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ANALYSIS AND RECONSTRUCTION IN STAGES OF THE DESIGN AND CONSTRUCTION PROCESS OF THE OLD AND NEW BASILICA OF S. PETER IN VATICAN, AND ITS SURROUNDINGS

VOL. I

DOCTORAL THESIS

Programa de doctorado 3130 Historia del Arte

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Introducción resumen

1. Objetivos

El objetivo general de esta Tesis Doctoral es reconstruir el proceso de diseño y construcción de la antigua y nueva basílica de San Pedro en el Vaticano, y de su entorno cercano. De forma complementaria, se reconstruye la evolución de la trama urbana del área del Vaticano, desde su origen hasta la actualidad.

La reconstrucción del proceso de diseño y construcción se realizará de forma descriptiva y, especialmente, de forma gráfica. Los planos se realizarán con gran detalle, a escala y con gran precisión, utilizando las más avanzadas herramientas de dibujo digital.

La reconstrucción de las diferentes etapas del proceso de diseño y construcción de la antigua basílica se realizará por medio de planos de planta, alzados, y secciones del edificio, junto con algunos detalles constructivos.

Por otro lado, debido a la enorme magnitud y complejidad del edificio, el análisis y reconstrucción de las diferentes etapas del proceso de diseño y construcción de la nueva basílica se ejecutará únicamente mediante planos de planta.

Finalmente, la representación de la evolución de la trama urbana del área del Vaticano se realizará mediante planos de planta, y con dos escalas métricas (en *palmi* y metros).

Además de estos objetivos generales, con la presente Tesis Doctoral se han conseguido otros sub-objetivos:

1. Recopilar, ordenar y clasificar, por etapas consecutivas, las referencias bibliográficas disponibles sobre la actividad constructiva en el área del Vaticano.

2. Recopilar información sobre los edificios más representativos del área del Vaticano. Se ha recopilado información sobre la fecha de la construcción y del derribo de cada edificio; información sobre su forma y estructura arquitectónica; así como información sobre las modificaciones más importantes que han tenido a lo largo de su historia.

3. Recopilar la máxima información posible sobre la forma y estructura arquitectónica de la antigua basílica de San Pedro. Se ha compilado información

sobre los materiales y técnicas de construcción utilizadas en su construcción; sobre las dimensiones de los diferentes elementos y espacios arquitectónicos; sobre los diferentes espacios interiores; sobre los edificios colindantes; y en general cualquier información sobre la antigua basílica de San Pedro.

4. Recopilar, ordenar y clasificar, por etapas consecutivas, las referencias bibliográficas disponibles, relacionadas con el proceso de construcción de la antigua basílica de San Pedro.

5. Recopilar información sobre todos los proyectos ejecutados para la nueva basílica de San Pedro, por todos los arquitectos involucrados en su proceso de diseño.

6. Analizar todos los proyectos de la nueva basílica de San Pedro para reconstruir, etapa por etapa, el proceso de diseño realizado en cada uno de ellos.

7. Recopilar, ordenar y clasificar, por etapas consecutivas, las referencias bibliográficas disponibles, relacionadas con el proceso de construcción de la nueva basílica de San Pedro.

8. Reconstruir históricamente el proceso de diseño y construcción de la nueva basílica de San Pedro, especialmente en su etapa inicial.

2. Metodología

Identificar el proceso de diseño y construcción de cualquier edificio es una tarea compleja, pero analizándolo en profundidad se puede obtener la información adecuada para lograrlo.

Al analizar un determinado edificio se puede identificar un conjunto de patrones utilizados de forma reiterada, ya sean proporciones geométricas, como dimensiones, como pautas de actuación. Por consiguiente, se puede identificar un conjunto de reglas compositivas que brindan pistas valiosas para identificar su proceso de diseño. Este se compone de una secuencia de etapas. Se pasa de una a otra al tomar ciertas decisiones, de tal manera que el edificio a diseñar evoluciona paso a paso, y se va perfilando, desde la primera decisión, hasta que esté completamente definido.

Para que un determinado edificio se diseñe de forma correcta y armónica se debe aplicar de forma recurrente en todas las etapas del proceso de diseño un determinado conjunto -homogéneo y bien definido- de reglas compositivas. Es decir, durante todo el proceso de diseño, se debe utilizar un mismo conjunto de

proporciones geométricas, dimensiones y estrategias compositivas. Como resultado, se obtendrá un objeto arquitectónico en el que no sobre ni falte nada, y en el que todos sus componentes se relacionan perfectamente entre sí por medio de un mismo conjunto de relaciones, proporciones y dimensiones. En otras palabras, un determinado objeto arquitectónico estará mejor diseñado y será más atractivo y armonioso si se usa el mismo conjunto de reglas, de forma recursiva, en todas las etapas del proceso de diseño.

La relación armónica entre los diferentes elementos arquitectónicos entre sí, y con el conjunto arquitectónico general, fue denominada *"concinnitas"* por el arquitecto renacentista Leon Battista Alberti. En su tratado *De Re Aedificatoria*, describía la belleza en la arquitectura como *"concinnitas"*. Y en el Libro IV de este tratado declara que: "Juzgamos óptimo lo que se hace de tal manera que no se puede cambiar a menos que se empeore" (IV: 277).

Para identificar el conjunto de etapas del proceso de diseño de un determinado edificio, primero se debe analizar de manera exhaustiva. El análisis debe incluir multitud de aspectos, como, por ejemplo, la identificación de las relaciones geométricas y proporcionales existentes en las dimensiones de cada uno de los diferentes elementos arquitectónicos, las relaciones geométricas y proporcionales entre diversos elementos arquitectónicos, las relaciones geométricas y proporcionales entre un determinado elemento y el conjunto total, etc. También deben identificarse determinadas dimensiones que son importantes o relevantes en el diseño del edificio, ya sea desde un punto de vista simbólico o funcional. Finalmente, y lo más importante, se deben identificar las reglas compositivas por las cuales se pasa de cada una de las etapas de diseño a la siguiente.

Por tanto, para conocer el proceso de diseño que se siguió en la basílica de San Pedro, lo primero que se ha realizado es un análisis profundo el edificio en busca de determinadas dimensiones y proporciones geométricas para identificar un conjunto de reglas tentativas de composición y, con ello, averiguar la secuencia correcta de etapas de diseño y las reglas que le permiten pasar de una etapa a la siguiente.

Sin embargo, el análisis de la nueva basílica de San Pedro es más complejo que el análisis de la mayoría de los edificios por varias razones:

1. La basílica de San Pedro ha sido el resultado de la concatenación temporal de partes de proyectos completos realizados secuencialmente por varios arquitectos en diferentes etapas históricas.

2. En cada etapa del proceso de diseño (correspondiente a diferentes etapas históricas) varios arquitectos trabajaron al mismo tiempo, colaborando y compitiendo entre sí.
3. La construcción del edificio se prolongó durante muchos años, por lo que las reglas de composición utilizadas inicialmente diferían significativamente de las reglas que se usaron en etapas sucesivas. De hecho, incluso los objetivos deseados para el edificio eran sustancialmente diferentes en cada época.
4. Los primeros diseños de la nueva basílica de San Pedro mostraban un deseo de respetar e integrarse con la antigua basílica que se pretendía reemplazar.

Del mismo modo, el análisis de la antigua basílica de San Pedro también tiene importantes dificultades:

1. La antigua basílica de San Pedro no existe, ya que había comenzado a construirse en 324 y terminó siendo demolida por completo en 1610. Por lo tanto, su diseño no se puede analizar midiendo directamente
2. Solo existe un plano válido de la antigua basílica, que también se realiza mezclando el estado que tenía a finales del siglo XVI con el estado que pudo haber tenido en base a indicaciones y conjeturas.
3. En los años 40 del siglo pasado se realizaron determinadas excavaciones para llegar a los cimientos y la parte inferior de algunos muros y columnatas de la antigua basílica de San Pedro, por lo que se tomaron medidas directas. Estas medidas, aunque similares a los señalados en las fuentes históricas, no coinciden con ellos.

2.1. Dificultades para reconstruir la evolución, etapa por etapa, de la trama urbana del Área Vaticano

La reconstrucción de la evolución de la trama urbana del área del Vaticano (utilizando planos a escala) es una tarea extraordinariamente compleja. El objetivo es reconstruir la trama urbana del área Vaticana en las diferentes etapas representativas de su historia, mediante planos realizados a escala y con la mayor precisión posible.

Existen algunos planos realizados con posterioridad al siglo XVII, pero tan solo algunos se han hecho con precisión. Hasta el siglo XVII solo se realizaron planos muy burdos, y muchos de ellos apenas son bocetos, ya que los edificios están representados de manera desproporcionada y poco realista. A medida que nos adentramos en el pasado, los dibujos son cada vez más toscos, esquemáticos y desproporcionados.

La tarea parece por tanto imposible de realizar. Sin embargo, se ha diseñado una estrategia que permite reconstruir con bastante precisión los planos de la trama urbana del área Vaticana, en las fechas en las que apenas se hicieron planos, o eran apenas unos bocetos. La estrategia se basa en tomar como referencia los edificios que todavía existen, que sirven de referencia para ubicar otros edificios que no han sobrevivido hasta la actualidad. Tomando como punto de partida la situación actual de la trama urbana del área Vaticana, se puede ir hacia atrás en la historia y reconstruir la etapa inmediatamente anterior, realizando las modificaciones oportunas en base a las referencias históricas disponibles. En base a esta etapa se puede ir de nuevo hacia atrás y reconstruir del mismo modo la etapa inmediatamente anterior. Y así sucesivamente.

De este modo, y tomando como referencia los edificios históricos que aún sobreviven, y en base a las referencias históricas existentes, es posible reconstruir con cierta precisión, la trama del tejido urbano del área del Vaticano, desde sus orígenes hasta la actualidad.

Los planos a escala resultantes son de gran importancia para la Historia del Arte, y pueden ser de gran utilidad en varios aspectos, y permiten una mejor comprensión de la historia del área del Vaticano, y especialmente su desarrollo social, artístico, arquitectónico y urbanístico.

Estos planos detallados también permiten contextualizar hechos aislados de la historia del arte en el área vaticana y su entorno inmediato, permiten visualizar el tejido urbano en cada una de sus etapas históricas. Igualmente, proporcionan un contexto adecuado para el análisis de la evolución histórica de los edificios más importantes del área, tales como la antigua basílica de Constantino, la nueva basílica de San Pedro, el Mausoleo de la dinastía Severa, el Mausoleo de Honorio, el Circo de Nerón, y muchos otros.

Por supuesto, los planos reconstruidos no pretenden ser definitivos, ya que se pueden mejorar con futuras investigaciones de estudiosos de cualquier edificio del área vaticana. A partir de nuevas investigaciones, estos planos pueden enriquecerse,

proporcionando información cada vez más precisa y detallada sobre el estado de la trama urbana en las diferentes etapas de su evolución histórica.

2.2. Dificultades para identificar el proceso de diseño de la antigua basílica de San Pedro

Para identificar el proceso de diseño de la antigua basílica de San Pedro, teniendo en cuenta la poca información disponible, se ha diseñado una estrategia compleja, basada en la propuesta reiterada de hipótesis tentativas del proceso de diseño.

Esta estrategia consiste en tres etapas.

1. En primer lugar se deben recopilar información sobre todas las dimensiones disponibles en las diferentes fuentes históricas de los diferentes elementos arquitectónicos de la antigua basílica.
2. En segundo lugar, se deben identificar de forma provisional varias estrategias del proceso de diseño.
3. En tercer lugar, se deben evaluar todas las posibles estrategias de diseño tentativas, hasta encontrar una en la que las dimensiones de los diferentes elementos arquitectónicos difieran lo menos posible del conjunto total de mediciones disponibles en las referencias históricas.

Cada estrategia de diseño tentativa tiene una forma diferente de generar las dimensiones de los diferentes elementos arquitectónicos, por lo que cada vez que se define un determinado elemento arquitectónico se debe comparar con las medidas históricas disponibles. Si las dimensiones son similares, el proceso de diseño continúa, pero si las dimensiones de los elementos arquitectónicos generados difieren de las mediciones históricas, se debe rechazar la estrategia tentativa de diseño y se debe seguir otra. De esta forma, se ejecutan secuencialmente diferentes estrategias tentativas de diseño hasta encontrar una en la que las dimensiones de los elementos arquitectónicos generados coincidan aproximadamente con las dimensiones disponibles en las referencias históricas.

2.3. Dificultades para identificar el proceso de construcción de la antigua basílica de San Pedro

La principal dificultad para identificar el proceso de construcción de la antigua basílica de San Pedro es la falta de referencias históricas y la poca fiabilidad de

las primeras referencias existentes (como es el caso de las primeras biografías papales del *Liber Pontificalis*).

Sin embargo, los hallazgos arqueológicos basados en excavaciones realizadas en la década de 1940 pueden complementar la información histórica.

De forma complementaria, el conocimiento de los detalles constructivos, las soluciones constructivas y los materiales empleados en cada época implica un cierto orden cronológico previsible, así como unos plazos lógicos en el proceso constructivo. Por tanto, el conocimiento arquitectónico y constructivo permite complementar la evidencia arqueológica y la evidencia histórica. De este modo se puede determinar con considerable certeza el proceso de construcción de la antigua basílica desde el inicio hasta el final de su construcción. Del mismo modo, es posible determinar de manera confiable la evolución del aspecto de la antigua basílica desde su finalización hasta el momento en que fue demolida, para dar paso a la construcción de la nueva basílica.

2.4. Dificultades para identificar el proceso de diseño de la nueva basílica de San Pedro

Como consecuencia del apartado anterior, para deducir el proceso de diseño de la nueva basílica de San Pedro, se deben recopilar todos los proyectos de todos los arquitectos involucrados en las diferentes etapas de su proceso construcción.

Cada proyecto es válido ya que proporciona información valiosa. Es cierto que algunos proyectos fueron redactados para ser ejecutados; otros fueron simplemente propuestas tentativas que mostraban una determinada idea o un camino a seguir; otros eran descabellados, ya que eran enormemente grandes (fuera de las posibilidades económicas reales y fuera de plazos manejables), o se basaron en ideas personales sin tener en cuenta el entorno real construido; y otros fueron simplemente tratados teóricos hechos como resultado de lo aprendido, y que poco tenían que ver con proyectos encargados y reales.

En cualquier caso, se deben analizar todos los proyectos disponibles, y a partir de la concatenación de sus aportaciones individuales se puede elaborar una trama capaz de integrar cronológicamente los diferentes proyectos entre sí, y capaz de relacionarlos de una forma u otra con el avance de las obras.

Para iniciar el proceso de construcción, es fundamental identificar geométricamente el "núcleo central de Bramante" para comprender el resto de proyectos y establecer un hilo

narrativo secuencial para reconstruir lo que podría denominarse "el proceso del proceso de diseño". No hay una sola referencia histórica sobre la existencia del proyecto de este "núcleo central de Bramante" (que incluye los cuatro grandes pilones centrales y los contra-pilones correspondientes), pero sin duda debe haber existido ya que se construyó, por lo que se pueden realizar y reconstruir mediciones directas.

Una vez identificado y reconstruido el "núcleo central de Bramante", se pueden entender los proyectos realizados por los sucesores de Bramante, ya que todos lo respetaron y lo integraron en sus propuestas. Y de esta forma se puede deducir el complejo proceso de diseño seguido en la nueva basílica de San Pedro.

2.5. Dificultades para identificar el proceso de construcción de la nueva basílica de San Pedro

Con la finalidad de identificar el proceso de construcción de la nueva basílica de San Pedro, dando respuesta a muchas preguntas que aún existen, se han analizado todos los proyectos conocidos llevados a cabo por todos los arquitectos implicados. Se han analizado tanto los proyectos destinados a ser ejecutados, como los proyectos que simplemente expresan una idea y que estaban destinados a seducir a los clientes, como los proyectos de obra, bocetos de obra, bocetos de resolución de problemas específicos, etc.

Se ha dado una especial importancia y dedicación al período comprendido entre los años 1504 y 1520, y en especial al análisis de los primeros bocetos de Bramante, Giuliano da Sangallo y Fra Giocondo, con el fin de reconstruir adecuadamente el proceso de diseño inicial y tener una idea correcta de las primeras intenciones y, con ello, reconstruir adecuadamente el proceso de construcción de la nueva basílica, especialmente en su primera etapa.

Evidentemente el trabajo tiene un alcance gigantesco, y en esta Tesis, por razones de limitación de la información máxima admisible (50 MB), solo se incluye una pequeña parte del trabajo realizado.

3. Conclusiones

El objetivo general de esta Tesis Doctoral es determinar el proceso de diseño y proceso constructivo de la antigua y de la nueva Basílica de San Pedro, y la evolución temporal de la trama urbana del área Vaticana.

Este objetivo general consta de tres objetivos principales:

a. Reconstrucción por etapas de la evolución de la trama urbana del área del Vaticano, desde su origen hasta la actualidad.

b. Reconstrucción del proceso de diseño y construcción de la antigua basílica de San Pedro

c. Reconstrucción del proceso de diseño y construcción de la nueva basílica de San Pedro

Cada uno de estos objetivos principales se ha logrado a través de los diferentes capítulos de esta Tesis, junto con otros objetivos complementarios, como se muestra a continuación.

Objetivo a

Reconstrucción por etapas de la evolución de la trama urbana del área del Vaticano, desde su origen hasta la actualidad.

Este objetivo se ha logrado en el Capítulo 2 de la Tesis Doctoral.

En este capítulo se ha creado un relato histórico básico, y se han descrito secuencialmente los eventos más importantes que ocurrieron en el área del Vaticano desde su origen hasta el presente. El relato se ha estructurado en 29 etapas consecutivas, correspondientes a las etapas más significativas de la historia del Vaticano.

Del mismo modo, se ha realizado una reconstrucción gráfica de la evolución de la trama urbana del área del Vaticano en 29 etapas consecutivas. Para ello, se han realizado 29 planos a escala, correspondientes al estado de la trama urbana en las 29 fechas más representativas de su historia.

Objetivo b

Reconstrucción por etapas del proceso de diseño y construcción de la antigua basílica de San Pedro

Este objetivo se ha logrado en los capítulos 3, 4, 5, 6 de la Tesis Doctoral.

En el capítulo 3 se ha realizado un relato histórico sobre el proceso de construcción de la antigua basílica de San Pedro, así como su evolución temporal, desde su construcción hasta su demolición.

Para realizar este relato histórico, en primer lugar, se han identificado el inicio y el final de las obras, así como las etapas más características del proceso constructivo de la antigua basílica de San Pedro. Del mismo modo, se han

identificado las etapas más características de su evolución temporal, desde que se construyó hasta que fue derribada.

Las diferentes referencias históricas disponibles se han recopilado, clasificado e integrado por etapas. A partir de estas referencias y a partir del análisis de los diferentes dibujos históricos disponibles se ha realizado un relato básico sobre el proceso de diseño y construcción de la antigua basílica de San Pedro.

Sin duda, tuvo que haber un proyecto completo para la antigua basílica de San Pedro, ya que inicialmente se construyó una enorme plataforma sobre la que se construyó la antigua basílica.

En el capítulo 4 se ha podido reconstruir todas las etapas del proceso de diseño del proyecto de la antigua basílica de San Pedro, probando con diferentes escenarios compositivos y contrastando los resultados obtenidos con la evidencia histórica disponible.

La antigua basílica de San Pedro tuvo que ser cuidadosamente diseñada por su importancia social, y especialmente por su importancia religiosa y política. Por lo tanto, los diferentes componentes del edificio no se pudieron diseñar al azar. Como en todo buen proyecto arquitectónico, los diferentes elementos arquitectónicos de la antigua basílica debían estar perfectamente relacionados geométricamente entre sí, como resultado de la aplicación redundante del mismo conjunto de estrategias compositivas y del mismo conjunto de relaciones geométricas. Las reglas compositivas y las relaciones geométricas utilizadas en el diseño de la antigua basílica se han deducido a partir de una estrategia compleja, pero eficaz.

Inicialmente, se han probado tentativamente diferentes combinaciones entre ciertas estrategias compositivas y ciertas relaciones geométricas. A partir de ellas, se ha reconstruido un proceso de diseño tentativo, definiendo tanto el punto de partida como el camino a seguir. Durante este proceso de diseño se obtienen las diferentes partes de la basílica, cuyas dimensiones deben ser comparadas con las dimensiones conocidas a partir de la evidencia histórica disponible. Si alguna dimensión no coincide, es necesario retroceder y seguir probando un nuevo conjunto de relaciones geométricas con una nueva estrategia compositiva. Con este nuevo proceso de diseño, se vuelven a obtener las diferentes partes de la basílica, cuyas dimensiones deben ser comparadas, una vez más, con la evidencia histórica conocida. Continuando con este proceso,

llegará un momento en el que sea posible definir un determinado proceso de diseño que da como resultado una basílica en el que las dimensiones de sus diferentes elementos arquitectónicos resultantes coincidan con las dimensiones de la evidencia histórica disponible.

A partir de esta metodología se ha reconstruido el proceso de diseño de la antigua basílica de San Pedro, tanto en planta como en sección, y se han identificado todas sus etapas, desde la primera decisión, hasta la finalización del proyecto.

La identificación del proceso de diseño permite reconstruir con precisión la forma y dimensiones exactas de todos los componentes de la antigua basílica de San Pedro, y en base a esto ha sido posible reconstruir su proyecto ejecutivo (plano de planta y plano de sección).

La planta reconstruida en el capítulo anterior debió coincidir básicamente con la planta que pudo haber tenido la antigua basílica hacia el año 514 cuando se terminó su construcción. Por tanto, a partir de esta planta se pueden identificar las etapas más importantes tanto de su proceso constructivo como de su evolución temporal, desde que se construyó hasta que se derribó.

En el capítulo 5 se ha identificado el proceso constructivo de la antigua basílica, reconstruyendo gráficamente el estado del edificio en cada una de sus etapas más características, teniendo en cuenta las referencias históricas disponibles. A partir del estado de la edificación en 514 se ha vuelto a rastrear las principales actuaciones constructivas realizadas en cada etapa, por lo que cada una de las etapas se ha definido gráficamente con bastante precisión.

De forma complementaria, en este capítulo se han identificado las etapas más importantes de la evolución de la antigua basílica de San Pedro a lo largo de la historia, desde que se construyó en el 514 hasta 1505, poco antes de empezar a ser derribada para dar paso a la construcción de la nueva basílica.

Cada etapa del proceso constructivo y de la evolución temporal de la antigua basílica de San Pedro se ha representado por medio de planos de planta a escala con el mayor detalle posible. Los planos de planta no solo muestran la evolución de la antigua basílica, sino también la evolución de los edificios en su entorno.

En este capítulo también se han logrado dos objetivos secundarios.

1. En primer lugar, y como consecuencia de la reconstrucción de las etapas más importantes del proceso constructivo y de la evolución temporal, se ha podido completar un relato histórico detallado sobre la evolución de la antigua basílica desde el inicio de su construcción hasta que finalmente fue derribada.
2. En segundo lugar, se ha podido recopilar una bibliografía muy extensa y completa, relacionada con el proceso de diseño y construcción de la antigua basílica, y que sin duda puede facilitar el trabajo de los historiadores que deseen realizar investigaciones específicas sobre determinados aspectos relacionados con la antigua basílica de San Pedro.

