Start	Started by: GeorgiaTech			12/11/99 19:30:23 PM		12/11/99 19:30:23 PM
Performance test started	TUD			12/11/99 19:30:23 PM	12/11/99 19:31:51 PM	12/11/99 19:30:25 PM
Review test documents	TECAM	Documents accepted! Continue!		12/11/99 19:30:25 PM	12/11/99 21:10:09 PM	12/11/99 21:32:14 PM
Accepted!	TUD			12/11/99 21:32:16 PM	12/11/99 23:52:26 PM	12/11/99 21:32:18 PM
Performance test in progress	TECAM	Additional information needed!		12/11/99 21:32:18 PM	12/11/99 21:33:06 PM	13/11/99 15:41:21 PM
Need add information!	TUD	Sent requested information!		13/11/99 15:41:23 PM	13/11/99 19:17:36 PM	14/11/99 17:04:52 PM
Add. Information as requested	TECAM	Still more information needed!		14/11/99 17:04:54 PM	15/11/99 14:32:45 PM	15/11/99 15:19:33 PM
Still more info				15/11/99 15:19:34 PM		15/11/99 15:19:34 PM
Need add information!	TUD	Sent requested information!		15/11/99 15:19:35 PM	15/11/99 17:04:39 PM	15/11/99 18:57:36 PM
Add. Information as requested	TECAM	Still more information needed!		15/11/99 18:57:38 PM	15/11/99 20:11:46 PM	15/11/99 21:29:00 PM
Still more info				15/11/99 21:29:02 PM		15/11/99 21:29:02 PM
Need add information!	TUD	Sent requested information!		15/11/99 21:29:02 PM	15/11/99 21:48:08 PM	15/11/99 22:26:58 PM
Add. Information as requested	TECAM	Accepted! Continue!		15/11/99 22:27:00 PM	15/11/99 22:48:06 PM	15/11/99 22:52:53 PM
Accepted				15/11/99 22:52:54 PM		15/11/99 22:52:54 PM
Performance test in progress	TECAM	Test-step completed. Interim approval requested!		15/11/99 22:52:54 PM	15/11/99 22:53:22 PM	15/11/99 22:54:47 PM
Request for interim approval	TUD	Interim approval declined!		15/11/99 22:54:48 PM	16/11/99 00:27:44 AM	16/11/99 12:15:24 PM
Interim approval declined!	TECAM	Done		16/11/99 12:15:26 PM	16/11/99 14:11:51 PM	16/11/99 19:54:02 PM
Continue				16/11/99 19:54:04 PM		16/11/99 19:54:04 PM
Performance test in progress	TECAM	Test-step completed. Interim approval requested!		16/11/99 19:54:04 PM	16/11/99 19:54:24 PM	16/11/99 20:44:19 PM
Request for interim approval	TUD	Interim approval granted!		16/11/99 20:44:21 PM	16/11/99 22:10:44 PM	16/11/99 23:37:15 PM
Interim approval granted!	TECAM	Done		16/11/99 23:37:17 PM	17/11/99 13:51:41 PM	17/11/99 14:14:38 PM
Continue				17/11/99 14:14:39 PM		17/11/99 14:14:39 PM
Performance test in progress	TECAM	Final approval requested!		17/11/99 14:14:39 PM	17/11/99 14:17:47 PM	23/11/99 23:32:18 PM
Request for final approval	TUD			23/11/99 23:32:26 PM	24/11/99 15:41:52 PM	

Legend:

The programmer of the present model named the fields Step and Response. hh:mm:ss (format 24 hours) + PM or AM

Times format: DD/MM/YY Time: Server time + 1, GMT 1 (Amsterdam, Brussels, Berlin, Rome)

Task	Folder Definition	Folder Support Docs	Folder Approvals
Performance test started	commGA.txt - Copy of commGA.txt	Updating Catalogue Process.doc - Copy of Updating Catalogue Process.doc SET UP A DRAWING IN AutoCAD_EP-01.doc - Copy of SET UP A DRAWING IN AutoCAD_EP-01.doc READMEFIRST 9 11.txt - Copy of READMEFIRST 9 11.txt Procedure_VC-02.doc - Copy of Procedure_VC-02.doc Paper Based Drawings' Selection.doc - Copy of Paper Based Drawings' Selection.doc Naming Files Process.doc - Copy of Naming Files Process.doc naming conventions_EP-01.doc - Copy of naming conventions_EP-01.doc Layersspanish.xls - Copy of Layersspanish.xls 9 11.txt Introduction_VC-01.doc - Copy of Introduction_VC-01.doc Catalogue Model_VC-01.xls - Copy of Catalogue	- - -