En el capítulo 6, a partir de la información generada en los capítulos 4 y 5, y teniendo en cuenta la documentación histórica y los dibujos históricos disponibles, se ha podido reconstruir el aspecto de la antigua basílica de San Pedro en tres etapas fundamentales de su existencia:

- Año 514. Cuando la antigua basílica se construyó de forma completa
- Año 1003. Hacia la mitad de la existencia de la antigua basílica
- Año 1505. Cuando la antigua basílica comenzó a ser derribada

La reconstrucción del aspecto de la antigua basílica en estas tres etapas se ha realizado mediante planos de planta a escala, con el mayor detalle posible y con las dimensiones más importantes. Uno de los aspectos más destacados de los dibujos realizados es la reconstrucción de la variación de nivel del terreno circundante a cada lado de la antigua basílica. Se observa cómo con el paso del tiempo el nivel del terreno en el lado sur de la basílica fue subiendo paulatinamente como consecuencia de la recurrente pavimentación del terreno.

Los planos realizados para cada etapa han sido los siguientes:

- Planta
- Sección transversal
- Sección longitudinal
- Fachada sur
- Fachada este
- Fachada este al Atrio
- Fachada oeste

Los planos se han realizado con todo rigor y precisión, y representan en detalle las diferentes partes de la antigua basílica de San Pedro y los edificios de su entorno inmediato. Por este motivo, estos planos pueden resultar de gran

utilidad para los historiadores que deseen investigar un aspecto concreto de la antigua basílica y su entorno.

Objetivo c

Reconstrucción por etapas del proceso de diseño y construcción de la nueva basílica de San Pedro

Este objetivo se ha logrado en los capítulos 7, 8, 9 de la Tesis Doctoral.

En el Capítulo 7 se ha realizado un relato histórico completo del proceso de diseño y construcción de la nueva basílica, desde su inicio en la época del papa Nicolás V (1447-1455) hasta su finalización en la época del papa Alejandro VII (1655-1667). Para la realización del relato histórico se han agrupado, clasificado e integrado un gran número de referencias históricas y estudios históricos relacionados con el proceso de diseño y el proceso de construcción de la nueva basílica.

El relato histórico se ha estructurado en base a los períodos históricos consecutivos identificados en el proceso de diseño y construcción. Estos períodos se han delimitado, a su vez, en base a la presencia de los actores más importantes en el proceso de diseño (papas y arquitectos), cuya actividad ha influido directamente en la evolución del proceso de construcción de la nueva basílica de San Pedro.

Sin duda, este relato histórico tiene un gran valor histórico ya que permite conocer con el mayor rigor posible el proceso de diseño y construcción de la nueva basílica, y contiene una enorme cantidad de referencias históricas para aquellos estudiosos que deseen indagar en detalle algún aspecto específico de la misma.

El relato histórico realizado ha complementado los relatos previamente existentes debido a la exhaustiva recogida de datos históricos, y especialmente por las conclusiones obtenidas en el análisis realizado de los diferentes proyectos de la nueva basílica de San Pedro. El análisis riguroso de estos proyectos ha permitido complementar los vacíos existentes en los relatos históricos parciales previamente existentes y ha proporcionado un hilo conductor sólido para la génesis de un relato completo.

Por supuesto, el relato histórico confeccionado no pretende ser exhaustivo, y seguramente contiene deducciones que, en base a nueva información que pueda

aparecer en el futuro, pueden modificarse parcialmente. Sin embargo, estos pequeños cambios posibles sin duda pueden enriquecer este relato, pero creemos que no alterarían su vigencia, su esencia y su estructura básica.

En el capítulo 8, a partir del relato histórico completo que se ha realizado en el capítulo anterior, se puede deducir que el proceso de diseño de la nueva basílica fue sumamente complejo e involucró la actividad de varios arquitectos en diversas etapas históricas.

El proceso de diseño se originó en la voluntad de Nicolás V de llevar a cabo una importante renovación de la antigua basílica de San Pedro. Sin embargo, apenas realizó pequeñas obras en la zona occidental que supusieron la construcción de los cimientos de un nuevo ábside occidental. Sin embargo, tuvieron una enorme importancia en el futuro del edificio debido a la voluntad de Julio II de que estos cimientos sirvieran para construir un nuevo ábside que albergaría su propia capilla funeraria.

Julio II creó una estrategia de diseño complicada basada en la creación de un equipo formado por tres arquitectos que competían y cooperaban entre sí, y no se construiría nada sin el acuerdo de los tres arquitectos. Siempre debería haber tres arquitectos, y tras la muerte de un arquitecto otro ocuparía su lugar. En general, cada arquitecto puede realizar propuestas de forma independiente, que deben integrar las partes ya construidas. De todas las propuestas realizadas, solo se construyeron parcialmente aquellas que contaron con el consenso de los tres arquitectos. De esta forma se iba avanzando en la obra, construyendo solo algunos fragmentos incluidos en alguno de los proyectos realizados por alguno de los arquitectos del grupo. En ocasiones, incluso se decidió demoler algunas piezas ya construidas para que se pudieran llevar a cabo los proyectos que más gustaban a todos.

Este proceso general tuvo algunas excepciones. Por ejemplo, al inicio del proceso de diseño, Bramante tuvo un gran protagonismo sobre sus competidores. Como era de esperar, Miguel Ángel destruyó por completo esta estructura, ya que no aceptaba ningún colaborador. Después de Miguel Ángel, la estructura ideada por Julio II se mantuvo, pero el arquitecto principal tuvo un papel más importante sobre los demás, que se convirtieron simplemente en sus colaboradores. En resumen, se llevaron a cabo un gran número de proyectos a lo

largo del proceso de diseño, pero solo algunos de ellos se utilizaron para la construcción.

En este capítulo se han analizado y reconstruido los proyectos que se utilizaron en la construcción del edificio, o que al menos fueron vinculantes en ciertos aspectos de su construcción. Especialmente importante ha sido la reconstrucción del "núcleo central de Bramante", cuyo proyecto no nos ha llegado, pero que sin duda existió, ya que necesariamente tuvo que ser utilizado para el inicio de la construcción de la nueva basílica de San Pedro.

Se han analizado todos los proyectos realizados para la nueva basílica de San Pedro y se han reconstruido etapa a etapa. Sin embargo y debido a la limitación de tamaño de 50 Megabytes que debe tener una Tesis Doctoral en España, en este capítulo solo se muestran los proyectos más importantes, y de todos ellos solo se muestra una etapa inicial y la etapa final, junto con la superposición con el dibujo histórico que se ha reconstruido. Los proyectos directamente utilizados en el proceso de construcción son los siguientes:

- Proyecto de reforma de Nicolás V
- Proyecto del “Núcleo Central Bramante”
- Proyecto del ábside de Julio II
- Proyectos del deambulatorio Bramante-Raffaello-Antonio Sangallo
- Proyecto de Michelangelo
- Proyectos de Maderno

Se ha prestado especial atención al análisis y reconstrucción de los primeros proyectos realizados por Bramante y Giuliano da Sangallo. Además, se ha realizado un análisis exhaustivo sobre las diferentes tipologías arquitectónicas que se pueden conseguir con estos proyectos iniciales, así como la evolución de un proyecto a otro. Todo ello con el propósito de demostrar la génesis de una nueva tipología arquitectónica creada por Giuliano da Sangallo y Bramante, y que a lo largo de esta Tesis se ha denominado "tipología mixta de *quincunx*-naves".

Con esta tipología mixta se puede hacer un edificio con la pureza de una tipología centralizada, pero al mismo tiempo se puede alargar en dirección este,

donde se ubicaba la Plaza Vaticano, y donde debería ubicarse una nueva Loggia de las Bendiciones.

La secuencia de los diferentes proyectos ejecutivos permite una reconstrucción detallada de todas las decisiones de diseño tomadas por los diferentes arquitectos involucrados en el proceso de diseño. De esta forma, se ha podido reconstruir el proceso de diseño, como si lo hubiera realizado de principio a fin, por un solo arquitecto.

Como resultado final del proceso de diseño se han obtenido los planos detallados del edificio final existente hoy. Las dimensiones deducidas de los diferentes elementos arquitectónicos generados durante el proceso de diseño deducido de la nueva basílica coinciden casi exactamente con las medidas realizadas directamente sobre el edificio. Esto legitima que el proceso de diseño deducido coincide básicamente con el proceso de diseño secuencial llevado a cabo por los diferentes arquitectos involucrados en el diseño de la nueva basílica.

En el capítulo 9, a partir de la reconstrucción de los diferentes proyectos directamente vinculados al proceso constructivo, se ha podido reconstruir la forma y dimensiones exactas de la actual basílica de San Pedro. Estas dimensiones coinciden casi exactamente con las mediciones realizadas directamente en el edificio actual, con tecnologías avanzadas de medición láser.

Por tanto, en este capítulo, y en base a los planos obtenidos en el capítulo anterior, se ha identificado el proceso constructivo de la nueva basílica, reconstruyendo gráficamente el estado del edificio en cada una de sus etapas más significativas, teniendo en cuenta las referencias históricas disponibles.

A partir del estado actual del edificio, se han vuelto a rastrear las principales actuaciones constructivas realizadas en cada etapa, y con ello se ha podido definir gráficamente el estado de las obras en cada una de ellas.

Cada etapa del proceso constructivo de la nueva basílica de San Pedro se ha realizado mediante planos de planta a escala, con el mayor detalle posible. Los planos de planta no solo muestran la evolución de la nueva basílica, sino también la evolución de los edificios en su entorno inmediato.

Valor y utilidad de los resultados obtenidos

Los resultados de esta Tesis Doctoral pueden ser de gran utilidad para los historiadores que deseen investigar ciertos aspectos específicos de la antigua y de la nueva basílica de San Pedro.

1. En primer lugar, los planos a escala del área del Vaticano son de gran importancia para la Historia del Arte, y pueden ser de gran utilidad en varios aspectos, entre los que destacan los siguientes:

1. Permiten una mejor comprensión de la historia del área del Vaticano, y especialmente su desarrollo social, artístico, arquitectónico y urbano.
2. Permiten contextualizar hechos aislados de la historia del arte en la zona del Vaticano y su entorno inmediato.
3. Permiten la visualización de la trama urbana del área del Vaticano en cada una de sus etapas históricas.
4. Permiten conocer mejor las acciones arquitectónicas y urbanísticas más importantes que se llevan a cabo en cada etapa
5. Permiten identificar los principales trazados urbanísticos que, como cicatrices históricas, han caracterizado la evolución del área del Vaticano.
6. Proporcionan un contexto adecuado para el análisis de la evolución histórica de los edificios más importantes de la zona del Vaticano, como la antigua basílica de Constantino, la nueva basílica de San Pedro, el Mausoleo de la dinastía Severa, el Mausoleo de Honorio, el Circo de Nerón y muchos otros
7. Proporcionan un contexto gráfico detallado para enmarcar la investigación futura sobre aspectos específicos, o edificios específicos, incluidos en el área del Vaticano.

2. En segundo lugar, la identificación de todas las etapas del proceso de diseño y construcción de la antigua basílica de San Pedro es de gran importancia para la Historia del Arte, y puede ser de gran utilidad en varios aspectos, entre los que destacan los siguientes:

1. Proporciona una mejor comprensión de la historia de la antigua basílica de San Pedro.
2. Proporciona una mayor comprensión de la metodología de diseño arquitectónico en la antigua Roma.

3. Permite conocer con más detalle, la forma y dimensiones de la antigua basílica de San Pedro.
4. Ofrece un marco general para el estudio detallado de ciertos aspectos de la antigua basílica de San Pedro.
5. Permite la visualización de todos los hechos históricos relacionados con la antigua basílica de San Pedro, desde el inicio de su construcción hasta su derribo.
6. Permite conocer en detalle los edificios anexos a la antigua basílica de San Pedro
7. Permite conocer en detalle el proceso de diseño de la antigua basílica de San Pedro.
8. Permite conocer la evolución del proceso de construcción de la antigua basílica de San Pedro.
9. Permite conocer la evolución de la antigua basílica a lo largo del tiempo, especialmente las modificaciones, ampliaciones y reformas de su estructura arquitectónica.

3. En tercer lugar, la identificación de todas las etapas del proceso de diseño y construcción de la nueva basílica de San Pedro es de gran importancia para la Historia del Arte, y puede ser de gran utilidad en varios aspectos, entre los que destacan los siguientes:

1. Proporciona una mejor comprensión de la historia de la nueva basílica de San Pedro.
2. Proporciona una mejor comprensión de la metodología de diseño arquitectónico en el Renacimiento.
3. Ofrece un marco general para el estudio detallado de ciertos aspectos de la nueva basílica de San Pedro.
4. Permite la visualización de todos los hechos históricos relacionados con la nueva basílica de San Pedro.
5. Permite conocer en detalle los edificios anexos a la nueva basílica de San Pedro
6. Permite conocer en detalle el proceso de diseño de la nueva basílica de San Pedro
7. Permite conocer la evolución del proceso constructivo de la nueva basílica de San Pedro.

Sin duda, el trabajo realizado en esta Tesis Doctoral puede ser de utilidad para muchas personas y en muchos aspectos. Sin embargo, quizás su mayor aporte es que permite la

creación de un relato más completo de la historia de la basílica de San Pedro en el Vaticano, que evidentemente se ha convertido en uno de los mayores símbolos de la cultura occidental, y que ha sido efecto y causa de una forma de pensar que ha ido evolucionando con el tiempo.

La Basílica de San Pedro, más que un símbolo de una determinada religión, se ha convertido en el símbolo del poder humano.

ANALYSIS AND RECONSTRUCTION IN STAGES OF THE DESIGN AND CONSTRUCTION PROCESS OF THE OLD AND NEW BASILICA OF S. PETER IN VATICAN, AND ITS SURROUNDINGS

VOL. I

DOCTORAL THESIS

LUIS DE GARRIDO

A mis padres

“Il lavoro nobilita l'uomo e arricchisce qualcun altro.”

Michelangelo Buonarroti

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CHAPTER 1

"If I make the lashes dark
And the eyes more bright
And the lips more scarlet,
Or ask if all be right
From mirror after mirror,
No vanity's displayed:
I'm looking for the face I had
Before the world was made.

What if I look upon a man
As though on my beloved,
And my blood be cold the while
And my heart unmoved?
Why should he think me cruel
Or that he is betrayed?
I'd have him love the thing that was
Before the world was made"

William Butler Yeats

Chapter 1. Introduction

1.1. Delimitation of the research topic

This Doctoral Thesis focuses on the reconstruction of the design process, and construction process of the old basilica and the new basilica of S. Peter in the Vatican, as well as the evolution of the urban structure of the Vatican area throughout history.

The delimitation of the research work carried out in five fundamental sections:

1. Reconstruction of the evolution of the urban structure of the Vatican Area, from its origins to the present day.

The evolution of the urban structure of Vatican Area will be carried out by showing its status in the 28 most significant stages of its evolution. Each stage is defined by means of scale plans layouts (scale in meters and in *palmi*), made with the maximum possible detail, and with more advanced digital tools. Each plan is commented adequately, according to the most important historical references, while highlighting the most important historical events that occurred in each stage, as well as reviewing in detail the most important urban and architectural changes.

2. Reconstruction of the design process of the old basilica of S. Peter

The design process of the Old S. Peter's Basilica has been rebuilt, step by step, from the first idea, until the project was completed. The design process will be reconstructed in plan and also in section.

3. Reconstruction of the construction process of the old basilica of S. Peter

The construction process of the old S. Peter's Basilica has been rebuilt, from the beginning until the building was completed. In the same way, it is intended to reconstruct the evolution of the building, since it was built until it was demolished, to make way for the construction of the new basilica. The construction process is shown by means of scale plans, made with great precision, of the most significant stages. Each of these stages is adequately commented on, describing the most important construction actions executed in each stage, according to the bibliographic references collected. Finally, and as a

consequence of the research work, the appearance of the old basilica is shown on three significant dates in its history: year 514, year 1003 and year 1505, by means of plans to scale and with all precision. Each plan is discussed in detail, taking into account the historical references gathered.

4. Reconstruction of the design process of the new basilica of S. Peter

It involves rebuilding the design process for the new S. Peter's Basilica. The design process was very stormy and was executed by various architects, both initially and throughout the construction process. The reconstruction of the design process includes the reconstruction of the most important theoretical projects carried out by the architects involved in the design process. Many of these projects have not been taken into account for the construction of the building, but they are key to understanding the design process. Finally, the final design process is reconstructed, in a concatenated and sequential way, taking into account parts of projects executed by the different architects involved in the design process.

5. Reconstruction of the construction process of the new basilica of S. Peter

The construction process of the new basilica has been rebuilt, from the beginning of the works, until the construction was completed. The construction process is shown by means of scale plans, made with great precision, of the most significant stages. Each of these stages is discussed in detail, describing the most important construction actions carried out in each stage, according to the bibliographic references collected.

All the plans layouts have been set to scale and have been exhaustively dimensioned in the same units of measurement that were used in both the old basilica (*roman foot*) and the new basilica (*palmo*).

1 *roman foot*(*Vatican area*) = 4/3 *palmo*

1 *palmo* '*di architetti'* = 22.34 cm.

1 *roman foot* (*Vatican area*) = 29.78 cm.

1.2. State of art

The Basilica of S. Peter is undoubtedly the most studied building on the planet. However, there are hardly any references regarding the research topic that is the subject of this Doctoral Thesis.

1. Reconstruction of the evolution of the urban structure of the Vatican area throughout history

With regard to the reconstruction of the evolution of the urban structure of the Vatican area there are hardly precedents. These only focus on a small part of the urban mesh of the Vatican area (the area near the basilica), and also refer to only a few historical stages.

These precedents include the works of Paul Letarouilly (1795-1855), Rodolfo Amedeo Lanciani (1847-1929), Giovanni Battista Piranesi, etc. and more recently the fabulous work of Leonardo Benevolo. The latter has reconstructed with great precision, and detail, the surroundings near the basilica, in the time of Pius IV and Paul V, and also in the time of Bernini. It has also rebuilt the state of the Borgo urban mesh in 1930, as well as the *Borgo restauro urbano* project.

Undoubtedly, this information is very valuable, despite the fact that the reconstructed area is small and refers to very few historical stages.

2. Reconstruction of the design process of the old basilica of St. Peter

There is no precedent for the design process of the old basilica of St. Peter. Historians and researchers who have reconstructed the plans of the old basilica have done taking into account the plans of Alfarano, slightly modified and using measurements provided in other historical references, and some partial measurements made in the excavations of the 40s of the twentieth century.

However, no researcher has tried to reconstruct the design process carried out in the project of the old basilica. And this is very important, given that in an architectural project (and especially in ancient Rome and the Renaissance) the different architectural elements are intertwined with each other in a geometric way, thus if these geometric relationships are known, and the dimensions of some architectural elements, the dimensions of the rest of architectural elements can be deduced.

3. Reconstruction of the image of the old basilica of S. Peter

There are several proposals for rebuilding the appearance that the old basilica must have had just at the end of its construction. Without a doubt the most successful proposals are those made by Bruno Maria Apollonj Ghetti, Hugo Brandenburg, Ralf Biering, Paolo Liverani, Alberto Carlo Carpiceci and G. Dibenedetto.

These proposals are very valid and help to better understand what the old basilica must have looked like just when it was built. However it is possible to provide more detail, correct certain errors and omissions, and slightly correct its dimensions.

Among the inaccuracies, errors or omissions that still exist to date, the following should be highlighted:

- The atrium, the side wings, and the rooms adjacent to the gate house must be defined in detail.
- The different relative unevenness between the floor levels of the warehouses, the narthex, the atrium and the gate house must be located and quantified.
- The design and architectural structure of the exedras must be corrected so that their design corresponds to those shown in a wide variety of historical references.
- The columns placed by Nicholas V on the piers of the Arch of Constantine must be defined.
- The general dimensions of the basilica must be corrected and completed so that they correspond to a greater number of historical references, and also be consistent with the design practice carried out in the design of a basilica typology. For this, it is vitally important that the design process carried out in the initial project can be properly deduced.
- The different dimensions of the different architectural elements of the basilica must be precisely defined.
- The buildings that have been attached to the basilica throughout history must be properly reconstructed, since they are so closely linked to the basilica that their presence is essential to understand its history.

In a complementary way, only Letarouilly has made proposals for the reconstruction of the possible aspect that the old basilica of S. Peter could have

had in the Middle Ages and in the Renaissance. His proposals are valuable, but in many cases, they do not coincide with various existing historical documents, perhaps because Laterouilly was not aware of them. In any case, their proposals only serve as a starting point to more accurately reconstruct (taking into account the historical documents available today) the appearance that the old basilica could have had in the Middle Ages (more or less half of its history) and in the Renaissance (shortly before its destruction had started).

4. Reconstruction of the construction process of the old basilica of S. Peter

Various historians and researchers have compiled historical information on certain construction activities in the old basilica of S. Peter and its nearby surroundings, such as Richard Krautheimer, Alberto Carlo Carpiceci, Hugo Brandenburg, Antonella Ballardini, Christof Thoenes, Paolo Liverani, Richard Gem, Rosamond Mckitterick, John Osborne, Pietro Zander, etc.

However, these researchers have hardly made specific graphic diagrams of certain parts of the old basilica, corresponding to a certain historical stage.

In addition, in the interpretation of several historical events there are discrepancies between some of these historians, so it has not yet been possible to make a sufficiently complete narrative to understand the construction process of the old basilica. Sometimes the positions between them seem forcibly opposed, and this makes it impossible to create a continuous story that can bring together and contextualize the available information.

5. Reconstruction of the design process for the new St. Peter's Basilica

The design process for the new basilica has been extensively studied in recent years, and countless historians and researchers have made contributions.

Among all these historians are Franz Wolff Metternich, Christoph Luitpold Frommel, Arnaldo Bruschi, Christof Thoenes, Franz Krauss, Federico Bellini, William Tronzo, etc.

Without a doubt, the most important graphic contributions are the drawings made by P. Foellbach, under the direction of Christoph Luitpold Frommel. This is the reconstruction to scale of some drawings made by Giuliano da Sangallo, Bramante and Fra Giocondo, representing their first projects for the new basilica of S. Peter.

6. Reconstruction of the construction process of the new basilica of S. Peter

The construction process of the new basilica has been described in considerable detail by several current historians, including Hugo Brandenburg, Antonella Ballardini, Christof Thoenes and Arnaldo Bruschi.

At present there is not a complete historical account that perfectly describes the construction process, but it can be considerably enriched based on the results and conclusions of the analysis of the different projects carried out, especially in the period between the years 1505 and 1520.

On the other hand, there is not a detailed graphic description showing the construction process of the new basilica, step by step, during its most significant stages. Undoubtedly, this graphic reconstruction would allow a better understanding of the construction process of the new basilica and adequately contextualize it in its built environment.

1.3. Objectives

The general objective of this Doctoral Thesis is to reconstruct the design and construction process of the old and new basilica of S. Peter in Vatican, and its close surroundings. In a complementary way, it is intended to reconstruct the evolution of the urban structure of the Vatican area, from its origin to the present day.

The reconstruction of the design and construction process will be carried out both in a descriptive way, and especially in a graphic way. The graphic representations will be made with great detail, and enormous precision, using the most advanced digital drawing tools.

The analysis and representation of the different stages of the design and construction process of the old basilica will be done using graphic representations in floor plans layouts, elevation layouts and section layout of the building, together with some construction details.

On the other hand, due to the enormous magnitude and complexity of the building, the analysis and representation of the different stages of the design and construction process of the new basilica will be executed only by means of a graphic representation in floor plan layouts.

Finally, the representation of the evolution of the urban structure of the Vatican area will be carried out using plan layouts, on a larger scale (in *palmi* and meters).

In addition to these general objectives, it is intended to achieve other particular sub-objectives, no less important.

1. Compile, sort and classify, by consecutive sequential stages, the bibliographic references available on construction activity in the Vatican area.
2. Collect information on the most representative buildings in the Vatican area. This includes information on the date of construction and demolition of each building, information on its architectural structure and its appearance, as well as information on the most important modifications they have had throughout their history.
3. Gather the available information on the architectural structure and appearance of the old basilica of S. Peter. This includes information on the materials and construction techniques used in its construction; and also information on the dimensions of the different architectural elements and spaces, information on the different interior spaces, information on the adjoining buildings, and in general information that helps define the old basilica of S. Peter.
4. Compile, sort and classify, by consecutive sequential stages, the bibliographic references related to the construction process of the old basilica of S. Peter.
5. Collect information on all the projects executed for the new basilica of S. Peter, by all the architects involved in the design process.
6. Analyze all the projects for the new basilica of S. Peter, to reconstruct, stage by stage, the design process carried out in each one of them.
7. Compile, sort and classify, by consecutive sequential stages, the bibliographic references related to the construction process of the new basilica of S. Peter
8. Reconstruct historically the design and construction process of the new basilica of S. Peter, especially from its initial stage.

1.4. Sources

To meet the objectives indicated in this Doctoral Thesis, the following sources have been used:

- Acquisition of a large number of books and specialized magazines.
- Compilation and acquisition of more than 230 historical articles published in different specialized magazines.
- Purchase of copies of several original drawings, in order to analyze the plans in detail, avoiding the mistakes that are usually made in regular publications, when making sequential copies or photographs of the same drawing. The acquisition of the drawings has been made mainly at the *Gallerie degli Uffici*.
- Direct measurements in the new basilica of S. Peter. The measurements have been made by conventional means (tape measures and laser meters), and also by a laser total station “Leica Viva TS16”, in order to make an exact model of the measurements of what is called "central nucleus of Bramante". That is, the dimensions and exact shape of the 4 crossing piers, and the adjacent counter-piers, as well as the separation between them.
- Acquisition of the cadastral plan of the urban area of the Vatican City, in digital format at very high resolution.
- Google Earth measurements of the Vatican City, and especially of the surroundings of the basilica.
- Direct analysis of several original archival documents, during an international stay at the Bibliotheca Hertziana (Max-Planck Institut für Kunstgeschichte), in Rome.

1.5. Methodology. Difficulties in analyzing the design and construction process of the basilica of S. Peter

Identifying the design and construction process of any building is a complex task, but by analyzing it in depth, the appropriate information to achieve it can be obtained. When analyzing a certain building, a set of geometric proportions and a set of determined dimensions can be identified and, as a consequence, a set of compositional rules can be identified, which provide valuable clues to identify its design process.

The design process of any architectural object is made up of a sequence of stages, and each stage corresponds to a certain state of the problem and the solution. At each stage, a set of decisions is made to move to the next stage, in such a way that the object to be designed evolves step by step, and it is outlined, from the first decision, until it is completely defined. In a complementary way,

and in order to ensure that a given architectural object is designed correctly and harmoniously, a certain set -homogeneous and well defined- of compositional rules must be applied on a recurring basis at all stages of the design process. Therefore, throughout the design process, the same set of geometric proportions, the same set of dimensions, and the same set of compositional strategies must be used. As a result, an architectural object will be obtained in which all its components are perfectly related to each other, and to the whole, through the same set of relationships, proportions and dimensions. In other words, a certain architectural object will be better designed, and it will be more attractive and harmonious, if the same set of rules are used repeatedly at all stages of the design process.

The harmonic relationship between the different architectural elements among themselves, and with the general architectural ensemble, that is, the harmonic relationships between the whole and the parts, was called "*concinnitas*" by the Renaissance architect Leon Battista Alberti [1]. Furthermore, in his architectural treatise, *De Re Aedificatoria*, described beauty in architecture as "*concinnitas*", alluding to the harmony or congruence of the various parts of an assembled building according to principles summarized in three categories: *numerus*, *finitio* and *collocation* [2].

In reality Alberti did not invent anything new with the term *concinnitas*, since in fact all the good architects in history had already been designing that way. And not only architects, but also writers and philosophers. For example, *Cicero* regarded the term *concinnitas* as the supreme quality of speech. A good speech is one in which not a single word is given more, nor less, and each and every one of the words is in its right place. And that is what Alberti declared in Book IV of his treatise that: "We judge optimal that thing that is made in such a way that it cannot be changed unless it is made worse" (IV: 277).

In general, the notion of beauty in Alberti is referred to the *concinnitas*, because beauty is a concinity (*composure?)* of all parties in relation to what they belong to and because *concinnitas* is a quality of the object that detracts when something is added to it, taken from it, or changed. The right object is the *probabilius*, the most approved of all, so that of the variations, *probatius*, of such an object, only in one is the *concinnitas* fulfilled (VI, I, 447).

Ut sit pulchritudo
quidemcerta cum rationeconcinnitas
universarumpartium in eo, cuiussint
itautaddi
autdimini
autimmutanpossit nihil,
quin improbabiliusreddatur. Alberti (VI, I, 447)

Therefore, it will be easier to identify the design process in a correctly designed building, than in a poorly designed building, and therefore it will have lower architectural quality. In a properly designed building, a set of compositional rules, geometric relationships and specific dimensions have been applied correctly and recurrently, and therefore it will be easier to discover them. On the other hand, if these compositional rules, proportions and dimensions have not been applied recurrently and properly, it will be more difficult to discover them.

The general methodology described has already been successfully applied in previous investigations, and the design process of some of the most attractive and relevant buildings in the history of architecture have been deduced [3]. In the analysis of these buildings, a set of sequential stages have been identified, from the first decision, up to when the building is completely designed. The first decision leads to the first stage, the second decision leads to the second stage, and so on. In general, each decision creates a new stage of the design process, so that the final stage coincides with the complete design of the building.

It is evident that in order to identify the set of stages, and therefore the design process followed in a given building, it must first be exhaustively analyzed. The analysis must include a multitude of aspects, such as, for example, the identification of the geometric and proportional relationships existing in the dimensions of each of the different architectural elements, the geometric and proportional relationships between various architectural elements, the geometric and proportional relationships between a certain element and the total set, etc. Certain dimensions that are important or relevant in the design of the building must also be identified, either from a symbolic or functional point of view. Finally, and most importantly, the compositional rules by which one passes from each of the design stages to the next must be identified.

Therefore, if you want to discover the design process followed in the basilica of S. Peter, the first thing to do is analyze the building in search of certain dimensions and geometric proportions, and as a result identify a set of tentative compositional rules, to find out the correct sequence of design stages, and the rules that allow you to go from one stage to the next.

However, the analysis of S. Peter's basilica is more complex than the analysis of most buildings for several reasons.

1. The basilica of S. Peter has been the result of the temporary concatenation of parts of complete projects carried out sequentially by various architects at different historical stages. Each architect carried out one or several projects, and of which only some parts were built. In the same way, the following architects carried out one or several projects respecting and integrating all or part of what was already built, but also of these new projects, only some parts were built. Thus, the process was repeated continuously until the building was completed.

2. At each stage of the design process (corresponding to different historical stages) several architects worked at the same time, collaborating and competing with each other.

2. The construction of the building took many years, so the compositional rules used initially differed significantly from the rules that were used in successive stages. In fact, even the desired objectives for the building were substantially different in every age.

3. The first designs of the new basilica of S. Peter showed a desire to respect and integrate with the old basilica which it was intended to replace. As evidenced in the *GDSU 20 A* drawing, Bramante, the first architect involved in the design process, wanted the width of the main nave and the transversal arms to correspond with the width of the central nave of the old basilica of S. Peter. In the same way, he wanted the main nave and the transverse arms to be geometrically related to each other by means of a regular octagon. This means that the genesis of the design process of the new basilica is based on some characteristics of the old basilica since it was desired, in a certain way, both were integrated. This means that to deduce the design process of the new basilica the design of the old basilica must be analyzed, and therefore its design process must also be deduced.

4. The old basilica of S. Peter does not exist, since it had started to be built in 324 and ended up being completely demolished in 1610. Therefore, its design cannot be analyzed by measuring directly

5. There is only one valid plan of the old basilica, which is also made by mixing the state that it had at the end of the 16th century, with the state that it might have had initially based on indications and conjectures. In addition, there are certain references and drawings and partial measurements in various historical sources. To make matters worse, each historical source provides a different set of measurements, and the measurements that are common to various historical sources are different from each other, and in many cases contradictory.

6. In the 40s of the last century, certain excavations were carried out to reach the foundations and the lower part of some walls and colonnades of the old basilica of S. Peter, so direct measurements were taken [4]. These measurements, although similar to those indicated in the historical sources, do not coincide with them (for reasons that will be indicated later).

With this large set of difficulties, it might seem impossible to deduce the design and construction process of both the old basilica and the new basilica. However, despite numerable obstacles, they have been overcome.

The specific difficulties related to the deduction of the design and construction process of the old and new basilica of S. Peter are set out below, and the work methodology that has been followed to resolve them and to achieve the proposed objective.

1.5.1. Difficulties in reconstructing the evolution, stage by stage, of the urban structure of the Vatican Area

The reconstruction of the evolution of the urban structure of the Vatican area (using scale plans) is extraordinarily complex. Its intention is to rebuild the urban mesh in the different representative stages of the Vatican's history by means of plans made to scale, and with the greatest possible precision.

There are hardly any plans since the 17th century, and only some have been done with precision. Previously, there were only rough drawings, and many of them are hardly conjecture, since the buildings are disproportionately and unrealistically represented. As we go into the past, the drawings are increasingly crude, schematic and disproportionate.

The task seems impossible to accomplish. However, taking as reference the historical buildings that still survive, and based on the existing historical references, it is possible to reconstruct with some precision, the structure of the urban mesh of the Vatican area, from its origins to the present day.

The resulting scale plans are of great importance for the History of Art, and can be very useful in several aspects, and they allow a better understanding of the history of the Vatican area, and especially its social, artistic, architectural and urban development. These plans also allow contextualizing isolated events in the history of art in the Vatican area and its immediate surroundings.They allow the visualization of the urban mesh of the surroundings of the Vatican area in each of its historical stages, provide a suitable context for the analysis of the historical evolution of the most important buildings in the Vatican area, such as the old Constantinian basilica, the new basilica of S. Peter, the Mausoleum of the Severan dynasty, the Mausoleum of Honorius, the Circus of Nero, and many others.

Of course, the reconstructed plans are not intended to be definitive, but rather a graphic environment that can be improved upon with future research by scholars of any building in the Vatican area. Based on new research, these plans can be enriched, and they can be modified, providing increasingly accurate and detailed information on the state of the urban structure of the Vatican area, in the different stages of its historical evolution.

1.5.2. Difficulties in identifying the design process of the old basilica of S. Peter

The old basilica of S. Peter probably began to be built in the year 324 (founding platform) by Constantine, in the time of Pope Sylvester I (314-335). It began to be demolished in 1505 and was demolished in 1610. Therefore, the building does not currently exist, and measurements cannot be directly made in order to analyze it properly as previously described. Fortunately, a drawing by Alfarano has been preserved, made in 1571 when the western part of the old basilica had already been demolished. In addition, several perspective drawings are available, and several texts describing some aspects and measurements of the building, although the dimensions provided by the historical sources often differ from each other, and in some cases are even contradictory.

To identify the design process of the old basilica of S. Peter with so little information available, a complex and slow strategy has been designed based on the repeated proposal of tentative hypotheses of the design process.

This strategy consists first in listing all the dimensions available in the different historical sources of different architectural elements of the old basilica. Remember that the measurements included in the historical documents could have been inaccurately and partially taken, or that there could even have been significant discrepancies between the project and the final execution of the building. The list of measurements must be made without initially rejecting any measurement, even though the dimensions for the same architectural element may be very different from each other.

Second, certain sequential compositional strategies of the design process should be roughly outlined. Different options should be identified to start the design process, and different alternatives for each specific stage of the design process.

Finally, all possible design strategies should be checked until one is found that differs as little as possible from the total set of measurements available in the historical references. Each tentative design strategy has a different way of generating the dimensions of the different architectural elements, so each time a certain architectural element is defined it must be compared with the available historical measurements. If the dimensions are similar, the design process continues, but if the dimensions of the generated architectural elements differ from the historical measurements, the tentative design strategy should be rejected, and another should be followed. In this way, different tentative design strategies are executed sequentially, until one is found in which the dimensions of the generated architectural elements coincide with the dimensions available in historical references. Logically, not all the dimensions generated will coincide with the dimensions of the historical references (since they differ from each other in the different historical texts). Therefore it is necessary to make estimates and determine which historical dimensions are viable (because they are compatible with the different design strategies), and which dimensions are not viable (because they cannot be generated geometrically through any design process). In this case these dimensions can be rejected, and other alternative measurements from other historical texts must be considered. Similarly, each

historical reference has differences in credibility, since, for example, a writer's measurements cannot bear the same weight as an architect's.

1.5.3. Difficulties in reconstructing the construction process of the old basilica of S. Peter

The main difficulty in identifying the construction process of the old basilica of S. Peter is the lack of historical references, and the reliability of early historical references (such as the first papal biographies of the *Liber Pontificalis*).

However, archaeological findings based on excavations done in the 1940s can complement the historical information. In addition, the knowledge of the construction details, the construction solutions and the materials used implies a certain foreseeable chronological order, as well as certain logical deadlines in the construction process. This architectural and constructive knowledge allows complementing archaeological evidence and historical information, and thus the construction process of the old basilica can be determined with considerable certainty from the beginning to the end of its construction.

Using the same strategy, it is possible to reliably determine the evolution of the old basilica's appearance from completion up to the point it was demolished, done to make way for the construction of the new basilica.

1.5.4. Difficulties in identifying the design process of the new basilica of S. Peter

In most buildings, and as in the case of the old basilica of S. Peter, the design process of a building precedes the construction process, and in any case, it takes place at different stages. However, the same has not happened in the case of the new basilica of S. Peter.

Visitors of the new basilica may have the feeling that all its spaces were designed at the same time and by the same architect, since apparently no substantial differences are observed in the architectural style or structure of the spaces. Many buildings whose construction has been prolonged seem like an incongruent concatenation of spaces made at different times and in different styles. On the other hand, and although the construction of the new basilica of S. Peter also lasted a long period of time, the building seems to have been designed once and built continuously. However, that was not the case.

Visitors of the new basilica of S. Peter walks through its spaces from west to east, but the history of its design and construction has been reversed, that is, it has passed from east to west. Its design and construction process were very tortuous and were plagued by all kinds of vicissitudes, and in total lasted about 200 years, from its beginning, in the time of Pope Nicholas V (1447-1455), to its end, in the time of the Pope Alexander VII (1655-1667).

For this reason, when narrating the history of the building, it may seem sound to adopt a logic of development from west to east. However, this would be a mistake, for three main reasons.

1. The first reason has to do with the fact that the construction process has resulted in a building that hides its genesis. From the beginning, in the days of Nicholas V, only a reform was desired that implied the temporal continuity, although transformed, of the old basilica. Notwithstanding, it mutated at the time of Julius II (1503-1513), and the idea of building a new building emerged. However, it was never clear to all those involved if a reform of the existing basilica was being carried out, or if a new basilica was being built, since the construction proceeded slowly from west to east, as parts of the old basilica were being demolished. Therefore, both basilicas (the old one and the new one) were linked throughout the construction process, and as the new one appeared, the old one disappeared. At the beginning of construction, in the time of Julius II, the new basilica was meant to testify to the primacy of the Bishop of Rome, constituting a *Templum Petri*. And this fact acquired more evidence as the work progressed, and even the counter-reform ideologues went so far as to deny any essential difference between the old and the new building, since although the *struttura* of the basilica was changing, it was not changing its essence [5]. Therefore, each new project aimed at the construction of a new basilica in its entirety, and the conceptions of the building did not proceed from each other, but overlapped and diluted each other, until they even reached to the physical destruction of certain parts already built [6]. Throughout the ages it has been known that only a homogeneous architecture could highlight the power of the Church of Rome, centered on the figure of the pope. Therefore, the chronology of the construction of S. Peter cannot be illustrated based on the evolution of the form, such as the growth of the trunk of a tree with its annual rings. The description remains linked to the narration, and vice versa. In other words, the design and construction process were continuously intertwined, and it is very difficult to be able to completely differentiate between them.

2. The second reason has to do with the long duration of the construction process. While the huge building was advancing very slowly (in the 16th century it was on average 1.4 m. per year), new popes and new architects had to replace those who already perished, and each had their own ideas, which simultaneously competed and collaborated at every moment. Consequently, an *eccedenza d'idee* was generated, which in some cases generated a huge gap between the design process and the construction process, and in a certain way generated a *virtuale* architecture by S. Peter, compared to the which material building appears as a weak image, containing only a fraction of the architecture that its designers had in mind. At certain stages of the process (for example, while Antonio da Sangallo was working on his latest wood model), the link between the design process and the construction project appears to have been completely disrupted. In addition, the already completed parts of the building put limits on the design process, since supposedly each project should respect and integrate what was built. However, this was not always the case. From the beginning of the design and construction process, Bramante started a double game, building at the same time the robust genesis of its project, "the central nucleus of Bramante", and its greatest obstacle: the apse of Julius II. Many later architects created a multitude of projects trying to integrate the apse of Julius II into them, so the result was not particularly attractive. Undoubtedly, the solution was to knock it down, as it was done years later. The same happened with Fra Giocondo niche, and with the southern ambulatory of Raffaello and Antonio da Sangallo, or with the construction of the first longitudinal body of Maderno.

Initially, the new architects, urged by the popes, tried to respect everything that was already built, but when analyzing their proposals, they realized how unattractive they were, so the solution was to demolish part of what was already built. That is, although in every era great effort was made to integrate what was previously built (based on projects by previous architects and previous ideas), the new projects (based on new ideas by new architects and new popes) were not adequate and there was no other choice but to demolish part of what was already built. In fact this was continuously the case, each stage of construction was followed by a stage of partial demolition, in order to continue construction based on a new project.

3. The third reason has to do with the enormous variations in the balance of decision-making powers over the work. Usually, there is a tendency to describe historical events from a general development perspective, and they narrate the facts in a simplified way. However, moments of unanimity between the actors involved in the construction of the

new basilica of S. Peter are very rare, and on the contrary, the general rule was antagonisms, or even conflicts, whose traces are found throughout its history.

On the one hand there were the popes, some very politically active, and endowed with great determination, and who indicated the direction to follow, such as Nicholas V, Julius II, Paul II, Sixtus V, Paul V, Urban VIII, or Alexander VIII. But also, in the *pontificati intermedi*, events of great importance for the future of construction occurred (for example, after the papacy of Julius II, a compromise was reached between innovators and conservatives, between desire and reality; or after the papacy of Paul III, the return to the ecclesiastical tradition and the cult of memory was agreed).

On the other hand, there were the architects who, during some pontificates, came to the fore, and in some cases, claimed command, as happened with Bramante, Michelangelo and Bernini, who led the construction under the power of their own arts. On the other hand, other architects had less character, and proceeded in a more or less creative way, under the directives of the papacy, such as Antonio da Sangallo or Maderno (Maderno was very flexible and not a fighter, but he had enormous talent and enormous capacity for work).

However, both popes and architects were involved in a company whose spatial and temporal magnitude went beyond their personal capabilities, even beyond the economic resources at their disposal. It was ultimately an impossible battle to win, and of which even the founding pope, Julius II, had realized in his last years of his life [7]. In fact, in the sixteenth century none of the protagonists of this story was destined to achieve the goal. Only in the 17th century were the means found to carry out the building according to its concept. Perhaps it is no coincidence that this coincided with the time when a great architect and a great pontiff (Bernini and Alexander VIII) were able to constructively collaborate.

The design process of the new basilica was formed by the sequential and additive concatenation of various projects carried out by various architects, making it a "process of design process". The first designs were made by Bramante, who also hurried to make the works progress as quickly as possible. He also began to build from the inside out, consolidating what I personally call "the central nucleus of Bramante" so his successors had no choice but to respect it, and thus safeguard the essence of his project. And indeed, it happened.

Therefore, the study of Bramante design process is of special importance for the identification of the design process of the new basilica of S. Peter. But the identification

of Bramante's design process, in addition to being the initial and essential part, is the most complex, both due to the absence of historical references and the characteristics of its own project methodology [8].

Bramante used a pyramid design methodology, during his stay in Milano and later in Rome. At first he only determined the location and general characteristics of the architectural elements, and later he would define them throughout the process, thus allowing him to gradually make substantial variations on them, and only in the details, but also in some parts of the floor plan. As if that were not enough, not only did he make changes before the works began, but he also made them throughout the execution of the works.

As he did in several of his buildings such as Belvedere, the Palazzo dei Tribunali, or the fortress of Civitavecchia, in Loreto, Bramante projected the entire building roughly, but geometrically defined its different components precisely.

Some parts of this project are susceptible even to considerable changes throughout the design process, not only from program reviews but also from new ideas that he himself may be generating (since, as Vasari says, Bramante is: "*risoluto, presto e bonissimo inventore*").

Bramante's design process before and after the start of the works was very tormented due undoubtedly to the discrepancies between his ideas and the requirements of Pope Julius II [9]. Based on the analysis of the drawings attributed to him, Bramante wanted to make a great building, in which all the architectural components were closely related to each other, forming a hierarchy of intertwined spaces. This objective was clearly utopian since the building had to consider on the one hand the requirements of Pope Julius II, and on the other hand seamlessly integrate with the old basilica all while taking into account a complex built environment. Therefore, once his first ideas were rejected by the pope, Bramante focused on achieving a new typology by integrating a quincunx typology with a typology of naves. In this way the building was reborn from the essence of the old basilica, retaining its own integrity and architectural purity while still extending longitudinally to the square. However, the biggest problem, unsolvable I would say, was the fact that the Pope wanted the foundations of Nicholas V to be used to house his own tomb. Clearly, this requirement was incompatible with Bramante's ideas, thus a stormy and ambiguous design process began. Of course, as he makes changes, new problems of all kinds arise, which Bramante tries to resolve by making new changes, and so on. In fact, the known projects of Bramante *GDSU 3*

A; GDSU 1 A; JSM codex Coner, f. 18; GDSU 7945 and GDSU 20 A do not correspond to what had started to be built, as represented in the famous *JSM drawing, codex Coner, F. 24v, ed. Ashby, n. 31*. This drawing shows the state of the works between the years 1515 and 1516, although Metternich and Frommel correctly point out that it also shows parts of the construction planned, but not yet built in 1515 [10].

Bramante did not completely define any project, nor did it define any project as definitive. However, it is obvious that he had to project its "central nucleus" in detail, as he began to build it immediately, and today it remains in the central part of the new basilica. This “central nucleus” was generated geometrically from the heart of the old basilica, and made possible both a centralized quincunx typology, as well as a longitudinal typology of naves.