Task	Folder Definition	Folder Support Docs	Folder Approvals
		Model_VC-01.xls Carib Layers _EP-02.xls – Copy of Carib Layers _EP-02.xls 00 Readme Performer.txt - Copy of 00 Readme Performer.txt 00 Readme Conventions.txt - Copy of 00 Readme Conventions.txt 00 Readme Client 9 11.txt - Copy of 00 Readme Client	
Contents:	11/11/99: Start comments from GA To performer: You are now starting with Task2, which is the performance test. As Task1 ended successfully, the client is satisfied that you understand the procedure and that you are capable of doing a drawing test. You already have been informed what the testing exercise is, and the workflow will lead you through all the steps with feedback from the client as you proceed. Upload your production in the approval folder. If for some reason the upload procedure fails, ftp your production to the Funredes server in folder 'task2/approval' (procedure known to PUCMM). For purposes of completeness all relevant documents have been attached to this flow. These documents are already in your possession so there is no need to download them.	▪ Introductions ▪ Explanations ▪ Conventions ▪ Standards ▪ Procedures ▪ Instructions	
Review test documents	CommTECAM1.txt - Copy of commTECAM1.txt	- - -	- - -
Contents:	November 11 1999, 3:36 PM: (TECAM) We need to confirm the following issues to begin the test (please, be as practical as possible in your answers) 1. We already have 6 drawings (TIFF files), for the performance test, are we free to select any of them? 2. In this test what we exactly will do is:		

Task	Folder Definition	Folder Support Docs	Folder Approvals
	A. Draw Gridlines B. Draw External Walls C. Draw Columns All the above with their dimensions		
Accepted!	commTUD1.txt - Copy of commTUD1.txt	**04 Outsourcing Manual.doc - Document containing all the necessary explanations**	- - -
Contents:	11/11/99: (TUD) The uploaded new document in the definition folder will give all explanations: Uploaded document: Outsourcing Manual.doc This is actually the reply to what performer is asking for, it is an excerpt of the Manual specially designed for this task. Other direct reply to performer: |We need to confirm the following issues to begin the test OK |(please, be as practical as possible in your answers) |1. We already have 6 drawings (TIFF files), for the performance test, |are we free to select any of them? No, you are not, as already explained somewhere, the drawings were six just to facilitate the understanding of the building and to allow the retrieval of all the necessary information. |2. In this test what we exactly will do is: |A. Draw Gridlines |B. Draw External Walls |C. Draw Columns |All the above with their dimensions OK for A. NO for B., maybe later on, if time is enough.	1. Complete drawings 2. X-Refs 3. Sub-X-Refs	

Task	Folder Definition	Folder Support Docs	Folder Approvals
	NO for C. Yes for dimensioning the drawings. To be more explicit, I have prepared a further piece of text that applies to this test, it is the document 04 Outsourcing Manual.doc here attached. Please follow the instructions.		
Performance test in progress	commTECAM2.txt - Copy of commTECAM2.txt	- - -	- - -
Contents:	11/12/99 (TECAM) We still have the question: What TECAM has to do in the "Performance Test" is: “DRAW GRIDLINES AND THEIR DIMENSIONS FOR ALL 6 DRAWINGS” OK?		
Accepted!	commTUD2.txt - Copy of commTUD2.txt	04 Outsourcing Manual2.doc	- - -
	11/12/99 (TUD) The reply is NO, just for a [one, 1] general, and thus valid for every drawing of the same scale, gridlines drawing of the plans in scale 1:50. As far as I know there are two or three points to clarify: 1) as already said in my letter, all of the six drawings were send just on purpose to clarify the understanding of the building. 2) they are: - 3 plans in scale 1:100: R6 begane grond [R6 ground floor] R9 1e verdieping [R9 1st floor] R14 3e verdieping [R14 3rd floor] - 3 plans in scale 1: 50: 111V begane grond [111V ground floor] 120V 1e verdieping [120V 1st floor] 128V 2e+3e verdieping [128V 2nd+3rd floor 3) the building is the same at all the floors and in all the drawings 4) the reference points and modules are the same at all the floors	- Copy of 04 Outsourcing Manual2.doc 1. Complete drawings 2. X-Refs 3. Sub-X-Refs Corrected version after noticing mistakes in it.	