After Bramante's death, and once the "central nucleus of Bramante" had been built, their successors had no choice but to adopt the same methodology. No project carried out was definitive, since all were, to paraphrase Arnaldo Bruschi, "*ipotesi di progetto*" [11]. Both the drafts, preparatory projects, discarded projects, definitive projects, delayed projects, approved projects, *ufficiali* projects made in parchment ... all are only "*ipotesi di progetto*". These hypotheses should be presented as possible solutions of maximum use for the execution, capable of being developed and deepened with the clarification of the details, but which could also be reviewed or discarded later. Furthermore, as is well known, it would not even be enough for Antonio da Sangallo, at the time of Paul III (1534-1549), to implement a grandiose and very expensive model and to advance considerably in construction to prevent Michelangelo from proposing a very different solution, and to initiate a process of enormously expensive and long-lasting demolition.

This singular way of working may have begun, at the will of Julius II, already in the period of intense planning activity that precedes the laying of the first stone, with the competence of Giuliano da Sangallo and Bramante and with the initial consultation of Fra Giocondo [12].

As a consequence of the above to deduce the design process of the *new S. Peter basilica*, all the projects of all the architects involved in the different stages throughout its construction must be compiled. Each project is valid as it provides valuable information. It is true that some projects were written to be executive, other projects were simply tentative proposals that showed a certain idea or a way forward, while

others were farfetched, since they were enormously large (outside the real economic possibilities and outside manageable deadlines), or were based on personal ideas without taking into account the real built environment, or the plans did not respect what was already built, or were simply theoretical treatises made as a result of what was learned, and which had little to do with real projects or with a commission. In any case, all the available projects must be analyzed, and based on the concatenation of their individual contributions, a plot line can be elaborated capable of chronologically integrating the different projects with each other, and capable of relating them in one way or another with the progress of the works. In addition, it is essential to geometrically identify the "central nucleus of Bramante" in order to understand the rest of the projects and establish a sequential narrative thread to define what has been called the "process of design process". There is not a single historical reference to the existence of the project for this "central nucleus of Bramante", but it undoubtedly must have existed since this nucleus was built, and therefore direct measurements can be made and reconstructed.

Once the "central nucleus of Bramante" has been identified and rebuilt, the projects carried out by *Bramante*'s successors can be understood, since they all respected it and integrated it into their proposals. And in this way the complex design process followed in the *new basilica of S. Peter* can be deduced.

1.5.5. Difficulties in reconstructing the construction process of the new basilica of S. Peter

The deduction of the construction process has the same difficulties already mentioned with respect to the design process since, as has been said, both were intertwined in time, with the additional difficulties indicated. Contrary to what happened with the old basilica, there are a large number of historical references documenting the different stages of the construction process, and there is only one large gap, corresponding to the most complex period, and at the same time the most attractive, which runs from the year 1504 (two years before the start of construction) until the year 1520. Precisely for this reason much more work has been dedicated to this crucial period, and especially to the period in which *Bramante* incubated his fabulous project, between the year 1504 and the start of construction in 1506.

The new basilica of S. Peter is a global reference for humanity in many ways, and its construction began thanks to the joint dream of two outstanding personalities, Pope Julius II (1503-1513) and Bramante. As Jacok Bruckhardt summarizes in a sublime way: "*Giulio trovó nella riedificazione di San Pietro il grandioso simbolo visible del proprio orientamento; l'impostazione voluta da Bramante è forse la massima espressione che si conosca di un potere accentrato*" [13].

The construction of the new basilica of S. Peter was full of all kinds of problems and vicissitudes, but the end result was great. Perhaps this is why many historians and researchers have been interested in reconstructing the construction process of the new Basilica of S. Peter.

Perhaps the first source that tries to give an idea of the chronology of the construction of the new Basilica is the book by Filippo Buonanni, *Numismata Summorum Pontificium Templi Vaticani Fabricam indicata, Chronologica ejusdem Fabricae narratione, ac multiplici eruditione explicate*, first published in Rome 1696 [14]. In this book an account is made of the papal medals related to the new basilica of S. Peter, complemented by different historical reviews and exhaustively documented. Thanks to this book, for example, Johann Wolfgang Goethe was able to get a very exact idea of the history of the new basilica and published it in 1786 in his work *Sämtliche Werke nach Epochen seines Schaffens. Münchener Ausgabe* [15].

Years later, researchers like Paul-Marie Letarouilly or Heinrich Geymüller did a fabulous job collecting, analyzing and classifying the enormous number of drawings from the *Uffici Gallery* in Florence. Letarouilly had to work in the *Uffici* before Geymüller although her work was published a little later. Geymüller published his work *Die ursprünglichen Entwürfe für Sanct Peter in Rom* in 1875 [16], while Letarouilly's work, *Le Vatican et la Basilique de Saint-Pierre de Rome*, began to be sold in 1878 edited by Alphonse Simil (architect assigned to the *Commission of Historical Monuments*) [17]. Geymüller had an important follower and collaborator in his time, Constantin Jovanotis, who remained in his shadow at all times, but published several works such as *Forschungenüber den Bau der Peterskirchezu Rom* [18], and *Zu den streitfragen in der Baugeschichte der Peterskirchezu Rom* [19]. Letatouilly's work continued to be investigated at all times although it caught the attention of the historian *Hubert*, who published *Bramantes St. Peter-Entwürfe und die Stellung des Apostelgrabes*, in 1988 [20].

In the 60s and 70s of the last century, historians Franz Wolf Metternich and Christoph Luitpold Frommel, among others, stood out. In fact, Frommel considering all the data previously collected and in order to illuminate Raffaello's intervention, proposed a great analytical reconstruction of the design activity carried out until 1520, the year of Raffaello's death [21].

Their keen observations provide an overview that can appear almost complete and exhaustive. But in reality, Frommel's proposal constitutes a more fundamental approach for the reconstruction of the tormented process of design and construction of the basilica between the years 1505 and 1520. It should not be forgotten, however, that the conceptual reconstruction of the different projects is based on scant historical data, and on a series of inductions and hypotheses from graphics and fragmentary texts that are sometimes apparently contradictory, and often imprecise or generic, and therefore susceptible to doubtful interpretations, and in many cases equivocal.

Metternich correctly observed that the most obvious gap in the graphical data runs from the studies of the drawing *GDSU 1 A* to the *JSM drawing, codex Coner, F. 24v, ed. Ashby, n. 31*, which records at least in part what had been built until the year 1515-1516 [22].

In the 80s and 90s researchers such as Franz Wolf Metternich, Christoph Luitpold Frommel, Arnaldo Bruschi, Christof Thoenes and some others, continued the conceptual and historical reconstruction of the design and construction of S. Peter in Vatican [23]. These researchers continued with the data collection process, which was still scarce and fragmentary, and with the process of creating a historical account that would attempt to coherently group these fragments.

To complement these fabulous works and enrich the identification of the construction process, answering many questions that still exist, all the projects carried out by all the architects involved in the construction process of the new basilica of S. Peter have been analyzed. Both the projects destined to be executed have been analyzed, as well as the projects that simply express an idea and that were destined to seduce clients, such as work projects, work sketches, specific problem-solving sketches, etc. analyzed all available graphic historical documents.

I have had a special dedication to the period between the years 1504 and 1520, and especially to the analysis of the first sketches by Bramante, Giuliano da Sangallo and Fra Giocondo, in order to adequately reconstruct the initial design process, and as a consequence have a correct idea of the first intentions and in this way am able to adequately reconstruct the construction process of the new basilica, especially in its first stage.

Evidently the paper has a gigantic scope, and in this Thesis, for reasons of limitation of the maximum admissible information, only a small part of the work carried out is shown.

1.6. Justification of the Doctoral Thesis structure

To meet the objectives set, the Thesis has been structured in three main parts.

a. Urban structure

Chapter 2. Reconstruction in stages of the urban structure of the Vatican area, from its origin to the present day

The first part identifies the evolution of the urban structure of the Vatican area in 28 stages, corresponding to significant historical dates. The reconstructed Vatican area integrates the entire current Vatican City, and part of the urban mesh of Rome around it.

Each stage is defined by means of scale plans (in meters and *palmi*) taken with the greatest possible detail. In the present Thesis they have been printed to occupy the dimension of a DIN A-4 sheet, although they can be reproduced on a larger and different scale, so that all the details can be appreciated. The graphics have been made for easy reading printed in a DIN A-3, or DIN A-2 size.

At each stage, the most relevant historical events that occurred in it are discussed, as well as the consequences they had on the urban structure of the Vatican area. All kinds of historical drawings and plans are provided, as well as the most important bibliographic references considered.

b. Old basilica

In the second part of the Doctoral Thesis, the old basilica of S. Peter is studied, based on four fundamental parts:

Chapter 3. Historical analysis of the design and construction process of the old basilica of S. Peter

In this chapter, a sequential reconstruction of the most relevant historical events regarding the process of design and construction of the old basilica is carried out, compiling and ordering all possible references from different bibliographic sources. In addition, and in order to be able to conveniently reconstruct its design, the functionality of the building throughout the Middle Ages is analyzed, as well as its relationship with its surroundings.

Chapter 4. Reconstruction in stages of the design process of the old basilica of S. Peter

In this chapter a sequential reconstruction of the design process carried out in the realization of the architectural project of the old basilica is done.

In order to properly reconstruct the design process, all possible information regarding the dimensions of the different architectural elements of the old basilica must be previously collected, based on the available bibliographic references. A compilation of the different available historical graphic references should also be made, to serve as a guide while reconstructing the design process.

The different stages of the design process will be made to scale, drawn with precision and bounded in the same units of measure standard in the Vatican area, and in which the project was initially realized (*roman feet*). Later converted to the standard units in the Vatican area during the Middle Ages and the Renaissance (*palmi "di architetti").*

In the first place, the design process in floor plan layout will be reconstructed, and secondly the design process in section. The design process of a building in Ancient Rome was basically done in floor plan layout, and then an elevation was made. Hardly any additional plans were made, due to various factors including the scarcity of paper or papyrus. Therefore, the floor plan layout and

section design process has been rebuilt, since they were probably the only plans that were made. In any case with these plans the project is sufficiently defined.
As a result, the plan and the main section of the old basilica will be completely and precisely defined, so it can be reconstructed as it might have looked just when it was finished.
To demonstrate the validity and veracity of the reconstructed design process, the dimensions of the different architectural elements built are compared with the dimensions specified in the different previously collected historical graphic documents, and it is evidenced that they basically coincide in their entirety.

Chapter 5. Graphic reconstruction of the most significant stages of the construction process and evolution of the old basilica of S. Peter (324-1503)
This chapter is divided into two main parts.
In the first part, a graphic and descriptive reconstruction of the construction process of the old basilica is carried out, from the beginning of the works, until it was completely built (as can be seen in Alfarano drawing).
In the second part, a graphic and descriptive reconstruction of the architectural evolution of the old basilica is carried out, from the completion of its construction until just before it was demolished, to make way for the construction of the new basilica.
The construction process will be carried out by drawing on the plan the state of the works in each of the most significant stages of the same. In the same way, the evolution of the state of the basilica over time will be carried out by drawing the appearance of the basilica in plan in each of the most significant stages of its history. The drawings have been made to scale and in full detail, showing not only the evolution of the basilica, but also the evolution of the buildings in its immediate surroundings. For the reconstruction of these buildings, a compilation and classification of the historical documents available in each era will be made again.
At the end of the process, the appearance of the old basilica in 1505 is obtained, drawn in plan and in full detail, together with the buildings in its nearby surroundings.

Chapter 6. Graphic reconstruction of the appearance of the old basilica of S. Peter, in the years 514, 1003 and 1505

Once the floor plan layout of the old basilica has been rebuilt in various stages of its history while considering the reconstructed section in chapter 4, it is possible to reconstruct in some detail what the old basilica might have looked like at different stages of its history.

In this chapter the complete appearance of the basilica is built in three fundamental stages of its existence: when its construction finished (year 514), in the middle of its existence (year 1003), and shortly before it began to be demolished (year 1505).

The reconstruction of the appearance of the old basilica in each of these stages will be carried out using the following plans: Floor plan layout, Cross section, Longitudinal section, South facade, East facade, East facade to the Atrium, West facade and virtual perspective images. All the plans will be drawn to scale, with the greatest possible detail, and with the most important dimensions in *roman feet* and in *palmi*. In a complementary way, the most important construction aspects shown in each plan will be justified based on the different historical references previously collected.

c. New basilica

In the third part of the Doctoral Thesis, the new basilica of S. Peter is studied, based on three fundamental parts:

Chapter 7. Historical analysis of the design and construction process of the new basilica of S. Peter

In this chapter, a historical reconstruction of the design and construction process is carried out, based on all the historical references collected. The design and construction process of the new basilica of St. Peter was extremely complex, and there are still many questions, especially in its first stage, from 1506 to 1520.

For this reason, in the first place, an exhaustive compilation of all available historical references has been made, and a first analysis of them has been carried out. Based on this analysis, a detailed classification has been made, showing the most significant stages of the design and construction process of

the new basilica. Finally, an exhaustive literary story has been made, sequentially describing in detail the design and construction process of the new basilica of S. Peter, according to all available historical references.

This detailed literary story allows us to adequately understand the complex framework of the design and construction process of the new basilica, considering not only the available historical references, but also the partial conclusions of the analysis of the projects of the architects involved. Therefore, the literary story in this chapter should be completed with the analysis of all the projects carried out in chapter 8, as well as in the reconstruction of the construction process carried out in chapter 9.

Chapter 8. Reconstruction in stages of the design process of the new basilica of S. Peter

This chapter reconstructs the design process for the new basilica of St. Peter. The design process was extremely complex and convoluted, and it is difficult to provide a sequential story so that it can be understood.

In general, the design process was carried out based on a group of architects who collaborated and competed, developing a huge number of proposals, which were mostly rejected by the promoter popes.

The different architects involved in the design process made a huge number of proposals. Most of the proposals were rejected, but even if they were accepted, in the best of cases, they were only partially built. As the design and construction process dragged on in time, the approved projects were systematically questioned by the following responsible popes and/or architects. In many cases, part of the previously built was demolished. Therefore, the design process for the new basilica is based on an enormous sequence of projects, but only some of them were partially built.

Therefore, to identify the design process of the new basilica, two complementary actions have been carried out.

1. On the one hand, all the projects of all the architects involved in the design process have been analyzed. Based on this analysis, the design process of all these projects has been reconstructed. The task has been very arduous and extensive, and due to space restrictions, the present doctoral thesis has only incorporated the reconstruction of the design process of the most important

projects in the design process of the new basilica of S. Peter. The sequence of these projects allows us to understand the evolution and transformation of architectural ideas that gave rise to the different executive projects.

2. On the other hand, the projects that in some of its parts were built have been analyzed. The sequence of these executive projects makes it possible to understand the executive design process of the new basilica. As a result of this analysis, this chapter reconstructs the stages of the design process of each project of chain of executive projects, directly involved in the design process of the new basilica of S. Peter.

Chapter 9. Graphic reconstruction, description and justification, of the most significant stages of the construction process of the new basilica of S. Peter

This chapter reconstructs the construction process in stages of the new basilica of St. Peter. The construction process will be carried out by drawing on the plan layouts the state of the works in each of its most significant stages. The floor plans layouts corresponding to the state of the works in each specific stage are drawn to scale, with all precision, and bounded in *palmi*. In each floor plan layout, not only the state of the works of the new basilica is shown, but also the state of the demolition of the old basilica, as well as the most important changes that have occurred in the buildings in its immediate surroundings.

The different floor plans layouts have been made considering the reconstruction of all the projects involved in the design process (and of which some part was built), as well as all the available historical references, shown in chapter 7.

As a result, a precise historical account (narrative and graphical) of the evolution of the construction process of the new basilica has been achieved, from the beginning of the construction process up to its completion.

Notes

[1] *Leonbattista Alberti, L'architettura* (*De re aedificatoria*), ed. e trad. di G. Orlandi, introduzione e note di P. Portoghesi, 2 vol. (Milano: Il Polifilo, 1966)

[2] One of the best references to illustrate the indicated concepts can be seen in: Robert W. Tavernor, *Concinnitas in the architectural theory and practice of Leon Battista Alberti*. PhD Thesis (Cambridge: University of Cambridge, 1985)

[3] This strategy has been widely used successfully, and documented in: Luis De Garrido, *Applications of Artificial Intelligence in the composition of architectural objects*. PhD. Thesis (Valencia: Universidad Politécnica de Valencia, 1989); Luis De Garrido, *Geometric relationships, dimensional deduction and sequential stages of the design process followed by Apollodorus of Damascus in the project of the Pantheon of Rome*. 2020. Submitted and under review.**;** Luis De Garrido, *Identification of the design process and the compositional mesh of the 'Vitruvian man', by Leonardo da Vinci. Applications for architectural design*. 2020. Submitted and under review; Luis De Garrido, *Reconstruction of the stages of the design process and architectural definition of the project of the old basilica of Saint Peter in Vatican*. 2020. Submitted and under review.

[4] There are several references to the excavations carried out under the current *new basilica of S. Peter*. Many of these references include certain measurements made of some architectural elements of the *old basilica of S. Peter*, especially the separation between the bases of the columns of the five naves, and their separation with the side perimeter walls: Bruno Maria Apollonj Ghetti, Antonio Ferrua, Enrico Josi, Engelbert Kirschbaum, *Esplorazioni sotto la confessione di San Pietro in Vaticano eseguite negli anni 1940-1949*, Bruno Maria Apollonj Ghetti, Antonio Ferrua, Enrico Josi, Engelbert Kirschbaum, Prefazione di Mons, L. Kaas (eds.), Appendice numismática di C. Serafini, 2 vols. (Città del Vaticano: Tipografia Poliglotta Vaticana, 1951); Richard Krautheimer, Spencer Corbett, Alfred K. Frazer, and Wolfgang Frankl (eds.), *Corpus Basilicarum Christianarum Romae. The Early Christian Basilicas of Rome* (IV-IX cent.), 5 vols. (Vatican City, 1937-77); Alberto Carlo Carpiceci and Richard Krautheimer, 'Nuovi dati sull'antica basilica di S. Pietro in Vaticano', in *Bollettino d'Arte* 93-4, (1995), 1-70, 95; (1996), 1-84; Jocelyn Mary Catherine Toynbee, and John Brian Ward-Perkins, *The Shrine of Saint Peter and the Vatican Excavations* (London: Pantheon Books,, 1956); Engelbert Kirschbaum, *The Tombs of Saint Peter and Saint* Paul, John Murray S. J. (Translator), CBCR, V., 165-279, (London: St. Martin's Press, 1959); Jonathan M. Hall, 'The Bones of Sant Peter', in *Artifact and Artifice. Classical Archeology and the*

Ancient Historian (Chicago and London: The University of Chicago Press, 2014), 187-206; Pietro Zander, *La Necropoli di San Pietro. Arte e Fede nei sotterranei della Basilica Vaticana* (Fabbrica di San Pietro in Vaticano: Elio de Rosa Editore, 2014)

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[8] Arnaldo Bruschi, 'Problemi del San Pietro bramantesco', in Arnaldo Bruschi, Christoph Luitpold Frommel, Franz Graf Wolff Metternich, Christof Thoenes (coords.), *San Pietro che non c'è: da Bramante a Sangallo il Giovane*, Cristiano Tessari (ed.) (Milano: Electa, 1996), p. 119

[9] Arnaldo Bruschi, *Problemi del San Pietro bramantesco*, 120

[10] Christoph Luitpold. Frommel, 'San Pietro, Storia della sua construzione', in C.L. Frommel, L. Christph, S. Ray, M. Tafuri, *Raffaello architetto* (Milano, 1984), p. 264

[11] Arnaldo Bruschi, 'Le idée del Peruzzi per il nuovo San Pietro', in Arnaldo Bruschi, Christoph Luitpold Frommel, Franz Graf Wolff Metternich, Christof Thoenes (coords.), *San Pietro che non c'è: da Bramante a Sangallo il Giovane*, Cristiano Tessari (ed.) (Milano: Electa, 1996), p. 201

[12] Franz G. Wolff Metternich, and Christof Thoenes, *Die frühen St. Peter-Entwürfe*, 1505-1514 (Tübingen, 1987)

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[19] Constantin A. Jovanotis, *Zu den streitfragen in der Baugeschichte der Peterskirche zu Rom* (Wien, 1878)

[20] Hans Hubert, Bramantes St. Peter-Entwürfe und die Stellung des Apostelgrabes, in *Zeitschrift für Kunstgeschichte*, 51 (Berlin, 1988), pp. 195-211

[21] Christoph Luitpold Frommel, *San Pietro, Storia della sua construzione*, 241-310

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[23] There is an innumerable amount of work by these researchers, but to get a general idea of their research and especially during the less known period on the design and construction process of the new basilica, between the years 1505 and 1520, the best reference is: Arnaldo Bruschi, Christoph Luitpold Frommel, Franz Graf Wolff Metternich, Christof Thoenes (coords.), *San Pietro che non c'è: da Bramante a Sangallo il Giovane*, Cristiano Tessari (ed.) (Milano: Electa, 1996), To have a general idea about the design and construction of the new basilica without a doubt the most complete reference is: Hugo Brandenburg; Antonella Ballardini; and Christof Thoenes, *San Pietro. Storia di un Monumento* (Milano: Jaca Book, 2015)

CHAPTER 2

"Jesus himself, and most of the message of the Gospels, is a message of service to the poor, a critique of the rich and powerful, and a pacifist doctrine. And it stayed that way, that's how Christianity was ... until Constantine"

Noam Chomsk

Chapter 2. Reconstruction in stages of the urban structure of the Vatican area, from its origin to the present day.

2.1. Objectives

This chapter reconstructs the evolution of the urban structure of the Vatican area at different dates throughout history, from the time there are historical references to the present day.

In the first place, the most characteristic dates of the evolution of the urban structure of the Vatican area have been identified, coinciding with some of the most important events that took place in it throughout its history.

The situation of the urban structure in each of the chosen historical stages is represented graphically, making scale plans (with measurements in meters and palmi) with all possible precision, detailing the state of the different constructions, public spaces, gardens, roads and fields, and describing the most important changes that have occurred from the previous stage.

The most important and representative buildings are represented on the ground floor, showing the distribution of their spaces in detail. On the other hand, the rest of the buildings will be represented only as a plot, with the sole purpose of delimiting the built part from the non-built part.

In a complementary way, for each stage a compilation of the most important historical events related to the Vatican area has been made, making special reference to the construction and demolition of the most important buildings, walls, roads, paths, and in general, to the most important changes that may have occurred in the urban structure.

2.2. Identification of the most relevant historical dates in the evolution of the urban structure of the Vatican area

The dates have been chosen for their relationship with the most relevant historical events that have occurred throughout history and that, in one way or another, have been able to influence the evolution of the urban structure of the Vatican area.

At least one date per century has been chosen, although the speed of the changes has been very different throughout history in each stage. In the High Middle Ages, the changes in the urban structure of the Vatican area were very slow and there were hardly any relevant historical milestones (especially between the 10th and 12th centuries), for this reason an indeterminate date was simply chosen more or less in the middle of each

century. In other cases, as in the Renaissance, the built environment underwent major changes in a short period of time, and therefore the dates associated with these changes have been chosen, and in some cases several dates per century.

The most recent historical dates correspond to the existence of historical plans of the urban structure of the Vatican area. Therefore, in the first place, these historical plans have been rebuilt to scale and with all possible precision. In this way, this scale plan serves as a reference to reconstruct the previous stage, based on the historical information available at that stage. Following this process, each scale plan that is made serves as a reference to draw the previous plan to scale. And so on until the first stage.

The dates chosen are the following:

Stage 1. 100 B.C. *Etruscan necropolis* along *Via Triunfalis* and *Via Cornelia*
Stage 2. 50 B.C. Settlement of houses of noble families in the area
Stage 3. 33 A.D. Beginning of the construction of *circus of Caligula*
Stage 4. 64 A.D. *Peter* (30?-64?). Great fire of Rome
Stage 5. 117 A.D. *Alexander I* (107-115). *Vaticanus necropolis* construction
Stage 6. 139 A.D. *Pius I* (140-155). Construction of *Mausoleum of Hadrian*
Stage 7. 217 A.D. *Zephyrinus* (199-217). Construction of *Severan Mausoleum*
Stage 8. 325 A.D. *Sylvester I* (314-335). Construction of platform and *Constantine Arch*
Stage 9. 399 A.D. *Siricius* (384-399). Construction of *Mausoleum of Honorius*
Stage 10. 484 A.D. *Simplicius* (468-483). Construction of lateral wings of the atrium
Stage 11. 514 A.D. *Symmachus* (498-514). O*ld basilica of S. Peter* finished
Stage 12. 650 A.D. *Martin I* (649-655). Expansion of Christian pilgrimage
Stage 13. 852 A.D. *Leo IV* (847-855). *Leonine walls*
Stage 14. 1003 A.D. *Silvester II* (999-1003). Beginning of the *late middle ages*
Stage 15. 1124 A.D. *Callixtus II* (1119-1124). 1123. First *council of the Lateran*
Stage 16. 1216 A.D. *Innocent III* (1198-1216). Beginning of the *Apostolic palace*
Stage 17. 1280 A.D. *Nicholas III* (1277-1280). Extension of the *Apostolic palace*
Stage 18. 1378 A.D. *Gregorius XI* (1370-1378). Re-establishing of pontifical see in Rome
Stage 19. 1464 A.D. *Nicholas V* (1447-1455). Reform project *old basilica of S. Peter*
Stage 20. 1503 A.D. *Alexander VI* (1492-1503). Opening of *Via Alessandrina*
Stage 21. 1514 A.D. *Leo X* (1513-1521). Death of *Bramante*
Stage 22. 1564 A.D. *Pius IV* (1560-1565). Death of *Michelangelo*
Stage 23. 1589 A.D. *Sixtus V* (1585-1590). The dome of *new S. Peter* is finished
Stage 24. 1667 A.D. *Alexander VII* (1655-1667). New *basilica of S. Peter* is finished
Stage 25. 1748 A.D. *Benedict XIV* (1740-1758). Plan by *Giambattista Nolli*

Stage 26. 1883 A.D. *Leo XIII* (1878-1903). First urbanistic plan of Rome
Stage 27. 1950 A.D. *Pius XII* (1939-1958). Inauguration of *Via della Conciliazione*
Stage 28. 2020 A.D. *Francis I* (2013-)

2.3. Methodology followed for the graphic reconstruction in stages of the evolution of the urban structure of the Vatican area

In order to describe and graphically represent the state of the urban structure of the Vatican area in each of the previously chosen stages, a somewhat complex methodology based on the following stages has been followed:

Stage 1. Collection of information and preparation of work plans

This stage includes 7 consecutive actions:

1. Compilation of graphic material classified by stages (urban plans, aerial views, engravings, sketches, drawings, paintings ...).
2. Compilation of the most important bibliography referring to each stage.
3. Classification of the most important historical events that occurred in each stage.
4. Obtaining the “cadastral plan” of the current urban structure of the Vatican City, in the year 2020 (Fig. 2.1).
5. Superimposition to scale of the current cadastral plan with the “plan of archaeological excavations” carried out by Paolo Liverani [1] (Fig. 2.2).
6. Preparation of the “work plan” for each stage, superimposing the cadastral plan of the current urban structure with the plan of archaeological excavations by Liverani. The "work plan" of each stage must be complemented, superimposing the already defined plan layout corresponding to the one consecutively later in time, and highlighting the buildings that have survived to this day and that already existed in each stage.
7. Location of buildings, constructions, roads, urban elements and geographical elements that have survived to this day, in the work plan of the stages in which these constructions and geographical elements existed.

Stage 2. Realization of the urban plans, stage by stage, inversely in time from the present day to the most remote stage.

This stage consists of a reverse design process, from the current stage to the first stage.

First of all, the urban plan corresponding to the current stage (year 2020) must be carried out, starting from the cadastral plan of the Vatican area, and carrying out all the measurements considered necessary in situ.

Starting from the plan of the current stage, the plan corresponding to the previous stage (year 1950) can be made, adding, eliminating or modifying details with respect to the current plan. To carry out this transformation work, all the graphic material available from the previous stage must be analyzed (urban plans, photographs, drawings, building plans, paintings, etc.), in order to know all the changes that have occurred between them.

Starting from this stage (1950), the plan of the immediately previous stage (year 1883) can be reconstructed, taking into account the first urban planning plan of Rome, carried out in that same year, and all the historical information available, regarding the changes that have occurred between these two stages.

Following this process, starting from this stage (1883), the immediately preceding stage (year 1748) can be reconstructed, since the map of Giambattista Nolli (1748) and others, are available, and all the historical information collected between these two stages.

To draw up the map corresponding to the immediately preceding stage (1667), the map drawn up by Giovanni Battista Falda in 1676 is especially useful. The information contained in this map must be supplemented with other available maps and the historical information collected.

The drawing made by Antonio Tempesta in 1593 is very useful for drawing up the corresponding plan for the immediately preceding stage (year 1589). Again, the information contained in this drawing must be supplemented with other maps and drawings, and the available historical information

In order to draw up the plan corresponding to the immediately preceding stage (year 1564), the drawing made by Étienne Dupérac and Antonio Lefreri, in 1577, is especially useful. The plan made by Leonardo Bufalini, in 1551, also helps, supplemented with other maps and all available historical information.

To make the plan corresponding to the immediately preceding stages (year 1514 and year 1503), it can be used the drawing made by Hartmann Schedel, in 1493, together with all available historical references.

In order to carry out the plans corresponding to the previous stages, no historical plans are available, so they must be made taking into account only the historical information available, so that their precision and reliability is becoming less and less. However,

following this methodology, to make the plans for each stage, the plans for the immediately subsequent stages are arranged, which have been prepared with the greatest possible rigor.

In general, once the map corresponding to the urban situation of each stage has been drawn, it is used as a starting point to draw up the map of the consecutively previous stage, taking into account all the available historical information. Therefore, each new plane will serve as a starting point to elaborate the plan of the consecutively previous stage, and so on, until the plan of the first stage is reconstructed.

Following this strategy, the plan of each stage can be reconstructed based on making small changes with respect to the immediately later stage, taking into account all the historical information and graphic material available for each stage.

Obviously, as we go into the past, the available historical and graphic material is less and less reliable. At a certain point, photographs cease to exist and are replaced by scale plans, scale plans are replaced by approximate plans, plans become drawings of aerial views, and as we move into the past, aerial views are becoming more rudimentary and fanciful. In this way, the level of error in the information available increases, and it accumulates slightly as we go back into the past.

Despite this level of error or incremental inaccuracy as we go into the past (both the graphic material and the historical references), it is compensated by the designed work methodology, since some buildings are represented in a crude way and disproportionate in the old graphic material, corresponding to a certain stage, it was already fully located and precisely defined in the later stage.

The buildings that have survived to the present day must be located in all the stages in which these buildings existed. Once correctly located, these buildings become an immovable reference for the location of the rest of the buildings that are shown in the historical drawings corresponding to each stage. Therefore, the available historical drawings, even if they have been made in a crude, disproportionate or imprecise way, serve as a script to locate the buildings and objects represented in them. Historical drawings contain all kinds of references that allow the buildings represented in them to be located and drawn precisely, once the reference buildings have been drawn correctly.

That is to say, the buildings represented in the historical graphic material available for each stage, become perfect references to locate the rest of the buildings represented and that have not survived to the present day.

In the Vatican area there are several references that have remained immovable with the passage of time and that serve as a great help to relocate, and draw to scale, the buildings represented in the different engravings of the time, which were often made simply documentary or symbolic. These references are: The Castel Sant'Angelo, the Leonine wall (Leo IV), the wall of Pius IV, and the basilica of S. Peter.

It is true that the new basilica of S. Peter has a recent existence, but since the exact and precise relationship it had with respect to the old basilica of Constantine is known, it can be located with all precision, and therefore the adjacent imperial mausoleums can also be located (In addition, the eastern mausoleum can be perfectly located since there are archaeological remains).

Triangulating the relative position of all the buildings with respect to these “reference-buildings”, and with the help of the available historical plans and Liverani's excavation plan, you can be sure that you are making plans with enough precision.

2.4. Strategy to make accurate and scaled plans for each stage

As has been indicated, some of the relevant dates in the evolution of the urban structure of the Vatican area have been chosen because urban plans were made on those dates. This is the case, for example, of stages 25 and 26, corresponding respectively to the plan by Giambattista Nolli, made in 1748, and to the plan of the first urban planning of Rome, made in 1883.

The reconstruction of these stages has been very simple, since they were drawn with enormous precision, so that, starting from the current topographic plans, proceeding in the way indicated, they have been reconstructed with precision, and hardly any minor tweaks have been made with respect to the historical plans. Small dimensional adjustments have simply been made, small inaccuracies have been corrected, and the graphics used have been changed (so that all stages have the same graphics).

However, in most of the historical dates chosen, no detailed plans were made and there are hardly any engravings in distorted perspective, paintings, or partial drawings without scale. In these cases, this graphic material must be analyzed in detail and a list of the changes that can be seen in them with respect to the scale plan already made corresponding to the immediately subsequent period must be done.

In some specific aspects, for which there is no graphic material, reliable historical assumptions must be made, and appropriately graphed (for example, on the size of the

vineyards, the position of the agricultural houses associated with them, the position of the trees, etc. …).

The historical plans corresponding to each stage provide general information on the situation of the Vatican area at the time they were made. However, these plans are not to scale, and show serious dimensional errors. Some buildings are too big, others too small, others simply deformed ... Generally, the most important buildings are usually drawn larger, instead, the less important buildings were drawn smaller than they were. These plans and drawings are actually approximate and distorted representations of the reality they represented. Narrow streets are represented smaller than they were, trees are usually graphed with a larger relative size, and in many cases less important buildings were not even represented.

Therefore, to redraw these historical plans to scale and represent truthfully the built environment of a certain period, three complementary actions have been carried out:

1. Confirm the existence of the represented buildings, and find out if there were more buildings than those represented at the time. To do this, the graphic documentation that has been collected from each period must be carefully examined (including plans, perspective engravings, paintings, sketches, etc.). It is usual for a certain building to appear represented in a certain way in one drawing, and in a different way in another drawing. Furthermore, the same building may appear with one size in one drawing, and with another size in another; it may even appear in some drawings and not appear in others. Therefore, it is important to know the expertise of the author, as well as his training, his specific interests, his cultural background and even his specific interests when drawing. Based on this information, credibility criteria can be established, and therefore each of the collected drawings can be properly assessed.

2. Carry out an intense documentary investigation, compiling as many historical references as possible about the reality represented in each one of the planes that are intended to be reconstructed to scale. This allows knowing details of some buildings that existed at that time, and that from their written description could be represented graphically with some precision.

3. Carry out a dimensional and proportional adjustment in each historical stage with respect to the reference-buildings, and with respect to the immediately later

stage, previously drawn to scale. The objective is to reconstruct and redraw the existing historical plans, but to scale and in a proportional and precise way. Based on the scale plan already made corresponding to an immediately later stage, the appropriate changes are made, having as a script the available historical plans corresponding to the current stage. As the reference-buildings are know in detail, and also all the buildings of the immediately later stage, the buildings of the current stage can be drawn with certain precision.

2.5. Reconstruction of the most important stages of the evolution of the urban structure of the Vatican area

Based on the methodology described, it has been possible to identify the state of the urban structure of the Vatican area in each stage. Obviously these plans, although they are represented to scale and with all precision, contain certain inaccuracies and errors, which increase when the stages are older, since much less historical material is available.

The plans corresponding to each stage are shown below, describing the most relevant historical events, and the most important changes in the urban structure.

Stage 1. 100 B.C.

Etruscan necropolis along Via Triunfalis and Via Cornelia (Plan layout UE 1)

The appearance of the urban structure of the Vatican area in 100 B.C. it is uncertain, since there is hardly any information about it, and the same can be said even about the origin of the name *Vaticanus*. Some researchers are of the opinion that the name comes from the Etruscan goddess *Vatica*, to whom a temple was erected in the area. On the other hand, other researchers think that the name comes from a hallucinogenic herb that grew on the slope of *Mons Vaticanus* [2]. A third theory is that the Etruscan people who occupied the area were called *Vatucum*.

This hill, located to the west of the Tiber river and outside the city limits, has housed a necropolis since Etruscan times. There are hardly any remains of this necropolis, but as is known, in an approximate way, the route of the path that connected the Etruscan necropolis with the city of Rome, and how we have certain information about the structure of other Etruscan necropolis whose remains have reached our days, it is possible to at least hint what this necropolis looked like.

On the other hand, it is known that near the necropolis, there were several temples, such as the *Templus Martius*, or the temple dedicated to the goddess *Cybele* (*Phrygianum*) [3] built around 191 BC, which had to be demolished in the construction of the great foundation platform from the old basilica, in the year 324 [4]. The location of this temple is known, located at point 51 of the archaeological plan of Paolo Liverani (Fig. 2.2). To the east of the river was the *Campus Martius*, an area located to the north of the Servian walls, and which was so named because from very ancient times there was an altar dedicated to Mars, mentioned in the laws attributed to *Numa Pompilius*, second king of Rome, after *Romulus*. In the year 388 B.C. the consular tribute Tito Quincio Cincinato Capitolino, erected a new temple to this god, to fulfill a vow made on the occasion of the invasion of the Gauls. At the time of the Republic it was a place for armies to camp, and for military exercises. Chariot races were also held on *Campus Martius*, and horse stables were located. There was also the *Trigarium* pool, a public beach where you could go swimming, and right at the bend of the river there were springs of thermal mineral water with healing properties, called *Tarentum*. In 5th century B.C. a temple dedicated to *Apollo*, who was considered the protector of health, was built in *Campus Martius*.

Stage 2. 50 B.C.

Settlement of houses of noble families in the area (Plan layout UE 2)

The grounds of the *Mons Vaticanus*, close to the Etruscan necropolis, were used basically for growing vineyards and as a burial area, and there were hardly any small buildings for agricultural use. For this reason, several noble families acquire land in the area, seeking to escape the bustle of the city, in which they build large gardens with weekend houses, such as the *Horti Agrippina* and the *Horti Domitiae*.

Funerary monuments were also built at this time, such as the Meta *Romuli* pyramid (at the crossroads between Via *Cornelia* and Via *Triumfalis*), and the *Terebinthus Neronis* [6] mausoleum, which soon became a symbol of the *Vatican area*. These constructions appear in various drawings and plans, for example in the fresco *Visione della croce* from the school of Raffaello Sanzio, dating from 1520-1524, located in the Sala di Constantino in the Vatican, and attributed to Giulio Romano and Raffaellino del Colle (Fig. 2.3). The *Meta Romuli* can also be clearly seen in Leonardo Bufalini's plan, made in 1551 (Figs. 2.4a and 2.4b).

During this time, a wooden bridge was most likely built, undoubtedly a precursor of the *Pons Neronianus* [7], in order to communicate the area of *Campus Martius* with the Vatican fields where the imperial family had properties along the *Via Cornelia*. There is no evidence of this wooden bridge, nor is there any evidence that Nero built the bridge that bears his name in stone, as a substitute for the wooden bridge.

The region near the bridge had the name "the plain(s) of Nero" until the middle ages. For this reason, the citizens of Rome, without knowing the origin of the ruined bridge, named it after the area in which it was located, and not after the name of the emperor that it supposedly built. In any case, it is evident that if some of the most powerful families in Rome built their mansions on the other side of the river, would demand that a bridge be built with all immediacy in order to access them. It is possible that initially a temporary wooden bridge was built, and that a few years later, another stone bridge was built to replace the previous one made of wood. However, both had to be done quickly and hastily, since the *Pons Neuronianus* sank by itself in the fourth century, and was never rebuilt.

The *Pons Neuronianus* is mentioned in *Mirabilia* (II) (Graphia 10) *"...pons Neronis id est pons ruptus ad s. Spiritum in Sassia...*" (Anon. Magi. 158, Urlichs), and it was already in this ruinous in the fifteenth century, and probably already in the fourth century, since it has not been mentioned again since then in any text. Still today there are remains of the pillars in the lower part of the river (NS 1909, 13; BC 1909, 124-125), and they can be seen when it has little water [8].

Stage 3. 33 A.D.

Beginning of the construction of *circus of Caligula* (Plan layout UE 3)

On the Vatican hill, outside the city of Rome, the construction of the Circus of Nero began on what was formerly the Etruscan necropolis. The work begins with Caligula (37-41) and ends with Nero (54-68). The circus was private and there were horse and chariot races, and only on some occasions was it open to the public. At the end of the construction of the circus, in AD 37, the emperor Caligula transported an obelisk from Alexandria to Rome, as described by Pliny the Elder in his *Naturalis Historia* (16.76.201), and later it was installed in the *spina* of the circus, where it would remain until 1586, when it moved to the place where it is today [9].

The circus was built longitudinally along an east-west axis, with the entrance on the east side (as the west side was partially carved into the hill). The exact dimensions and

position of the circus are not known exactly, but it can be deduced based on the archaeological plan of Paolo Liverani, in "*La topografia antica del vaticano*" (Fig. 2.2 detail). This map shows archaeological evidence of the circus prisons at point 21 on the map. In the same way, evidence of a wall structure is shown at point 79, which could be from the circular west wall of the circus (as Magi thinks [10]), and at point 78 there are mosaics, which agree with the mosaic of the perimeter gallery of the circus in the western part. The distance between points 78 and 79 with point 21 agrees with the measurements assumed for a circus, based on the architectural structure of Roman circuses that have survived to this day. The location of the obelisk is also precisely known, located on the *spina* of the circus (point 57).

For the location of some roads, both in the Vatican area and on the other side of the river, the plan made by Rodolfo Amedero Lanciani in 1901[11] has been taken into account (Figs. 2.5a and 2.5b), and also the fabulous plane "*View of Ancient Rome*", by Étienne Dupérac (Figs. 2.6a and 2.6b). Along the road that runs along the north face of the circus, warehouses for construction materials and auxiliary activities began to be built, due to the construction activity promoted by the circus.

Stage 4. 64 A.D. Peter (30?-64?) (Plan layout UE 4)

Great fire of Rome

For the reconstruction of the urban mesh of the Vatican area this year, the plan *Le piante di Roma* made by Giuseppe Luigi and Italo Gismondi, of *Roma Antica*, made in 1949 (Figs. 2.7a and 2.7b), the drawing *Antiquae Urbis Romae Imago accuratissime ex vetustis monumentis formata* made by Pirro Ligorio *i*n 1551, which shows the Circus of Nero (also named Circus of Caligula), the Circus of Hadrian, and the Mausoleum of Hadrian (Figs. 2.8a, 2.8b), and also the drawing *Urbis Romae totius olim orbis domitricis situs, cum adhuc extrantibus sacrosanetae vetustatis monumentis*, made by Pirro Ligorio in 1570 (Figs. 2.9a, 2.9b).

On the other hand, and with respect to the Circus of Nero, Christian tradition assures that the Apostle Peter arrived in Rome between the years 64 and 68, under the mandate of Nero, and that he was martyred in the circus and buried near it and near of the imperial villa. Although these facts have been continuously refuted and doubted by scholars and historians, Christians assure that the remains of the Apostle Peter lay in a small tomb in the *Vaticanus necropolis*, and from the moment of his death many Christians began an incessant pilgrimage until this place.

While the circus was still standing, a series of small funerary buildings began to be built on its north side, as can be seen in the plan of the Liverani excavations in 1999 (Fig. 2.2).

After the great fire in Rome, many of those affected (who lost their houses in the fire) were temporarily housed in buildings within *Campus Martius*. Many of these refugees, whether poor or rich, were eventually forced to reside outside the city [12]. For this reason, the *Campus Martius* was rapidly urbanized, especially in the northern area adjacent to the river, streets were laid out orthogonally, in north-south and east-west directions, and a large number of buildings began to be built temporarily. The most important road, in an east-west direction, and very close to the river, was the *Via Recta*, whose layout was barely altered and became Via dei Coronari in the Renaissance, and which has been preserved to this day.

Stage 5. 117 A.D. *Alexander I* (107-115) (Plan layout UE 5)

***Vaticanus necropolis* construction**

The construction of the *Vaticanus Necropolis* begins along the north face of the Circus Gai Et Nerons, when it fell into disuse at the end of the second century [13]. The area was divided and assigned to individuals for the construction of tombs belonging to the necropolis.

At this time, burials within the walls were prohibited, and for various reasons, freedmen (slaves who had obtained freedom and had small fortunes) were the social group that preferred to be buried in this area, since although it was on the other side from the river, it remained connected to the city by two bridges [14].

Stage 6. 139 A.D. *Pius I* (140-155)

Construction of *Mausoleum of Hadrian* (Plan layout UE 6)

The work of the Mausoleum of Hadrian began in the year 135 by the emperor Hadrian, with the aim of making it his personal and family mausoleum, although it was completed by Antonio Pio in 139 [15]. The mausoleum was built north of the *Campus Martius*, on the other side of the river, and to communicate directly with the city, the *Pons Elius* was built in the year 134 [16].

According to the drawings made by Letarouilly (Fig. 2.10), it appears that in those times there were few constructions in the area, and the great constructions that occupy the

urban landscape are the Circus of Nero, the Circus of Hadrian, the Mausoleum of Hadrian and the great gardens of *Agrippina*. *Pons Neronis* was the only link and connection with the city of *Rome* until the construction of the *Pons Elius*, it crosses the river and adjoins two major avenues, the *Via Triunphais* in a north direction and the *Via Cornelia* that goes west in the direction of the *circus of Nero*. Very close to the south face of the circus is the old *Templus Martius* that later fell into disuse. Along the *Via Cornelia*, small constructions for the sale of construction materials and crafts continue to be consolidated, due to the increase in construction activity in the area. Along the north face of the circus the *Vaticanus Necropolis* continues to grow.

Stage 7. 217 A.D. *Zephyrinus* (199-217)

Construction of *Severan Mausoleum* (Plan layout UE 7)

Between the years 212 and 217 the circus had been almost completely dismantled, and its own rubble had partially filled it, so the soil was compacting little by little, and it recovered the natural slope that it had before its construction. As a consequence, new access roads began to be consolidated from the west, crossing the *Mons Vaticanus*.

In these years, the *Severan Mausoleum* was built, right next to the west face of the obelisk and aligned to the *spine* of the *old Circus of Nero*. Some stamps found inside indicate that it was initially built in the time of Emperor Caracalla of the Severan dynasty (193-235), which follows that the circus had already fallen into disuse at the end of the second century [17] and that the Vatican area was beginning to have already a funerary character. In the times of Pope *Symmachus* (498-514), the mausoleum was renamed the Church of S. Andrea, and in the 14th century it was renamed Santa Maria delle Febbre.

Due to the construction of the circuses and the funerary character of the area, the area began to lose residential appeal, and little by little the large mansions were dismantled. When the *Horti Agrippina* was dismantled, transversal communication routes were created, which directly connected the *Pons Neronis* and the *Pons Elius* with the southern part of the dismantled circus, and with the Via Aurelia Nova. In this way, a network of roads was created that allowed a rapid urbanization of the Vatican area.