Task	Folder Definition	Folder Support Docs	Folder Approvals
	5) as it should be normal in an architectonic practice, the difference in-between drawing the same element at different scales is just in adding for smaller scales (1:1, 1:5, etc.) or taking away details for bigger scales (1:100, 1:500, etc.) 6) gridlines are composed just by lines, simple letters and dimensions CONCLUSION: It is impossible to foresee different gridlines for the same architectonic object even at different scales of representation. The only possibility is that a drawing representing gridlines to a scale 1:50, could be modified [adapted] to represent gridlines to a different representation level [for example 1:100] by modifying line thickness, line colours, dimensions of drawn texts, etc. NEVER it will be drawn differently for a different floor, unless the building itself is a de-constructive building, or one that shifts, turns or changes the disposition of floors at every floor...		
Performance test in progress	CommTECAM-3.txt - sending first part Task2	- - -	- - -
	Error message: "Failed to get attachment"		
Accepted!	CommTUD3.txt -Very important request for furthers sending!	- - -	- - -
	Just a short note to let You know that we cannot get the commTECAM-3.txt; the error message says: "Failed to get attachment" Please re-send using a different method		
Performance test in progress	CommTECAM3.txt - re-send commTECAM3	- - -	050L(00)00.dwg - Gridlines
	I am sending them, The first part The TASK2, that consists In The DRAWING PLANE IIIV [beg.grond] (GRIDLINES, DIMENSION, TEXTS And POINT REFERENCE). The file this in the servant of FUNREDES.		
Test accepted by	CommTUD4.txt - Remarks and comments	- - -	- - -
	11/11/99 06:45 PM (TUD) Thanks for the file; we evaluated it. According to our quality standards and to the		

Task	Folder Definition	Folder Support Docs	Folder Approvals

comparison to the procedure [File: 04 Outsourcing Manual.doc] we propose the following remarks, and we ask for corrections:

1. File name: it is not "050L(00)00-.dwg" but "050L(00)00.dwg" at least you can add a few letters/ciphers to indicate a sequential order [e.g. 050L(00)00 vc01. dwg]. But the minus should not be there.
2. Gridlines:
   - Line type: WRONG, should have been DASH-DOT not BYLAYER
   - Colour: WRONG, should have been GREEN not RED [BYLAYER]
   - Line Weight: WRONG, should have been BYBLOCK not BYLAYER
3. Dimensions:
   - Line type: WRONG, should have been CONTINUOUS not BYLAYER
   - Colour: WRONG, should have been RED not RED [BYLAYER]
   - Line Weight: WRONG, should have been BYBLOCK not BYLAYER
4. Arrowheads:
   - Line type: WRONG, should have been ORIGIN INDICATOR not DOT
   - Colour: WRONG, should have been YELLOW not RED [BYLAYER]
   - Line Weight: WRONG, should have been BYBLOCK not BYLAYER
   - Scale: WRONG, should have been 175 d.u. not 200 d.u.
5. Extension lines: WRONG, they were not required, they are instead represented
6. 3,5 Texts:
   - Line type: WRONG, should have been STANDARD not RS80
   - Colour: WRONG, should have been YELLOW not RED [BYBLOCK]
   - Line Weight: OK, as it was not defined
   - Scale: WRONG, should have been 175 d.u. not 200 d.u.
7. 10,0 Texts:
   - Line type: WRONG, should have been STANDARD not RD100
   - Colour: WRONG, should have been PURPLE not RED

Task	Folder Definition	Folder Support Docs	Folder Approvals
	[BYBLOCK] Line Weight — OK, as it was not defined Scale — WRONG, should have been 500 d.u. not 700 d.u. Position — WRONG, should have been 1000 d.u. from the end of the line not 843.5856 d.u. 8. Dimensions: — OK, correct according to the control measures. Conclusions: - At a general, inattentive, first view the graphic appearance seems correct; - but the architectonic and conceptual aspects are completely wrong; - the drawing requires further handling to be successfully used; - moreover, it does not follow the instructions [manual]; - the manual has not been followed; - the drawing should have been different, as previously pointed out. It is therefore required to REDRAW/MODIFY/ADAPT it to our requirements.		
Test accepted by performer. Make decision!	commTECAM4.txt - Instructions for Task2	- - -	- - -
	November 15, 1999, 4:00 PM (TECAM) Following the instructions for task 2, we have the following questions: 1) Which are the concrete elements that we will draw specifically? Are these only the columns and external walls? 2) In the case of the columns: what index it should be used to draw them because they don't have specified dimensions. It would be useful a list of samples that show the types of columns and their dimensions.		
Test accepted by performer. Make decision!	commTUD5.txt - Replies and requests	- - -	- - -