Stage 8. 325 A.D. *Sylvester I* (314-335)

Construction of platform and *Constantine Arch* (Plan layout UE 8)

The Emperor Aurelian ordered the Aurelian walls to be built in order to defend the city of Rome against barbarian invasions. The construction of the walls begins in the year 271, and its length was 19 kilometers [18]. For this reason, the urbanization of *Campus Martius* accelerated considerably and the city began to compact in this area.

Later, during the papacy of Sylvester I, the Emperor Constantine greatly helps the Christian church, performs great works of charity both for priests and the faithful in need, and builds several basilicas in Rome, among which is the Lateran basilica.

As a result of this collaboration, the Vatican area was chosen as the appropriate place to build a large basilica, with the aim of becoming a benchmark for Christianity.

In the year 324 the great horizontal foundational platform was built, on which the enormous basilica building had to be built, since a year later, in the year 325 there are indications that the Arch of Constantine was built. This large construction generated great economic and labor expectations, attracted a huge number of businesses (builders, craftsmen, vendors, etc.), and prompted the construction of a growing number of buildings related to the construction sector, such as brick factories. construction warehouses, artisan workshops. These buildings began to be built mainly along and on both sides of *Via Cornelia*, on the roads of the north face of the platform, and on the roads in the southern part of the ancient Circus of Nero (since they were the places more suitable). As a consequence, a network of roads began to be developed and consolidated around the platform and the ruins of the ancient Circus of Nero.

Stage 9. 399 A.D. *Siricius* (384-399)

Construction of *Mausoleum of Honorius* (Plan layout UE 9)

To roughly reconstruct the state of the urban structure of the *Vatican area* in this year, the most important construction activity of the previous years has been taken into account, and of which there are concrete references.

The narthex and the perimeter wall of the anterior body were completed in the time of Pope *Siricius* (384-399), as narrated by *Paulinus de Nola* about the funeral of Paulina in the year 395-396 [19]. Before the year 393, the *Anicii Probi mausoleum* was built in the western part (attached to the apse), built by the Sixth Consul *Petronio Probo*, who died in that same year [20]. Some years later, around 400, *Honorius* (384-423), son of *Theodosius* I, built the *Mausoleum of Honorius*, a dynastic mausoleum for the

Theodosian section of the western imperial family [21]. Years later this mausoleum will be renamed the Chapel of Santa Petronilla [22]. The mausoleum was connected by a small portico to the southern exedra of the basilica, had the same ground level as the basilica, and was almost aligned to the west of the *Severan Mausoleum*, so it had privileged access to the sanctuary and the tomb of *Peter*.

In the 4th century, the *Pons Neronis* collapsed, and it would never be rebuilt, so the connection of the Vatican area with *Rome* would only be made through the *Pons Elius*. For this reason, the only connection with the Vatican area is through the *Via Cornelia* that extends to the Mausoleum of Hadrian, which stimulated the compaction of the building along its route, and especially to the south of *Meta Romuli*.

Stage 10. 484 A.D. *Simplicius* (468-483)

Construction of lateral wings of the atrium (Plan layout UE 10)

To roughly reconstruct the state of the urban mesh of the Vatican area this year, the most important construction activity of the previous years has been taken into account, and of which there are concrete references.

In the times of Pope Leo I (440-461) the first monastery of the place was built and the Church of Santo Stefano degli Abissini, initially known as Santo Stefano Maggiore, built on the ruins of a pagan temple dedicated to Vesta [23].

Leo I established for the first time the need for a papal residence, and also built the *Secretarium* on the outside of the basilica and attached to the south face of the narthex, a kind of sacristy in which the bishop prepared for access to the basilica [24].

In the times of Pope Simplicius (468-483) the lateral wings of the atrium were completed, as well as the anterior body, which includes the gate house, which was initially simply equipped with lateral columns [25].

Hadrian's mausoleum partially loses its function, since by connecting with the Aurelian walls it becomes part of the defensive system of the city. In fact, at this time the first reference to the building was made as a *Castellum*, and it was reinforced to be able to withstand all kinds of attacks [26].

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Stage 11. 514 A.D. *Symmachus* (498-514)

***Old basilica of S. Peter* finished** (Plan layout UE 11)

To roughly reconstruct the state of the urban structure of the Vatican area this year, the most important construction activity of the previous years has been taken into account.

In the time of *Symmachus* (498-514) the lateral rooms of the gate house were completed, including the *Episcopal Palace* and the papal residential building (called *Episcopia* in the *Liber Pontificalis*) *"nello stesso luogo a destra ea sinistra"* of the main entrance [27], as well as a team to attend to the pilgrims, a fountain in front of the access stairs and some latrines [28]. Therefore, it can be said that with the construction activity carried out by *Pope Symmachus* until the end of his days, the construction of the old basilica of S. Peter, begun in the time of *Constantine*, is finished.

In the days of *Symmachus*, several colonnaded porticoes were also built on the main avenues that led from the *Tiber River* (the northern end of the *Pons Aelius*) to the basilica. These porticoes protected the pilgrims from the sun and the rain. The covered porticoes were first referenced by *Procopius* in the 6th century, as they were used to hide in the attack of the Ostrogoth's in the year 537 [29]. Some historians believe that these porticoes were not an independent structure, but were arcaded spaces existing in the adjacent constructions on both sides of the avenues, since in the excavations carried out so far no traces of this structure have been found.

The last surviving large villas near the Mausoleum of Hadrian fall into disuse and are abandoned by their owners. The materials that remain of the constructions are looted, and are used in the construction of other houses that are being built around the *Via Cornelia*.

Stage 12. 650 A.D. *Martin I* (649-655)

Expansion of Christian pilgrimage (Plan layout UE 12)

The approximate state of the urban plot this year has been rebuilt taking into account the most important construction activity carried out previously, and for which there are references.

During these times the pilgrimage activity to the basilica of S. Peter increased, perhaps as a consequence of the general state of confusion after the fall of the Roman Empire. For this reason, among other things, Gregory I (590-604) began the construction of a small chapel as soon as he began his mandate, which in the 12th century was consecrated as Santa Maria in Vallicella. This church would undergo numerous modifications throughout the years acquiring more and more importance [30].

Gregory I also reorganized the interior of the basilica, and made a semi-annular passage to the crypt, which allowed pilgrims to venerate Apostle Peter without interrupting the services of the upper altar. Until then, a mobile altar was used to celebrate Mass, but it

seemed less and less suitable for the performance of rituals increasingly marked by an orderly, hierarchical and noble conception of the liturgical scene, which is why it became essential an intervention in the apse [31].

In these years, Hadrian's circus fell into disuse and was abandoned, and this caused the access road network to be modified in the northern part of the Vatican area. In general, construction activity slowed enormously within the Vatican area.

Stage 13. 852 A.D. *Leo IV* (847-855)

Leonine walls (Plan layout UE 13)

To roughly reconstruct the state of the urban plot of the Vatican in this year, the most important construction activity of the previous years, and of which there are references, has been taken into account.

Starting in the 8th century, certain settlements arose in the Vatican, each characterized by having its own military and civil organization made up of people from northern Europe who lived in the Vatican. These organizations are known as *scholae*, and their goal was to assist the pilgrims [32]. Currently the location of four of them is known: the *scholae Longobardorum*, the *scholae Saxonum*, the *scholae Frisonum* and the *scholae Francorum*, as well as that of several churches and chapels that existed during the Middle Ages within the Leonine walls (Fig. 2.11).

The first *scholae* was that of the Saxons, founded between 726 and 728. With the approval of Pope Gregory II, the Santa Maria in Sassia church dedicated to the Virgin was built. Between 817 and 852 the church had to be rebuilt due to fires in the area that seriously damaged it [33].

Several churches are also built, such as the Church of San Peregrino, dedicated to San Peregrino de Auxerre, a Roman priest [34]. The church of Santo Stefano Minore, known as Santo Stefano degli Ungheresi, is also built. Located to the south of the basilica, the construction remains until the year 1776, when it was demolished due to the extension of the new basilica of S. Peter. The exact location is known thanks to Rodolfo Amedero Lanciani's plan (Fig. 2.5b), since it superimposes buildings from different periods and gives us a reference to where it was located.

After the sack of the basilica by the Saracens in 846, Pope Leo IV (847-855) surrounded the entire area by means of a defensive wall [35], later known as *Mura Leoniane*, which was the only significant change of the defensive perimeter of Rome, after the Aurelian walls of the late 3rd century. The interior area was renamed the *civitas Leoniana*[36].

The defensive wall was built between 848 and 852, it was three kilometers long and completely surrounded the Vatican area at that time for the first time in its history, in fact, it was the only extension of the Aurelian walls of Rome. A few years earlier, by order of Pope Leo III, a similar wall began to be built, but the disturbances in the city forced the work to be suspended, and the sections already built were dismantled to be used in private buildings.

The wall ran from the Mausoleum of Hadrian, later called Castel San Angelo, to the slopes of the Vatican Hill located to the west, surrounding the basilica from west to south, and descending again in an easterly direction to the river. The wall was built from tufa (a soft porous rock consisting of calcium carbonate deposited from springs rich in lime) and tile, and was twelve meters high with 44 strong towers at arc-throw intervals. The wall had three doors to access the interior space. Two gates were in the northern part of the wall: the smallest was located behind the fortified mausoleum, called Posterula San Angeli and later called (due to its proximity to the castle) Porta Castelli, and the largest, the main gate to through which the emperors passed was located near the church of San Peregrino, called Porta Peregrini, later Porta San Petri. A third gate was located to the south, and connected the Leonine city to the Trastevere river. In addition, chain towers were built on both sides of the Tiber river to repel Saracen assaults by water. The wall was officially completed on June 27, 852.

Stage 14. 1003 A.D. *Silvester II* (999-1003)

Beginning of the *late middle ages* (Plan layout UE 14)

In the 10th century, construction activity in the Vatican area slowed down again, so that hardly any notable constructions were made, and the existing urban mesh was simply compacted little by little, and very slowly.

Nor was there any pope with constructive ambitions, and among all of them only Pope Silvester II stood out, since he was known as "the light of the church and the hope of his century" due to his great erudition. His studies in theology, philosophy, grammar, rhetoric, dialectics, astronomy, arithmetic, geometry and music allowed him to make changes during his papacy such as the use of the decimal system by clergymen. On the other hand, he invented Gerbert's abacus, introduced the pendulum and the invention of a cogwheel clock, and was the forerunner of a kind of shorthand system.

Stage 15. 1124 A.D. *Callixtus II* (1119-1124)

First *council of the Lateran* (Plan layout UE 15)

In the 11th century there is no news of any construction activity in the basilica, or in its close surroundings. These are turbulent times, and the different popes are focused on their struggles for power, leaving aside notable constructive activities in the basilica of S. Peter.

Callixtus II was a great defender of the reform of the church started by Gregory VII. He manages to return to Rome after forcing Antipope Gregory to flee. He is dedicated to solving the dispute of the investiture for which the papacy and the empire had been facing more than fifty years. With the support of Henry V, they sign the Concordat of Worms (1122) in which the emperor renounced the right of investiture, and became recognized as exclusive to the church, and the Pope recognized the emperor his right to attend the investiture. In 1123 the pope convened the First Lateran Council, in which the agreements reached in the Concordat of Worms were confirmed and sanctioned.

Stage 16. 1216 A.D. *Innocent III* (1198-1216)

Beginning of the *Apostolic palace* (Plan layout UE 16)

The approximate state of the urban plot in this year has been reconstructed taking into account the most important construction activity carried out in previous years, of which there are references.

With Innocent III (1198-1216) the papacy reached a great apogee, since this pope acted as a true feudal emperor and almost all the kingdoms and princes of Western, Central and Northern Europe were recognized as vassals.

During his papacy the San Lorenzo in *Piscibus* Church was built on what was formerly a small church dedicated to San Stephen. It was first mentioned in the *Ordo Romanus of Benedict the Canon*. It takes the name of *Piscibus* in 1205 since the construction is located in a fishing district during the Middle Ages [37].

In the times of Innocent III, a good initial part of the Vatican Palace was also built [38], located on the outskirts of the basilica in the northern area at the height of the atrium. The building included a prominent tower (later to be known precisely as “Torre di Innocenzo III”) [39].

Stage 17. 1280 A.D. *Nicholas III* (1277-1280)

Extension of the *Apostolic palace* (Plan layout UE 17)

To roughly reconstruct the state of the urban structure of the Vatican area in this year, the most important construction activity of the previous years has been taken into account, and of which there are specific references.

The greatest previous constructive activity was carried out in the time of Nicholas III (1277-1280), who was elected thanks to the influence of his powerful family and his papacy, despite being short, was characterized by his attempts to reinforce the position of the church in front of European princes. Part of this power involved continuing the constructions of the previous papacy and starting new ones.

As described by Carroll William Westfall (Fig. 2.12), during the papacy of Nicholas III the Vatican Palace was expanded. The Cappella Magan (later Sistine Chapel), the Aula Prima (Sala Reale), the Aula Seconda (Sala Ducale, Seconda Sala), the east facade and the Torre di Niccolo III were built [40].

The Passetto di Borgo was built in 1277, which is an 800-meter-long elevated walkway that connects the Vatican with Castel San Angelo that allows the pope to escape the Vatican and take refuge in the castle if he is in danger. It was built on a section of the Vatican murals during a restoration that took place at the time, as they were in very poor condition [41].

It is important to note that the existing porticoes on the main avenues since the imperial era continue to stand, although they begin to deteriorate over time. These porticoes were built in the imperial era on the main avenues in order to protect pilgrims.

Stage 18. 1378 A.D. *Gregorius XI* (1370-1378)

Re-establishing the pontifical see in Rome (Plan layout UE 18)

It has been possible to reconstruct in an approximate way the state of the urban structure of the Vatican area in this year, taking into account the most important previous construction activity, and of which there are references.

During the papacy of Boniface VIII (1294-1303) the east wing of the Vatican Palace was extended. The Hall of Constantine and a tower to the north are built. The Parva Chapel (piccola capella) is also built next to the primary classroom [42]. Due to the great extension that the Vatican Palace had reached, the wall is extended in the north and east. Some years later, Gregorius XI (1370-1378) is appointed pope at only 18 years of age, and during his papacy he tried to reconcile the Christian kingdoms in order to launch a

crusade against the Turks. France and England did not participate as they were involved in the Hundred Years War, so it only managed to resolve some of the territorial disputes through marriages.

Due to all the disputes that existed at the time due to the war, the defenses of Castel San Angelo were reinforced, a moat and a single entrance were built, and it is used as a strategic military and protection point for the pope.

During the 14th century the Church of Santa Andrea was renamed Santa Maria delle Febbre, in order to provide protection and hope to the inhabitants of Rome against a Malaria epidemic that since then began to spread throughout Rome.

Stage 19. 1464 A.D. *Nicholas V* (1447-1455)

Reform project *old basilica of S. Peter* (Plan layout UE 19)

In order to roughly reconstruct the state of the urban mesh of the Vatican area in this year, the most important construction activity has been taken into account, and of which there are references.

With the election of Nicholas V as pope, it was believed that there would be a major change in S. Peter, as he set out to make Rome a city of monuments, home of literature and art, stronghold of the pope and the capital of the Christian world. Their main concerns focused on five main activities:

1. The restoration of the urban walls
2. The renewal of the forty "*stazionali*" churches
3. The founding of a new neighborhood, between *Mole Adriana* and *old S. Peter*
4. The fortification and ornamentation of the Papal Palace
5. The reconstruction of the basilica of S. Peter.

With regard to the surroundings of San Pietro, the construction of the Santa Maria della Grazie alle Fornaci Church began at the beginning of the 15th century. Its name is due to the brick and clay construction materials factories that were located in the area [43].

Papal plans for the reconstruction of Rome were based largely on facilitating the mobility of groups of pilgrims. In the year 1450 many pilgrims arrived in Rome due to the Holy Year, this was an opportunity to restructure the Germanic cemetery within Vatican City. As part of the project, the Church of Santa Maria della Pietá, in Camposanto dei Teutonici, is built at the end of the 15th century. The site belongs to the hospice for the german pilgrims of the ancient *Schola Francorum* [44].

During the papacy of Nicholas V, the north wing of the Vatican Palace was built, including the Estancia di Eliodoro, the Estancia della Segnatura, and the Estancia dell´Incendio (Fig. 2.12). The Borgia Tower (1494) is also built, and the enveloping wall is built from east to north, which converges with the Tower of Nicholas V. This space between the wall and the palace would later become the Cortile San Damaso. The construction of the southern part of the Vatican Palace continues, the Cortile del Maresciallo and the Curia prima are formed. The Muro di Bonifacio IX was built which adjoins the Porta San Pietro and the Capella Magna at one end [45].

As can be seen in Bramante's drawing GDSU 287 Ar (Fig. 2.13), the union between the basilica and the Vatican Palace is consolidated through a porticoes patio and a series of rooms that close the space to the public. This construction comes to join with the already existing wall of Nicholas V.

Stage 20. 1503 A.D. *Alexander VI* (1492-1503)

Opening of *Via Alessandrina* (Plan layout UE 20)

It has been possible to reconstruct the state of the urban plot of this year taking into account the most notable construction activity of the previous years.

The papacy of Innocent VIII (1484-1492) was a period of insecurity in Rome due to insufficient punishment for crime. The most important architectural work of the papacy was the construction of the Palazzetto of Innocent VIII, begun in 1487, which probably included an earlier construction from the times of Nicholas V, and which, according to Vasari, was designed by Antonio del Pollaiolo [46]. The palazzetto, known as Villa del Belvedere, was a suburban villa with a loggia open to the countryside. In Letarouilly's drawing from 1503 (Fig. 2.14) you can see the advance of the Vatican Palace, and on the right side you can see the villa of Innocent VIII. Both buildings would be joined years later.

Hartmann Schedel's drawing in 1493 (Fig. 2.15) shows that the construction of the Vatican Palace was already quite advanced, and clearly shows the 3 towers that constitute it, as well as the Tower of Nicholas V, which articulates the expansion of the Leonine wall, which goes up to the Mons Vaticanus. The drawing shows that the constructions outside the wall were minimal, in the case of small country houses. The drawing also shows, on the west face of the river meander, the *Santo* Spirito in Sassia hospital, which was part of the *Schola Saxonum*, the largest of the four *scholas*, and the one that had the most importance over the years.

The successor of Innocent VIII, Alexander VI (1492-1503) came from an important family, well positioned and with influences, but being Spanish he generated important discrepancies from other powerful Italian families. Therefore, in order to ensure political stability, and given that he was a good administrative officer, he decided to reorganize the city of Rome dividing it into four districts, with a person in charge in each. In this way it would be easier to control the high crime rate that the city suffered since the papacy of Innocent VIII.

Pope Alexander VI carried out innumerable constructive activities in the Vatican area and in Rome in general, and the collaboration with Bramante was very fruitful. For example, and regarding the basilica of S. Pietro, the pope completed the Loggia della Benedizione, started by Pius II, and built the Porta di San Pietro ("Porta di Sancti Petri"), also known as "Viridiana Gate" or "Porta degli Svizzeri". However, the most important activity that he carried out in the Vatican area was the opening of the Via Alessandrina. In preparation for the jubilee of 1500, Alexander VI, in the consistory of November 26, 1498, ordered the construction of the first rectilinear route of Rome between Castel Sant'Angelo and the main entrance of San Pietro, called Via Alessandrina, or Via Recta. The works began in April 1499 under the orders of Cardinal Raffaele Riario, and the road was inaugurated on December 24, 1499 [48].

The objective of Via Alessandrina was to alleviate the large influx of pilgrims that was generated in the processions to the basilica [49]. This street followed the layout of an old road that was partially obstructed by the "Meta Remuli" pyramid [50], which, along with other buildings adjoining the street, had to be demolished on December 24, 1499. To develop the area quickly, facilities and privileges were given to those who wish to build buildings that are at least 11 meters high, so that Via Alessandrina is surrounded by noble families and wealthy bourgeois who build palaces and houses [51].

The successor of Alexander VI, Pope Julius II, had an even greater construction activity, and without a doubt the most important was the beginning of the construction of the new basilica of S. Peter. However, the pope promoted many other construction activities in the Vatican area, among which, for example, the San Giovanni dei Fiorentina Church, started in 1509, and whose construction lasted until the beginning of the 18th century, dedicated to Saint John the Baptist, the protector of Florence [52].

Stage 21. 1514 A.D. *Leo X* (1513-1521)

Death of *Bramante* (Plan layout UE 21)

To roughly reconstruct the state of the urban structure of the Vatican area in this year, the most important construction activity of the previous years, and of which there are references, has been taken into account.

Pope Leo X (1513-1521), a member of the Medici family, was educated at the Florentine court from a young age and began his ecclesiastical career with only seven years. Having had an erudite and artistic training according to the Medici tradition, during his papacy he spent large sums of money on projects by masters such as Rafael and Bramante, giving great importance to the arts.

The expansion of the Vatican Palace begins, the east arm of the Vatican Palace is built, a corridor of conjunction between the Vatican Palace and the Belvedere Palace that would connect these two buildings despite being at different levels. A corridor that would serve as a direct connection and be part of the museum, as seen in Letarouilly's 1558 drawing (Fig. 2.16) and the GDSU 2559A plan, by Dosio Giovani, (Fig. 2.17) of the Belvedere construction.

Pope Julius II (1503-1513) commissioned Bramante to build the lodges within the Vatican Palace, private and exclusive places, accessible only to the Pope and his closest collaborators. After Bramante's death, Leo X asks Raphael to finish the construction and decoration of the Vatican Lodges [53].

In 1512 the Bramante Staircase was built in the Palace of Innocenzio to communicate with the city and to be able to transport the construction materials up [54].

Taking as a reference the plans made by Frommel (Figs. 2.18a, 2.18b, 2.18c), one can have an approximate idea about the structure and internal distribution of the Vatican Palace in 1521 [55]. The palace had 3 levels that adapt to the topography from the place through long stairs that in turn connect it with S. Peter's Basilica.

Stage 22. 1564 A.D. *Pius IV* (1560-1565)

Death of *Michelangelo* (Plan layout UE 22)

It has been possible to reconstruct the approximate state that the urban plot of the Vatican area had in the year 1564 thanks to the fabulous plan by Leonardo Bufalini (Figs. 2.4a and 2.4b), supplemented with information from Muster's drawing of 1549 (Fig. 2.19), and the drawing by Dupérac in 1577, edited by Antonio Lafreri (Figs. 2.20a and 2.20b). The article *Lo sviluppo urbanístico dei Borghi from 1500 to 1870* has also

been of great importance for the reconstruction of the state of the urban structure of the Borgo, from 1500 to 1870 [56].

According to Muster's drawing of 1549 (Fig. 2.19), the Borgo was already quite consolidated, the church of Santa Spirito in Sassia stands out, the largest construction in the Borgo. Over the years the Church of Santa Maria in Sassia had deteriorated, so the reconstruction works began in 1538. The works were concluded in 1545, from this moment the church took the name of Santo Spirito in Sassia [57].

Outside of this densified area, the rest are small isolated houses, and outside the walls there are few buildings that existed, the security and stability that living within the walls implied was always sought. Castel S. Angelo had already been reinforced, looking more like a fortification and strategic military point. In this drawing, the Vatican Palace and the Palace of Innocenzio III are still separated, although years later they would end up being united.

Leonardo Bufalini's woodcut *Pianta di Roma*, from 1551 (Figs. 2.4a and 2.4b), is the first iconographic plant in Rome and constitutes a document of great value for understanding the state of the urban structure of the Vatican area at that time. The plan is made up of 24 woodcuts and was edited by Antonio Blado in 1551, although the edition that has come down to us (supposedly identical, since Bufalini died in 1552 and could not make relevant changes) was the one made in 1560 by Antonio Trevisi di Lecce [58]. The plan shows the Vatican area in the state it had around the year 1550 when Michelangelo had assumed the direction of the works. The representation is in many cases schematic, sometimes very distorted and even incorrect in some respects.

However, although schematically, the drawing shows important details to take into account when reconstructing the state of the urban structure in those years. The drawing shows how the southern ambulatory of S. Peter was already demolished, and in the western part something similar to an ambulatory appears, although in reality it is a retaining wall of lands that was made to build the Bramante apse and thus create a flat area around it, since the terrain in the western area had an upward slope. The intermediate section and the dividing wall of Sangallo, and the eastern surviving section of the longitudinal body of the old basilica are recognized. Also visible are the Tegurium de Bramante, the old eastern mausoleum (now called Santa Maria delle Febbre) and the obelisk in its original position (the western mausoleum had to be demolished to make way for the construction of the new basilica). You can also see the great staircase to the east, the square *(Forum S. Petri*) containing the fountain of the

pilgrims built by Innocent VIII (1484-1492) and the new wall of Paul III (1534-1549) inside which is appreciate the Vatican Palace and areas of agricultural use, such as *Pratum, Viridarum* and *Galinaria*. The drawing also provides information on the name of the gates of the wall, the streets and the churches existing in 1551. To get a detailed idea of the built environment near S. Pietro, Antonio Lafreri's drawing, *Disegno della Benedittione del papa alla Piazza di San Pietro* (Fig. 2.21), made between 1567 and 1572, few years after Michelangelo's death in 1564. This is an anonymous engraving, published by Antonio Lafreri, that shows Pope Pius V (1565-1572) blessing a hurrying crowd in Piazza S. Pietro. The drawing was published for the first time in 1567 and a replica is published in 1572. You can see how the front of the basilica to the square retains its medieval structure. On the left is the Palazzo dell'arciprete with the coat of arms of the reigning pontiff, on the right the vestibule (Santa Maria in Turri), with the three doors giving access to the atrium, on the right the Lodge of Blessings, from three floors, with the pope and his entourage on the noble floor. Then the Palazzo di Paolo II and Innocenzo VIII, with the *portone di bronzo*. In the projecting body of the factory in the northern part the balcony of the papal trumpeters is shown in the foreground, and in this building on the first floor is the residence of the Swiss Guard. In the farthest part you can see the cortile di San Damaso, with the front of the Logge di Raffaello. A little to your left is the roof of the Cappella Sistina. A little further to the left you can see the pediment of the old basilica and a little further back the second outstanding pediment of the intermediate body of Antonio da Sangallo. Finally, you can see the huge drum in the dome, almost finished.

As most notable events up to that time, it is worth noting the activity of Pope Pius IV (1559-1565). He dedicated a large part of his papacy to resolving political disputes of his predecessors and strove to generate an amnesty that would give stability to Rome. On the other hand, he incurred in the fortification and beautification of Rome, dedicating resources to fix the churches in the area. With regard to S. Pietro, Pope Pius IV incessantly protected Michelangelo against the attacks of the clan of Sangallo, so that he could continue with his work.

Stage 23. 1589 A.D. *Sixtus V* (1585-1590)

The dome of *new S. Peter* is finished (Plan layout UE 23)

To reconstruct with some precision, the urban structure of the Vatican area in 1589, basically the plan of Étienne Dupérac and Antonio Lafreri, *"Pianta di Roma"*, made in

1577 (Figs.2.20a and 2.20b), also the drawing made by Leon Pitor, in 1568 (Fig. 2.22), as well as Mario Cartaro's plan, "*Le piante di Roma*" from 1576 (Figs.2.23a and 2.23b).
Dupérac's plan has many inaccuracies, the streets excessively wide and the buildings distorted and disproportionate. However, the layout of some roads (especially those that have evolved to date, and those that appear in the plane of Nolli and later) is known quite precisely, so it is possible to proceed in the reverse way and correctly locate most of the buildings and streets that appear in the drawing. This is possible since the dimensions and location of certain outstanding monuments and buildings are precisely known, such as the new basilica and the old basilica of S. Peter, the obelisk, the Castel Sant'Angelo, the Church of Santa Maria delle Febbre, as well as other churches and monasteries. If the exact position and dimensions of these monuments are known, estimates and triangulations can be made, and in this way all the constructions shown in the drawing can be located, and as a consequence Dupérac plan can be reconstructed to scale, in a sufficiently proportionate and dimensioned way. On the other hand, the urban structure of the Vatican hardly changed from the year 1577 until 12 years later, when the dome of S. Peter was completed. For all these reasons, the urban mesh of the Vatican area can be reconstructed with certain certainty and precision in the year 1589.
To see the evolution of the urban structure, the drawing by Antonio Tempesta, "*View of S. Peter's square*" (Fig. 2.24), which shows its state four years later, has also been used.
The work carried out by Leonardo Benevolo has also been especially useful (Fig. 2.25), reconstructing the urban structure in the vicinity of the ancient basilica of S. Peter in the times between Pope Pius IV (1559-1565) and Pope Paul V (1605- 1621) [59].
In Dupérac's drawing the intermediate section, the dividing wall and the surviving part of the longitudinal body of the old basilica, as well as the surrounding buildings, are perfectly recognized. With respect to Bufalini's plan, it can be seen that some buildings have been demolished in order to expand the square to the south by orders of Pius IV (1559-1565).
The Tempesta drawing shows the Vatican area as seen from the Gianicolo, and the buildings appear even more deformed than in Dupérac's drawing. For example, the surviving longitudinal body of the old basilica appears extremely reduced, and the atrium has almost disappeared. There are buildings that do not appear in Dupérac's drawing and vice versa. However, there are buildings that appear in the two drawings, which mean that they were outstanding constructions, and therefore they have been the first to be rebuilt in the plan. Tempesta's drawing is of great pictorial interest and

provides an enormous amount of information and details of all kinds. However, the buildings, streets and public spaces appear distorted, which is why an exhaustive dimensional restructuring work has had to be carried out to prepare the map of the situation of the urban structure of the year 1589. In any case, the graphic information has been completed with the historical information available about the most outstanding construction activity in the environment.

It should be noted that, in these times, and once Rome was established as the pontifical see, a plan was initiated to recover the lost prestige of the city through its beautification and magnificence. The transformation of the city began in the Borgo Nuovo.

For this purpose, several churches were built, such as the Santa Anna dei Palafrenieri, in 1565, commissioned by Pope Pius IV, the design was by Jacopo Barozzi da Vignola [60]. The new Santa Maria in Transpontina church was also built in 1566 by the Pope Sixtus IV as a replacement for an old chapel located closer to the river that had to be demolished for blocking the views and hindering the military protection strategies of the city. The dome had to be built as low as possible so as not to fall into the same problem as the previous chapel [61]. Years later, the San Salvatore in Lauro Church was built in 1587 together with a convent of S. Gregorio. In 1591 the church is destroyed by fire and needed to be rebuilt [62].

Despite the fact that the Leonine wall falls into disuse, it is preserved. Doors are opened in the wall to communicate the roads from one side to the other as seen in Dupérac's plan of 1577 (Figs. 2.20a and 2.20b) and in Mario Cartaro's of 1576 (Figs. 2.23a and 2.23b). The lands of the northern part of the interior of the wall built by Pius IV in 1565, are preserved as a cultivation area.

From 1587 to 1588 a new building was built to house the Apostolic Library and the secret archive located between the two great corridors from the Vatican Palace to the Belvedere, by the architect Domenico Fontana, for which two separate courtyards were created, the Cortile del Belvedere and the Cortile della Pigna [63].

The Tower of the Winds, or Gregorian Tower, is built in the Vatican Palace (1578-1580), located on one of the corridors that connect the Belvedere Palace with the Vatican Palace [64].

Regarding the new basilica of St. Peter, it should be noted that Pope Sixtus V (1585-1590) proposed to finish the body of the new basilica according to the design of Michelangelo.

In his first intervention he decided to demolish the choir of Bramante, and the new western arm, identical to the transversal ones, was completed in 1587. In the same year the preparatory work for the construction of the dome began by Giacomo Della Porta and Domenico Fontana. Della Porta modifies Michelangelo's wooden model, giving the dome a sharp arched profile, and in accordance with this project the structure is built. Work began in July 1588, and in May 1590 the construction of the ring at the base of the lantern was completed.

Sixto V also makes an impressive reform of the Piazza S. Pietro. In 1585 he commissioned Domenico Fontana to move the obelisk from its former location on the south side of the basilica to Piazza S. Pietro, and to raise it on the axis of the old basilica (which at that time was still believed to coincide with the axis of the new basilica that he was building right behind). The works began in April 1586 and on September 10 the obelisk was erected in the center of the Plaza. In 1592, the Church of Santa Maria delle Febbre was connected to the Clementine Chapel.

Via Alessandrina changed its name to Nuovo Borgo in 1570, as another street was inaugurated in Rome by Cardinal Alessandrino, which would bear his name [65].

Stage 24. 1667 A.D. *Alexander VII* (1655-1667)

New *basilica of S. Peter* is finished (Plan layout UE 24)

To reconstruct with some precision, the urban layout of the Vatican area in 1667, the plan made by Giovanni Battista Falda, *"Pianta di Roma"*, made just 9 years later, in 1676 was used (Figs. 2.26a and 2.26b). This plan was made when the main monuments of Baroque Rome had been completed. You can see the great building with the giant order of Michelangelo, almost isolated from the built environment, and emerging from the labyrinthine framework of the Vatican buildings. The building uses the Church of Santa Maria delle Febbre as a sacristy, which has survived in time almost miraculously. The enormous arms of Bernini are appreciated opening to the network of small houses of the Borgo. In the background you can see the Castel Sant'Angelo whose dimensions rival those of the new San Pietro. The drawing shows the new compact urban structure of the former *Campo Marcio*, which is connected to the Vatican area through a single bridge. The urban structure inside the Vatican also appears very compact, contrasting with the little existing building on the other side of the walls.

In 1643 Pope Urban VIII (1623-1644) ordered the construction of the Janiculum wall, as an extension of the Leonine wall. This new wall would provide better protection for the southern area near the river [66].

Later, Pope Alexander VII (1655-1667) promoted the architecture and general beautification of Rome, where houses were demolished to make new avenues and new buildings. He became a great patron, especially of Bernini.

As seen in the Tempesta plan of 1593 (Fig. 2.24), the construction of both arms of the Vatican Palace was completed, and the design of the interior gardens of the palace was adapted. The northern lands that were previously used for agriculture are subdivided and built, new roads appear in this area: The Borgo Angelico, the Borgo Vittorio and the Borgo Pio. In the northern part of the Vatican Palace, renovations were carried out to the Palace of Innocenzio VIII, and constructions were added that would later make up the Pio Clementino Museum [67].

In the preparation of the map corresponding to this period, the anonymous drawing dated between 1660-1699, "La pianta del Borgo di Roma", Biblioteca Nacional de España, cod. bica0000055287, and the drawing "Plan of Rome in the XVII century", made by Antonio Tempesta, and edited by Giovanni Giacomo De Rossi, 1661-1662. A Pietro Frutaz. "Le piante di Roma". Rome: Instituto di Studi Romani (1962). Tav. 338.

Stage 25. 1748 A.D. *Benedict XIV* (1740-1758)

Plan by *Giambattista Nolli* (Plan layout UE 25)

The reconstruction of the urban structure of the Vatican area this year is very simple, since it basically must coincide with the plan of Giambattista Nolly (Figs. 2.27a and 2.27b).

Gianbattista Nolli (1701-1756) was an architect and worked in Milan as a surveyor, and with a group of assistants he drew up the plan of all of Rome and its surroundings. This work was carried out by himself, without the financial help of anyone, not even the pope, and published it in 1748, under the name *"Nuova topografía di Roma"*. The plan of the city of Rome consists of 12 boards and covers an area of 30 km^2. The accuracy of the drawing is surprising and not only the buildings and streets are graphed, but also details of the interior courtyards of the buildings, and even details of the terrain. The accuracy is so great that you can even see the eccentricity of the obelisk with respect to the axis of the new basilica (about 3.8 m.). The work was not republished since Nolli could not find a buyer, and he died practically destitute in 1756.

In the plan it is clearly seen how the concentration of constructions occurs mainly within the walls and on the river bank, while the land outside the walls is preserved as an area of crops with very few houses that are distributed along the roads that existed.
The construction activity carried out until 1748 was quite remarkable, and one of the most relevant events was the construction of the Santa Maria Annunziata in Borgo church, between 1742 and 1745, by the architect Pietro Passalacqua as an oratory for the brotherhood of the Hospital di Santo Spirito in Sassia [68].

Stage 26. 1883 A.D. *Leo XIII* (1878-1903)

First urbanistic plan of Rome (Plan layout UE 26)

To reconstruct the state of the urban structure of the *Vatican* area in 1883, the year in which the first urban regulation plan was made, the plan of Pietro Ruga of 1823 has been taken into account (Fig. 2.28a and 2.28b), the Letarouilly plan of 1838 "Plan of Rome moderne" (Figs. 2.29a and 2.29b), the Letarouilly plan "Guide to Rome" of 1841-1852 (Figs. 2.30a and 2.30b), and especially the plan of development and expansion of the city of Rome, of Augusto Thiollet in 1873 (Figs. 2.31a and 2.31b). Finally the plan developed by an anonymous author, in 1884 (Figs. 2.32a and 2.32b).), as well as the plan of the "Extension of the Borgo District city plan", with provisions of the 1883 plan, by Virano 1888 (Fig. 2.33),
Ruga's 1823 plan (Fig. 2.28a and 2.28b) shows the advance of the Vatican Palace, and the construction of the northern area is not yet fully consolidated. The expansion of the Belvedere and the construction of the 2 corridors that would later link the Belvedere with the rest of the Vatican Palace are not yet finished. Another thing that Ruga's plan shows is the use of the lands at the rear of the basilica, these lands are kept as agricultural use just like all the other lands outside the walls.
Pope Pius VII (1800-1823) ordered the construction of the new arm of the Chiaramonti Museum inside the Vatican Palace, inaugurated in 1822. A new area was needed to reorganize the pontifical collections that were recovered from France. This new construction communicates in a perpendicular way the 2 great corridors of the Vatican Palace [69].
In 1777 the Church of Santa Maria delle Febbre was demolished. Between the years 1792-1793 the vestibule of the Four cancelas in the Vatican Palace was built by Giuseppe Camporese, which was the old entrance to the Vatican Museums [70].

As can be seen in the Letarouilly plans of 1838 (Figs. 2.29a and 2.29b) and 1852 (Figs. 2.30a and 2.30b), the church of Santo Stefano Minore collapses, giving rise to another construction in its place south of the basilica. The Schola Francorum cemetery also undergoes some modifications due to this.

Thiollet in 1873 (Figs. 2.31a and 2.31b) like an anonymous author in 1884 (Figs. 2.32a and 2.32b), they make plans that include the name of avenues, squares, gardens, doors, villas and churches, as well as a shading that represents the topography that helps to understand why the city developed in this way.

In the preparation of the plan corresponding to this time, also has been taken into account the drawing "Roma in the XVIII century", made by Giuseppe Vasi, in 1781, A Pietro Frutaz. "Le piante di Roma". Rome: Instituto di Studi Romani (1962). Tav. 447.

Stage 27. 1950 A.D. *Pius XII* (1939-1958)

Inauguration of *Via della Conciliazione* (Plan layout UE 27)

To reconstruct the state of the urban structure of the Vatican area in 1950, the current situation of the urban structure of Rome has been taken into account (Fig. 2.1), as well as the plan of the "Extension of the Borgo District city plan", with provisions of the 1883 plan, by Virano 1888 (Fig. 2.33), and a large number of photographs, building plans and partial topographic studies. To reconstruct the urban structure in the vicinity of the basilica of S. Peter, the work carried out by Leonardo Benevolo on the evolution of the Borgo district in the 1930s has been of special importance [71] (Fig. 2.34).

Among the most important construction activity in the Vatican area, it is worth highlighting the construction, in 1886 of the Vittorio Emanuele II bridge, and inaugurated in 1911. The bridge connects through the Tiber river, the historic center of Rome with the Borgo and Vatican City. It is located very close to where the *Pons Neronianus* was formerly located. A few years later, the Principe Amadeo Savoia Aosta bridge was built between 1939 and 1942.

The plan of Virano of 1883, shows the three bridges that connect the Vatican with Rome: Ponte Sant Angelo, Ponte Vittorio Emanuele II and Ponte Principe Amedeo Savoia Aosta.

Inside the Vatican gardens, in 1926, the Church of Santa Maria Regina della Famiglia was built. It was ordered to be built by Pope Pius XI (1922-1939) behind the basilica of S. Peter to be the new headquarters of the Pontifical Romano Minor Seminary along with a chapel dedicated to Saint Martha [72].

In 1936, the construction of *Via della Conciliazione* began, which connects Piazza S. Pietro with Castel Sant'Angelo. It is concluded in 1950 for the Jubilee. This intervention caused the loss of a large part of the Borgo's urban structure. The palaces and churches that were affected were later built using some of their original features [73].
After the signing of the Lateran pacts, on February 22, 1929, between the Kingdom of Italy and the Holy See, it was established that the government of Italy would build and finance a railway line that would connect a station to be built within the City of Vatican [74]. That same year the works began and were concluded in 1932.
In 1927 Pope Pius XI founded the Ethnological Missionary Museum in the Vatican. Due to the large number of works of art that the Vatican had and the need for a new site with the proper conditions and care to ensure its conservation, in 1932 the Vatican Pinacoteca was ordered to be built [75].

Stage 28. 2020 A.D. *Francis I* (2013-) (Plan layout UE 28)

The situation of the current urban structure of the *Vatican* area is perfectly defined, and has been carried out by means of high-tech topographic studies, and using satellite photographs.

2.6. Historical value of the urban plans made

The urban plans made correspond to different consecutive stages in the evolution of the urban structure of the Vatican area, and have been drawn up based on all the information gathered. However, no matter how extensive the information collected has been, it is always insufficient, and errors of interpretation or deduction can always be made. As a consequence, the drawings produced may contain errors and inaccuracies, which can certainly be easily corrected in the future. Obviously, these possible errors and inaccuracies are greater the further we go in time.
Despite this, these scale plans are of great importance for the History of Art, and can be very useful in several aspects, among which the following stand out:

1. They allow a better understanding of the history of the Vatican area, and especially its social, artistic, architectural and urban development.
2. They allow contextualizing isolated events in the history of art in the Vatican area and its immediate surroundings.

3. They allow the visualization of the urban mesh of the Vatican area in each of its historical stages.
4. They allow a better understanding of the most important architectural and urban actions carried out at each stage.
5. They make it possible to identify the main urban plan layouts that, like historical scars, have characterized the evolution of the Vatican area.
6. They provide a suitable context for the analysis of the historical evolution of the most important buildings in the Vatican area, such as the old Constantinian basilica, the new basilica of St. Peter, the Mausoleum of the Severan dynasty, the Mausoleum of Honorius, the Circus of Nero, and many others.
7. They provide a detailed graphic context to frame future research on specific aspects, or specific buildings, included in the Vatican area.

Therefore, the plans made are not intended to be definitive, but rather a graphic environment that can be improved with future research by scholars of any building in the Vatican area. Based on new research, these plans can be enriched, and they can be modified, providing increasingly accurate and detailed information on the state of the urban structure of the Vatican area, in the different stages of its historical evolution.

Notes

[1] This archaeological plan by Paolo Liverani is located in: Paolo Liverani, *La topografia antica del Vaticano* (Città del Vaticano: Edizioni Musei Vaticani, 1999)

[2] To know the possible origins of the word *Vaticanus* (Vatican) can be consulted: Benjamin Blech, *The sistine secrets, Michelangelo's forbidden Messages in the Heart of the Vatican* (New York: Harper Collins, 2009)

[3] Hugo Brandenburg, 'L'antica basilica Vaticana costantiniana di S. Pietro', in Brandenburg, Hugo; Ballardini, Antonella; and Thoenes, Christof, *San Pietro. Storia di un Monumento* (Milano: Jaca Book, 2015), p. 12

[4] The most complete reference on the details of the construction of the foundation platform is: Richard Gem, 'From Constantine to Constans. The chronology of the construction of Saint Peter's basilica', in McKitterick, Rosamond; Osborne, John; Richardson, Carol M.; Story, Joanna (eds.). *Old Saint Peter's, Rome* (Cambridge: Cambridge University, 2013), p. 46

[5] Samuel Ball Platner and Thomas Ashby, *A Topographical Dictionary of Ancient Rome*, (London: Humphrey Milford. Oxford University Press, 1929)

[6] The most complete reference on the *Meta Romuli* and the *Terebinthus Neronis* is: Laura Petacco, 'La Meta Romuli y Terebinthus Neronis', in *Prima della Spina. Dall´agro vaticano a via della Conciliazione*, Parisi Presicce, Laura Petacco (a cura di) (Roma: Gangemi, 2016), pp. 33-41; For more information on the *Horti di Agrippina* see in the same book: Maddalena Cima, 'Horti di Agrippina', in *Prima della Spina. Dall´agro vaticano a via della Conciliazione*, Parisi Presicce, Laura Petacco (a cura di) (Roma: Gangemi, 2016), pp. 41-47

[7] Information on the construction of the wooden bridge and the *Pons Neronianus* can be obtained at: Lawrence Richardson, *A New Topographical Dictionary of Ancient Rome*, (Baltimore and London: John Hopkins University Press, 1992), p. 47; Henri Jordan, *Topographie der Stadt Rom* (Berlin: Weidmannsche Buchhandlung 1878), p. 416

[8] Samuel Ball Platner and Thomas Ashby, *A Topographical Dictionary of Ancient Rome*, (London: Humphrey Milford. Oxford University Press, 1929), DuP 52, 53, and fig. 25

[9] Flavio Biondo, *Roma instaurata. Liber I*, A. Raffarin-Dupuis (ed.) (París, 2005), pp. 68-71

[10] Filippo Magi, 'Il Circo Vaticano in base alle più recenti scoperte, il suo obelisco e i suoi carceres', in *Rend Pont Acc, XLV* (1972-73), pp. 37 ss.