Task	Folder Definition	Folder Support Docs	Folder Approvals
	November 15, 1999, 10:10 PM (TUD) First of all, correct/adapt/redraw gridlines then send it again. Still about Gridlines, take away the reference point, as it should not be there, but eventually represented on the single elements or combination of elements. About your questions: once the gridlines are correct, over them, you will draw further x-refs and finally send just the complete x-refs, as we, as clients, would already have the correct gridlines [once corrected and re-sent by You] Question 1) Just the concrete elements, I have not the drawing at hands, right now, but if I am not wrong the exterior walls are in bricks and not in concrete, but I will let you know ASAP, in the meanwhile there is time enough to correct the 050L(00)00.dwg drawing as it should be. Question 2) Right, we will give you further details ASAP, in such a way that you can easily recognise and represent such elements.		
Request for interim approval	commTUD6.txt - Approval not granted. Further adaptations required.	- - -	- - -
	16/11/99 12:00 PM (TUD) Thanks for the file; We evaluated it. According to our quality standards; to the previously proposed corrections and to the comparison to the procedure [File: 04 Outsourcing Manual.doc] we propose the following remarks, and we ask for corrections: 1. Gridlines: Line type WRONG, should have been DASH-DOT not ACAD_ISO04W100 Line Weight WRONG, should have been BYBLOCK not BYLAYER		

Task	Folder Definition	Folder Support Docs	Folder Approvals
	2. Dimensions: Colour WRONG, should have been RED not RED [BYLAYER] and neither appearing YELLOW 3. Arrowheads: Colour WRONG, should have been YELLOW not RED [BYLAYER] 4. 10,0 Texts: Position WRONG, should have been 1000 d.u. from the end of the line not an undefined d.u. 5. Reference point: WRONG, should not appear on this drawing Conclusions: - The drawing requires further handling to be succesfully used; - moreover, it does not follow the instructions and the remarks; - the manual has not been followed; - the drawing should have been different, as previously pointed out. It is therefore required to REDRAW/MODIFY/ADAPT it to our requirements or the approval will not be granted.		
Performance test in progress	commTECAM5.txt - Newest drawing version	- - -	050L(00)01.dwg - New Gridlines
	16/11/99, 11:00 AM TECAM, Some comments: 1) We understand that in AutoCAD 14.0 version when we change the dimensions colour it also changes the colour of the arrows. If you know the possibility to differentiate these properties please tell it to us. 2) In relation to the texts position (10,0) we understand that we have a distance of 1000 d.u. from the centre of intersection of the Gridlines with the arrowheads to the beginning of the texts. If this is not this way please explaining to us better.		
Explanation by performer!	commTUD7.txt - Approval granted! Beginning of new task	Detail of Columns.tif - Detail 1:20 of concrete columns	- - -

Task	Folder Definition	Folder Support Docs	Folder Approvals
	November 16, 1999, 10:30 PM (TUD) First of all, thanks for your active and productive co-operation and work: Some remarks about your last message of 16/11/99, 11:00 am: You wrote: | 1) We understand that in AutoCAD 14.0 version when we change the dimensions colour | it also changes the colour of the arrows. If you know the possibility to differentiate these | properties please tell it to us. 1) Right, We accept the explanation and We think that you are perfectly right if you follow the usual automated procedure to quote. In a more unconventional way, it is possible to quote and then add circles of the right colour/line thickness/etc. | 2) In relation to the texts position (10,0) we understand that we have a distance of | 1000 d.u. from the centre of intersection of the Gridlines with the arrowheads to the | beginning of the texts. If this is not this way please explaining to us better. 2) About the distance, it was required centre to centre, so, it is correct that you did it from the crossing point [gridlines/dimensions/arrowhead], but the other end should be with the centre of the letter itself and not with the beginning of the text. BTW The name should not have been changed in 050L(00)01 but at least 050L(00)00 [1] or 050L(00)00 A{B, C, D, etc.}. In spite of all that, we accept the result and GRANT INTERIM APPROVAL. For next task and referring to Your questions of November 15, 1999, 4:00 PM Question 1) We wrote: | Just the concrete elements, I have not the drawing at hands, right now, but | if I am not wrong the exterior walls are in bricks and not in concrete, but		

Task	Folder Definition	Folder Support Docs	Folder Approvals
	| I will let you know ASAP, in the meanwhile there is time enough to correct | the 050L(00)00.dwg drawing as it should be. We can confirm that the exterior walls are in bricks, thus they do not have to be represented at this stage. To be more explicit on what is a concrete wall/element, and what is not: 1. elements drawn by: - a contour-line probably represented using an ink pen with a thickness of 0.25 mm - filled up by a thin diagonal [left up to right down] hatching - and by a 10% dotted pattern ARE IN CONCRETE 2. all the other elements ARE NOT IN CONCRETE Question 2) We wrote: | Right, we will give you further details ASAP, in such a way that you can | easily recognise and represent such elements. We gave already further details to easily recognise such elements [see above] You will find an extra raster image representing two of the main concrete elements in the Support documents. The stairway [TRAP II] walls can be easily drawn by making easy calculations on the represented control dimensions. About the list of samples that shows the types of columns and their dimensions this is actually a x-ref. In the architectonic terminology it is called "Abacus" of the used elements. In fact it is part of your job, to create such a list of elements, either by representing all the different elements together or by creating different pieces of x-ref. easily recognisable as different elements by the opportune use of the ## naming. [see 04 Outsourcing manual]		

Workflow Status - **Task 3** Outsourcing Process – THE REAL PILOT1

Step	Recipient	Response	Comment	Started / Sent	Viewed	Completed
Start	Started by: GeorgiaTech			23/11/99 23:48:29 PM		23/11/99 23:48:29 PM
Task 3 started	TUD			23/11/99 23:48:29 PM	24/11/99 15:43:03 PM	23/11/99 23:48:29 PM
Send contract proposal	TECAM	Contract accepted!		23/11/99 23:48:29 PM	24/11/99 16:00:23 PM	24/11/99 16:04:05 PM
Contract accepted!	TUD	Done		24/11/99 16:04:05 PM	24/11/99 16:57:33 PM	24/11/99 23:01:07 PM
Review task documents	TECAM	Documents accepted!		24/11/99 23:01:11 PM	25/11/99 13:43:29 PM	25/11/99 13:45:49 PM
Accepted!	<<2>>			25/11/99 13:45:50 PM		25/11/99 13:45:50 PM
	TECAM				25/11/99 13:46:35 PM	
	TUD				25/11/99 15:31:50 PM	
Task in progress	TECAM	Final approval requested!		25/11/99 13:45:50 PM	25/11/99 13:46:50 PM	25/11/99 14:31:49 PM
Request for final approval	TUD	Final approval declined!		25/11/99 14:31:51 PM	25/11/99 15:32:21 PM	25/11/99 20:46:09 PM
Final approval declined!	TECAM	Done		25/11/99 20:46:11 PM	25/11/99 21:30:42 PM	26/11/99 16:15:50 PM
Continue until final				26/11/99 16:15:57 PM		26/11/99 16:15:57 PM
Task in progress	TECAM	Final approval requested!		26/11/99 16:15:57 PM	26/11/99 20:50:03 PM	26/11/99 20:52:07 PM
Request for final approval	TUD	Final approval granted!		26/11/99 20:52:07 PM	27/11/99 10:07:51 AM	29/11/99 19:50:29 PM
Final approval granted!	TECAM	Done		29/11/99 19:50:36 PM	29/11/99 21:02:07 PM	29/11/99 21:26:44 PM
Request for Task Assesment!	TUD			29/11/99 21:26:46 PM	29/11/99 23:18:02 PM	

Legend:

The programmer of the present model named the fields Step and Response.

Times format: DD/MM/YY
hh:mm:ss (format 24 hours) + PM or AM

Time: Server time + 1, GMT 1 (Amsterdam, Brussels, Berlin, Rome)

Task	Folder Definition	Folder Support Docs	Folder Approvals
Task 3 Started!	Comm TUD1.txt – Copy of commTUD1.txt	- - -	- - -
	November 23, 1999 TUD You have not finished the performance test (task2) completely. Nevertheless, we have granted you the permission to start the Task3 work. In case we find that you do not understand the working procedures we may have to restart task2 again. In the current Task3 you are requested to perform the CAD work according to the procedure you tested in Task2. You should produce at least three drawings. You will be working from the scans that are already in your possession. Please put your (intermediate) work in the approval folder on the server. If you experience problems with that, ftp your files onto the Funredes server, in folder PILOT1/Task3 approval/		
Explanation by performer!	Comm TUD2.txt – reiteration of guidelines	- - -	- - -
	November, 25 1999: TUD Please work according to the manual, you should only produce x-refs. For instance: The x-ref. of the gridlines is a reference in all drawings; the x-ref. of the structural elements of a floor will be useful in some of the drawings. With other words, again: drawings will be composed by client, based upon the requested x-refs!!! Please try to work according to the schedule of the "depot" in the manual. You should generate as many x-refs that the client can compose at least three of the six drawing scans that were handed to you at the start of the PILOT. Even if you have failed to work in this fashion, send us what you have produced thus far as soon as possible.		
Request for final approval!	TECAM	- - -	Pilot1CAD [drawing assignment].zip – Task 03 production

Task	Folder Definition	Folder Support Docs	Folder Approvals
Request for final approval!	Comm TUD3.txt – Required corrections	- - -	- - -

November, 25 1999: Comments TUD

Performer has been working very hard! Congratulations! Performer also has prepared a number of not requested drawings (no problem, but they will not be checked for approval by client) Here are the general remarks for basic necessary improvements. The required corrections are limited and it should be possible to finish all the work before the weekend!

1. General remarks drawings 050C(28)00-07:
   - Hatching: Should have been a combination of ANSI32 and AR-CONC.
   - Lines: Use polylines
   - Block c.q. use of layers: Elements should not be a block; hatching and linings to be put into different layers
2. Specific remarks drawings 050C(28)00, 01,05:
   - These concrete elements are exactly the same, only the rotation and/or insertion point is different. Two possibilities:
     - · Insertion point to be specified when element is inserted into other drawing
     - · Three x-refs of the same element with different insertion points.
3. Specific remarks drawings 050C(28)05,06
   - See remarks under 2.
4. Specific remarks 050C(28) 04, 07
   - Dimensions 050C(28)07.dwg are not correct; please check dimensions of 050C(28)04 too.
   - No hatching. "Same" element on floor 2and 3 (Scan 128V) is missing (window!)
5. Missing element
   - The concrete element at intersection G7 is missing
   - After correction: approval is granted; to continue with:
6. Remarks L111, 120, 128_BG(RG)-RM.dwg
   - Naming not correct:
   - These drawings are locations (L) of concrete elements (28), at different levels, so:
     - Ground floor, level 1 (scan 111V): 050L(28)01.dwg
     - Second and third floor, level 3 and 4 (scan 128V): 050L(28)03,04.dwg

Task	Folder Definition	Folder Support Docs	Folder Approvals
	First floor, level 2 (scan 120V); 050L(28)02.dwg Important: Gridlines should not be inserted because client already has the dwg (x-ref) of the gridlines! Only concrete elements by floor are requested!! So: the drawing (x-ref) of the structural concrete elements of each floor consists of a collection of the x-refs 050(C28) The insertion point is intersection A1 and must not be marked. 7. All other drawings Not requested, due to final stage of pilot 1 no comment at this moment Thanks and good luck!!		
Request for final approval	TECAM	- - -	Pilot1CAD .zip – Drawing corrections attended
	November, 29 1999: Comments TUD Performer: thanks for the amended production files. I will end the workflow and grant you final approval. Here are some issues that you need to be aware of. These are lessons for the future: Files should not have such a size to zip them. The system is based upon the exchange of simple drawing of small size, which are easy to send and easy to check. If something has gone wrong, by making the drawing or caused by the system, than it is easy to detect. Sending a bunch of files, as has happened the last times, makes it very complicated where things have gone wrong. Still there are some mistakes: - The insertion points should not be visible, the client has to remove them now. - There is some waste material, like layers and x-refs not in use for the drawing; for instance there are still layers called "Binnenkozijnen" and "buitenkozijnen" There have been a number of mistakes in the way the final drawings were composed (super-positioning of x-refs). We will do a full QA in the final evaluation report of the PILOt1 test. THIS ENDS THE WORKFLOW OF PILOT1 . We will be in touch shortly about the round up and the reporting of the PILOT.		

Conclusive Report

In accordance with the last version of the Technical Standards Manual, we have only been:

- Working with the x-ref. facilities of AutoCAD release 14,
- Drawing in Model Space Tiled, in a scale 1:1,
- Using the DWG format, original and standard format by AutoCAD,
- Using the Newcastle's server in its last development,
- Using the higher presentation level according to execution drawings in a scale 1:100

As a result of the check-control process performed on the drawing's quality, the following points are considered and their adequacy analysed:

The accuracy of drew dimensions.

All the lines have been drawn referring to the control dimensions that are explicitly drawn. In case of inaccuracy of the given dimensions, to avoid the imprecise process of approximation, the performer was required to solve it through correspondence with the client asking for more specifications. In case of particular drawing questions the performer has preferred to highlight the dubious areas by writing remarks and annotations to communicate doubts or problems.

Incorrect performance of drawing tasks.

After a strict and close correspondence, the mistakes due mainly to the ignorance of the procedure have been solved. Still following the procedure could, have solved the problems in the phases of drawing/evaluating/re-drawing.

Drawing technique

The normal convention would be to use a polyline, which is closed. This allows the area that they bound to be filled easily or calculated simply. In this case normal single lines point to point have been used.

Proper use of x-refs

After a strict and close correspondence, the first mistakes about gridlines, dues mainly to the ignorance of the procedure have been solved. The final drawings are just reduced desktops out of which some information have been erased and not proper x-refs. Still following the procedure could, have solved the problems in the phases of drawing/evaluating/re-drawing.

Unwanted or missing information

E.g. those are in this case insertion points or the gridlines left on the final drawings. Even if this problem is easily correctable, still following the procedure could, have solved the problems in the phases of drawing/evaluating/re-drawing.

Evaluation

It was easier than normal to check the adequacy of the final cad drawing, as it was composed by self-referring x-refs. A bit of a problem happened when it was necessary to check the elements one by one, but mainly because the sending happened to be all at the same time, even if that was explicitly forbidden.

Problems mainly occurred with naming of files, and at the beginning with the performer's try of interpreting and recreating the drawing as they were.

At the beginning, what was obtained was just a "nice" drawing, not an architectonic project in which every draft element represents a real object with a specific function!

Unless the other tests, anyway, this time the CAD operator, finally understood a little bit more about the meanings of symbols, standards etc. Thus acting consequently.

Final Conclusions:

Type of preparation of the team (skills, training, ..)

From the client side, TUD, preparation could be seen as high in terms of management, communication skills, tools knowledge, subject knowledge, knowledge of the official language etc. In the course of the last year, all the participants to the TUD team spent most of their time and also some extra time to improve their training and skills on almost all the issues object of CaribCAD. Discussions were proposed every time a new problem appeared and also immediately after seminars, lectures, adoption of new pieces of software etc.

From the performer side, it should be made a distinction in between PUCMM and TECAM, but preparation could in complex be seen as sufficient. Another distinction should be done on the subjects but finally it can be expressed in descending order, from better to worse, as follows: tools knowledge (good for TECAM, less good for PUCMM), subject knowledge (good for PUCMM, less for TECAM but in both cases not enough see. The manual was not followed), communication skills and knowledge of the official language (for both partners English was not the easiest language, and communication skill is lacking), finally management (probably good inside TECAM, but for the Pilot 1 project, not enough, probably due to prejudices or underestimation).

The time spent on the training and actual production (separate account for each of the participants)

About time spent, it is just possible to talk about us as for training, and also about our partners just related to the actual production. About time spent for training: TUD participated to different I.T. seminars, varying from CAD tools to communication/Internet tools. Self instruction by meaning of adoption and testing –accompanied by several

complete formatting of our machine and reinstallation of all programs and data …- of all kind of programs, tools, operating environments and systems; by researching on the Internet, the state of the art of CaribCAD researches, by participating to Online Lectures and chats…

About the actual CAD production times, we can say that the results by TECAM were almost satisfactory, and could have been faster and better in case they would have been following the manual and the procedure order. But substantially, the difference in between professional CAD operators and amateurs was immediately clear.

Mastering of the communication technology

This is actually the centre of gravity of the entire project, together with the time consuming and underestimated problem of the CAD issues. It can be said that apart from a certain facilitation provided by the combined uses of a MS Exchange server (in our viewpoint underdeveloped and underused) to Keyflow and a kernel of well combined tools, the approach was still traditional, mail related, and not advanced and superior as many other times it is possible to see in surfing the net. But probably these consideration are possible grace to our better and wider level of understanding of the Internet/Communication Technologies/Possibilities. A proposal that will not be just a criticism but a positive proposal for follow ups will be done later on.

Technical problems, failures, shortcomings of the technology

Again a “punto dolens” of the entire situation. We know how difficult it is to handle and program a server, but since the beginning we pointed out more pragmatic ways of doing things, were remembered that those ways were out of CaribCAD scopes, and discovered every time that the tools were really and undoubtely necessary that they could not handle the situation. It is not possible to say what were the causes for such failures, but a guess let us think that they were due to bugs in the programming of tools. Always possible for all kind of programs, tools (also Microsoft, Autodesk, etc.) but solvable, unlike the quoted examples, because of the positive connection existing in between partners and less people than the amount of users of such commercial programs. Notwithstanding the fact that we proposed new and powerful tools, inexpensive, internet related, pointing to a close future, the resistance to such tools was very high, due probably to prejudices, fears or cultural differences. They will for sure be implemented in a close future or follow ups will be showing the necessities for using them.

Other problems encountered (both in the communication as well as internal)

Due to technology failures, language differences, time differences, cultural differences, differences in training, academic preparation, etc. we experienced different problems:

- Technology failures create such problems as frustration, lost of contact, tranquillity, misunderstandings, waste of time, necessity to repeat/duplicate things over and over, and so on;

- Language differences create misunderstandings, necessity for intermediaries, translators, etc. thus improving overall times, or the necessity to create ad hoc documentation for every different partner.

- Time differences also gives problems if using an asynchronous system, e.g. I send a mail today in the morning, it does not arrive due to technology failures, nobody replies, and I just know it tomorrow… This just if there is a system and the partners are responsible, otherwise it can take weeks. This is also due to the still very high costs for calling by phone/sending fax, or to the time consuming sending by normal mail and to the fact that most of people does not work by evening-night.

- Cultural differences, differences in training and or academic preparation create in some cases the bad and unproductive feeling that the other partner is trying in any case to offend you while probably he/she is just trying to understand. In many cases, then the problem is real, and this makes it very difficult to handle.

Will this work in real life production?

The reply is yes, but it is not easy, the necessities are:

From the client point of view:

1. Clarification, definition or re-definition of own office practice in terms of workflow and organisation;

2. Re-definition, I.T. conversion, re-conversion of the office;

3. A transparent definition of standards, quality assurance, libraries, naming conventions, etc.

4. Creation of an interactive library of instructions, how's to, and procedures that can also be very useful in training internal new hired personnel;

5. Defining a professional figure devoted to the specific task of surveying the communication/technological issues;

6. The same person, or someone else should be able to cope with language issues, at least for the major languages, or at least the standard language "de facto": English;

7. The possibility of defining and adopting flexible working-times related to the necessity to handle time differences;

8. Adoption of a good compromise in Hardware/Software/Internet Tool.

From the performer point of view:

1. Clarification, definition or re-definition of own office practice in terms of workflow and organisation;

2. Re-definition, I.T. conversion, re-conversion of the office;

3. Capability to understand and adopt different standards, quality assurance, libraries, naming conventions, etc.

4. Capability of helping in the creation of an interactive library of instructions, how's to, and procedures;

5. Defining a figure devoted to the specific task of surveying the communication/technological issues;

6. The same person, or someone else should be able to cope with language issues, at least for the major languages, or at least the standard language "de facto": English;

7. The possibility of defining and adopting flexible working-times related to the necessity to handle time differences.

8. Adoption of a good compromise in Hardware/Software/Internet Tool.

From the Services provider, system administrator point of view:

1. Managerial, organisational capabilities in clarifying, defining or re-defining [re engineering] of AEC office practices in terms of workflow and organisation;

2. Managerial, organisational capabilities in re-defining, I.T. converting, re-converting of offices;

3. Capability to shape his/her services to adopt, reflect and make it possible to use different standards, quality assurance, libraries, naming conventions, etc.

4. Capability of helping in the creation of an interactive library of instructions, how's to, and procedures; Providing guidelines or already pre-constituted libraries, etc.;

5. Providing the highest levels of quality in surveying the communication/technological issues;

6. Providing language services both as translations or interpretations of the issues;

7. The assurance of such services 24h a day;
8. Adoption of the last and best Hardware/Software/Internet Tool;
9. Providing a reliable, legal proof server, working/meeting point/Inter- Intranet environment.

What were the biggest problems

- Lack of appropriate management,
- Underestimation of the issues,
- Underestimation of main tasks,
- Or overestimation of minor tasks,
- Blind execution, without referring to the procedure,
- Lack of interest in learning or researching, by most of partners,
- Lack of tools, or appropriate technology,
- Lack of human capabilities, time,

Is the CAD procedure adequate in relation to the skills of CAD operators

Yes, it is, unluckily the input by actual CAD firms was not enough and that resulted in a desperate seek for boundaries, standards, procedures, quality assurances and controls etc. It is also clear that a commercial office is not interested in doing researches, instruction, but as tools are getting more and more simple but at the same time different and complete, it can be foreseen for a future a sort of continuos training. For sure, new ways to create instruction documents have to be researched being completely inadequate the traditional paper based or inter-personal ways.

The only way to have easily checkable, reusable, combinable, modifiable drawings is the one based on self-referring x-refs. Probably it would be old fashioned in a recent future due to the rapid (finally) conversion to real 3D CAD, but to this purpose has been developed a sort of combined environment: plans, sections, facades, 3D model, etc. of each element. In it all the specific information regarding a specific element can be found and browsed through a CAD program such as AutoCAD before really opening it.

Was the workflow management adequate?

It could have been better but it went as possible. It can be distinguished in between two points: a human aspect and a procedural automated aspect. The human aspect of workflow management was not fully and perfectly functional due to the following aspect:

- None of the managers was a practical expert,
- The programmers of WFM tools and models were mainly researchers and in some cases they started from and kept a theoretical approach rather than a practical or pragmatic one,
- The procedural automated aspect was restrictedly functional to some and not all of the aspects:
- Some of the discussed issues could not be implemented,
- The management just concerned beginning, development and conclusion of tasks,
- Emergencies, beginning delays, crashes, had to be solved manually, and only after direct requests of the partners,
- Almost no foreseeing was done to manage extra's, while they proved to be the usual way,
- The chosen tools were not flexible, disconnected by a Working Environment (let us call it MS Office or Linux or others) exclusively self-referring,
- Again, these are probably the outcomes of someone who is already used to other, better systems, but if CaribCAD had to be feasible, it is not possible to ignore such problems.