[11] In the plans made by Rodolfo Lanciani his deductions on the urban structure of the Vatican City in three historical periods are superimposed: ancient Rome, the Middle Ages and the present. The Lanciani plans have multiple inconsistencies, as for example, they show Nero's circus with the entrance facing west, which is impossible as this part was partially excavated into the hill and was on the opposite side of the access road (which came from the east). However, some aspects of the Lanciani drawings are correct and very useful. These plans are included in the following publications: Rodolfo Amedero Lanciani, *The ruins and excavations of ancient Rome. A companion book for students and travellers* (London: Macmillan, 1897); Rodolfo Amedero Lanciani, *Forma Urbis Romae*, Istituto Nazionale di Archeologia s Storia dell Arte (Roma, 1901); Rodolfo Amedero Lanciani, *Storia degli scavi di Roma e notizie intorno le collezioni romane di antichità*, I, (Roma: E. Loescher, 1902)

[12] Miriam Griffin, *Nero: The End of a Dynast* (New Haven, 1984), p. 239

[13] Ferdinando Castagnoli, *Circo di Neron in Vaticano*, Atti della Pontificia Academia Romana di Archeologi (Roma, 1959)

[14] Pietro Zander, *The Necropolis Under St. Peter´s Basilica in the Vatican* (Fabbrica di San Pietro, Roma: Elio de Rosa Editore, 2009), p. 73; See also Italian edition: *La Necropoli sotto la Basilica di San Pietro* (Roma: Elio de Rosa Editore, 2007)

[15] Giovanni Battista Piranesi, *Le antichirá Romane* (París: Firmin Didot Freseres, 1835)

[16] Lawrence Richardson, *A New Topographical Dictionary of Ancient Rome* (Mausoleum Hadriani, p. 212) (Baltimore and London: John Hopkins University Press, 1992)

[17] Ferdinando Castagnoli, *II Circo di Nerone in Vaticano*, Atti della Pontificia Accademia Romana di Archeologia. Rendiconti 32 (1959-60), pp. 97-121F, 240; Richard Gem, *The Vatican Rotunda: a Severan monument and its early history, c. 200 to 500*, Journal of the Bristish Archaeological Association 158 (2005), pp. 1-45

[18] Rossana Mancini, *Le mura aureliane di Roma. Atlante di un palinsesto murario* (Roma: Quasar, 2001)

[19] Paulinus de Nola, *Epistulae, ep. 13.11-14*, G. de Hartl (ed.), Sancti Pontii Meropii Paulini Nolani Opera, I. Epistulae (CCSL 29), pp. 92-6 (ii) (Viena, 1894)

[20] Gabriele Bartolozzi Casti, *La Basilica Vaticana tra Medioevo e Rinascimento: la distruzione del Mausoleo degli Anici*, in Atti della Pontificia Accademia romana di archeologia, rendiconti in serie (2010/2011), pp. 427-455

[21] Hugo Brandenburg, 'L'antica basilica Vaticana costantiniana di S. Pietro', p. 29

[22] Giuseppe Zecchini, *Attila en Italia: ragioni politiche e sfondo ideológico*, L´Erma di Bretschneider (Roma, 1994), p. 162

[23] *The Vatican: spirit and art of Christian Rome* (New York: The Metropolitan Museum of Art, 1983)

[24] Hugo Brandenburg, 'L'antica basilica Vaticana costantiniana di S. Pietro', p. 32

[25] Hugo Brandenburg, 'L'antica basilica Vaticana costantiniana di S. Pietro', p. 27; Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', p. 47; Richard Krautheimer CBCR V, vol. V, p. 267

[26] Tina Squadrilli, *Vicende e monumento di Roma* (Roma: Standerini Editore, 1961), p. 76.

[27] Liber Pontificalis 1957, p. 53 c.7; J. D. Alchermes, *Petrine politics: Pope Simaco and the rotunda of Saint Andrew at old Saint Peter's*, Catholic historical Review 81 (1995), pp. 1-40

[28] Liber Pontificalis 1957, I, p. 455; Bryan Ward-Perkins, *From Classical Antiquity to the Middle Ages* (Oxford University Press, 1984), p. 195

[29] Liber Pontificalis 1957, I, 507; Hugo Brandenburg, *Roms Frühchristliche Basiliken des 4. Jahrbunderts* (München, 1979), p. 153

[30] Édouard De Bleser, *Rome et ses monuments. Guide du voyageur catholique* (Paris: Wenteorth Press, 1870), p. 467

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FIGURES 2

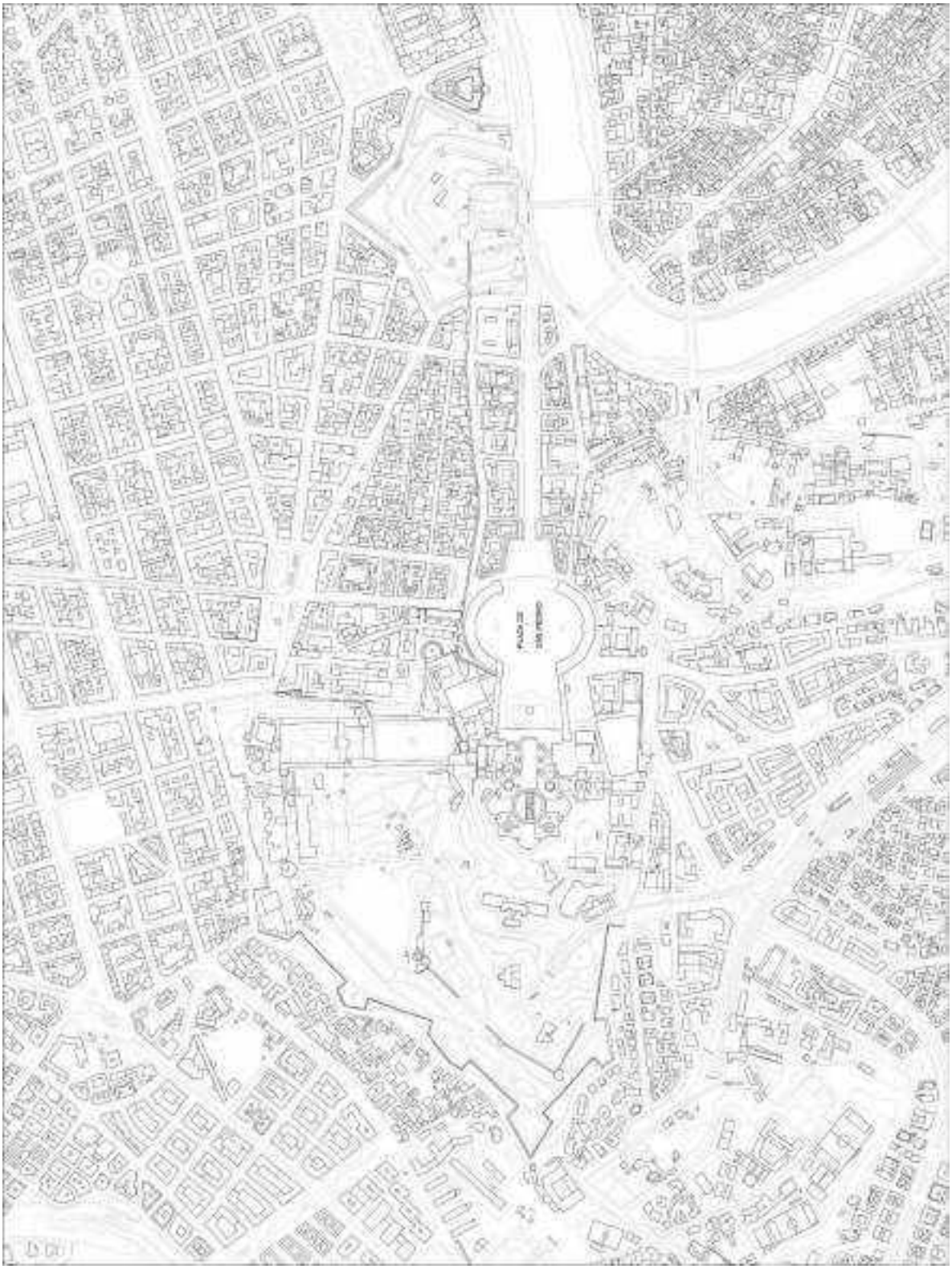
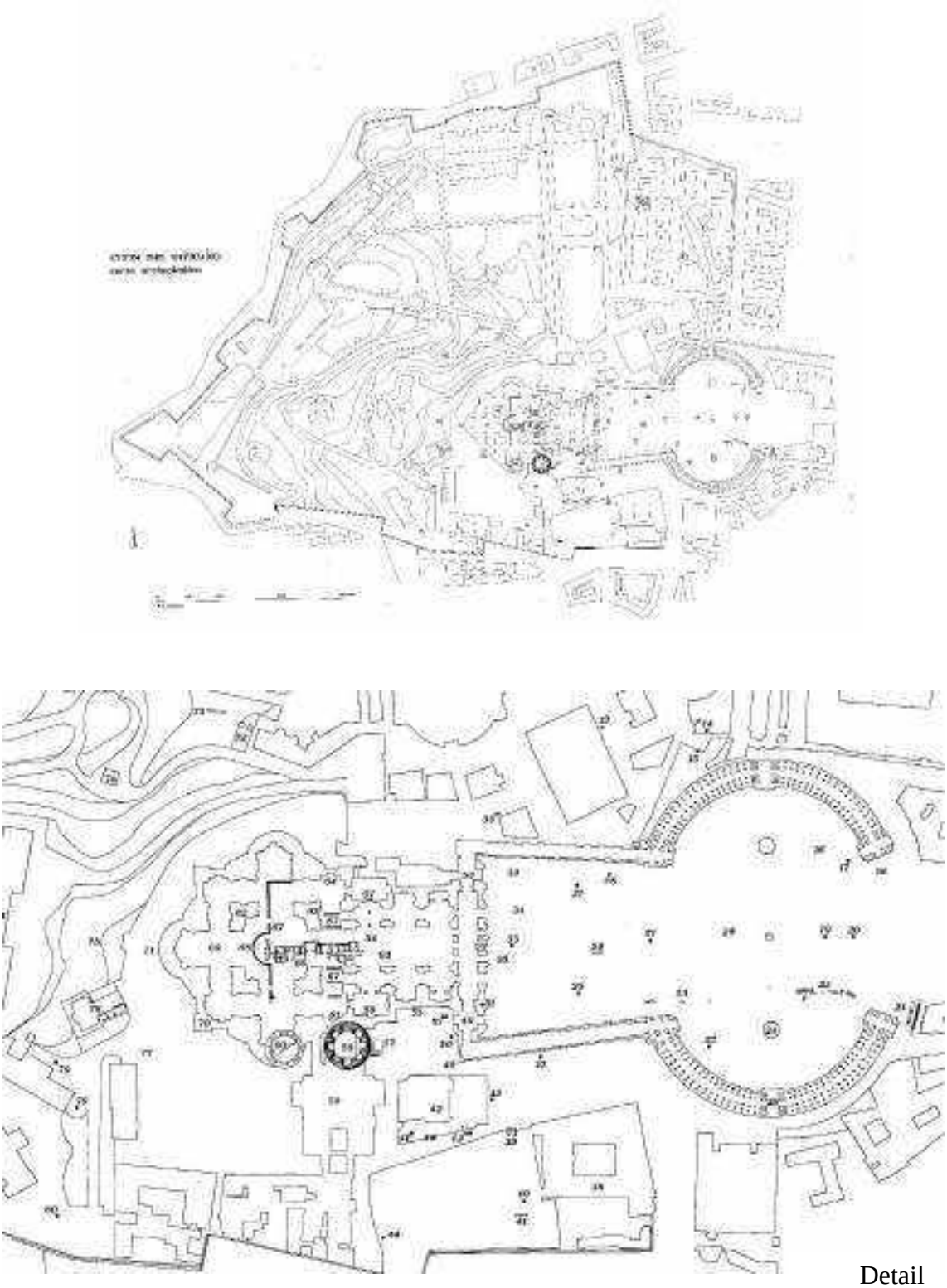


Figure 2.1

Cadastral map of Rome, 2020



Detail

Figure 2.2

Citta del Vaticano, carta archeologica

Paolo Liverani, 1999

Paolo Liverani. *La topografía antica del vaticano*. Vatican City: Monumenti, musei e gallerie pontificie (1999), p. 181

Detail

Figure 2.3

Visione della croce, Fresco

Giulio Romano and Raffaellino del Colle (Scuola di Raffaello), 1520-1524

Sala di Costantino, Musei Vaticani

Figure 2.4a

Roma nel sec. XVI.

Leonardo Bufalini, 1551

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 210-221

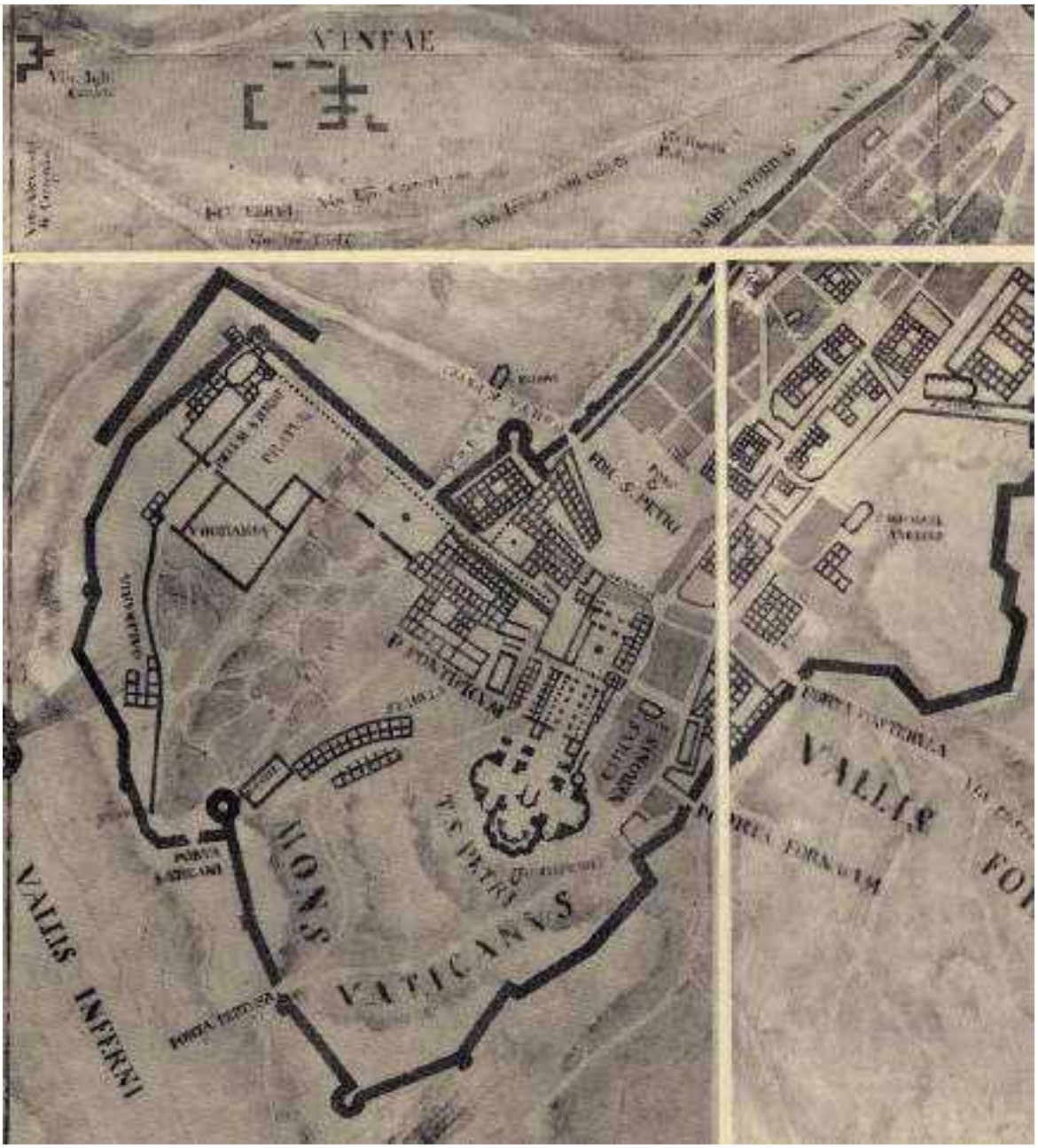


Figure 2.4b

Roma nel sec. XVI. Detail

Leonardo Bufalini, 1551

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 210-221

Figure 2.5a

Roma antica

Rodolfo Lanciani, 1893 - 1901

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 102-109

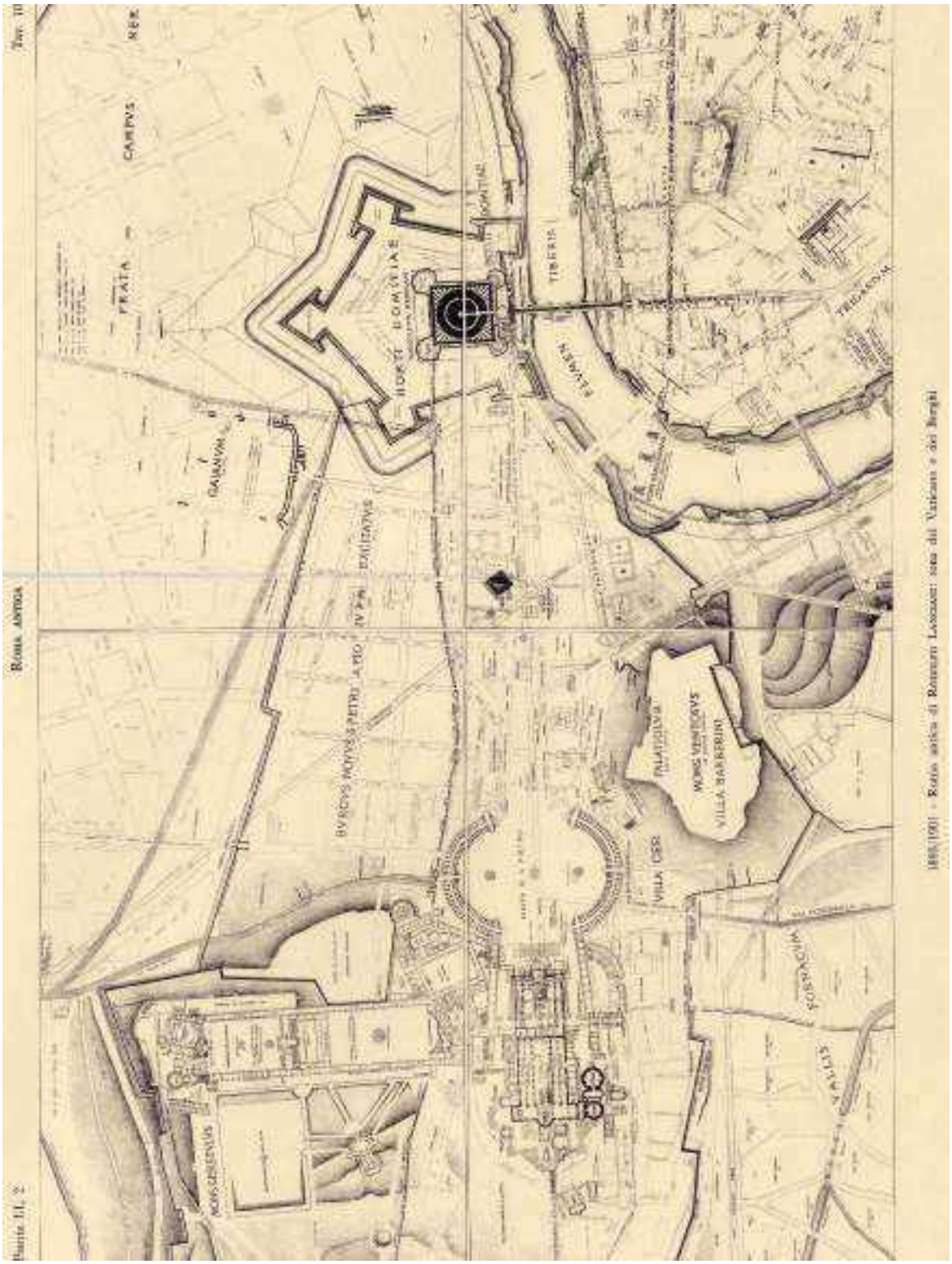


Figure 2.5b

Roma Antica. Zona del Vaticano e dei Borghi

Rodolfo Lanciani, 1893 - 1901

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 103

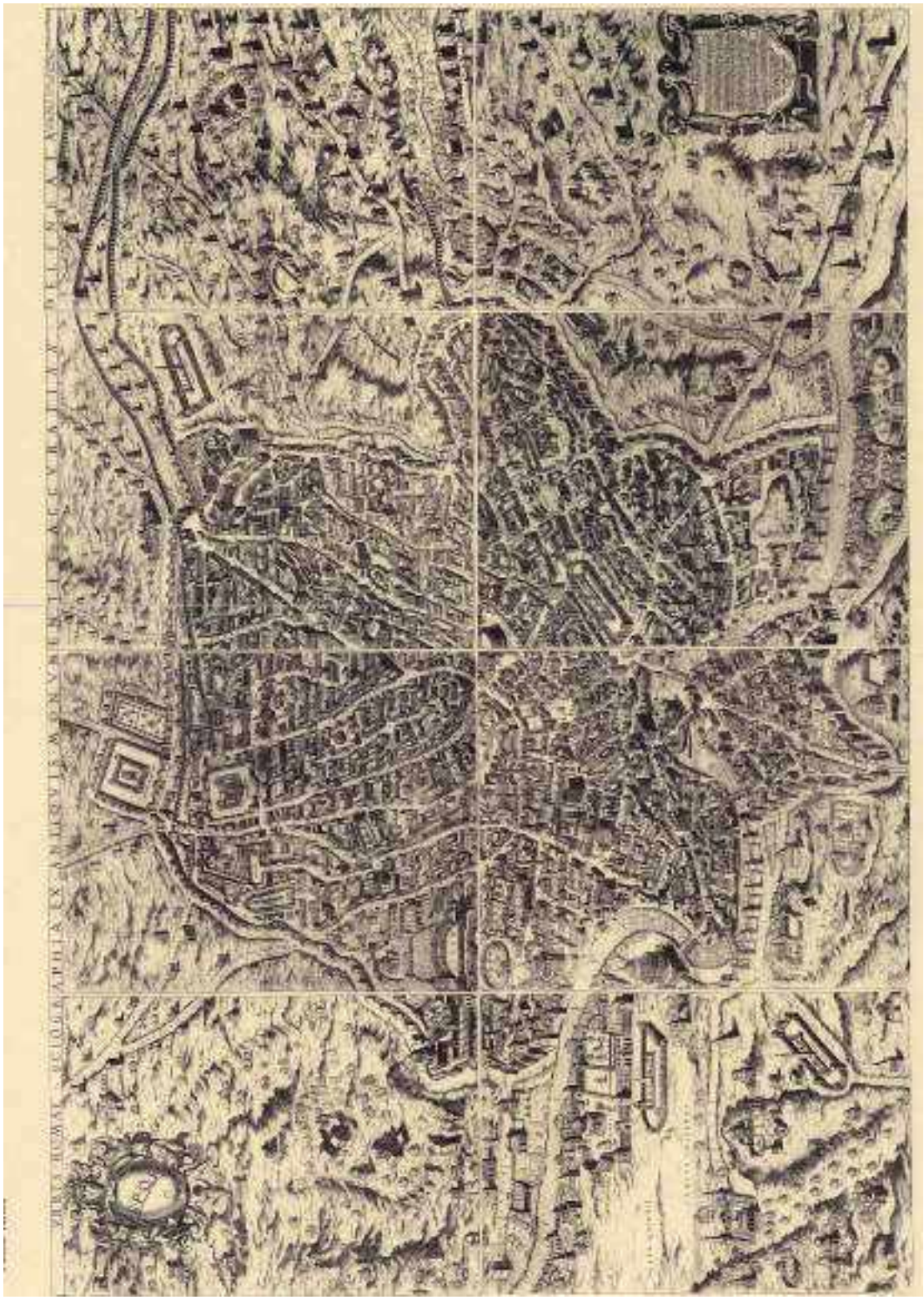


Figure 2.6a

Roma antica

Stefano Duperac, 1574

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 37

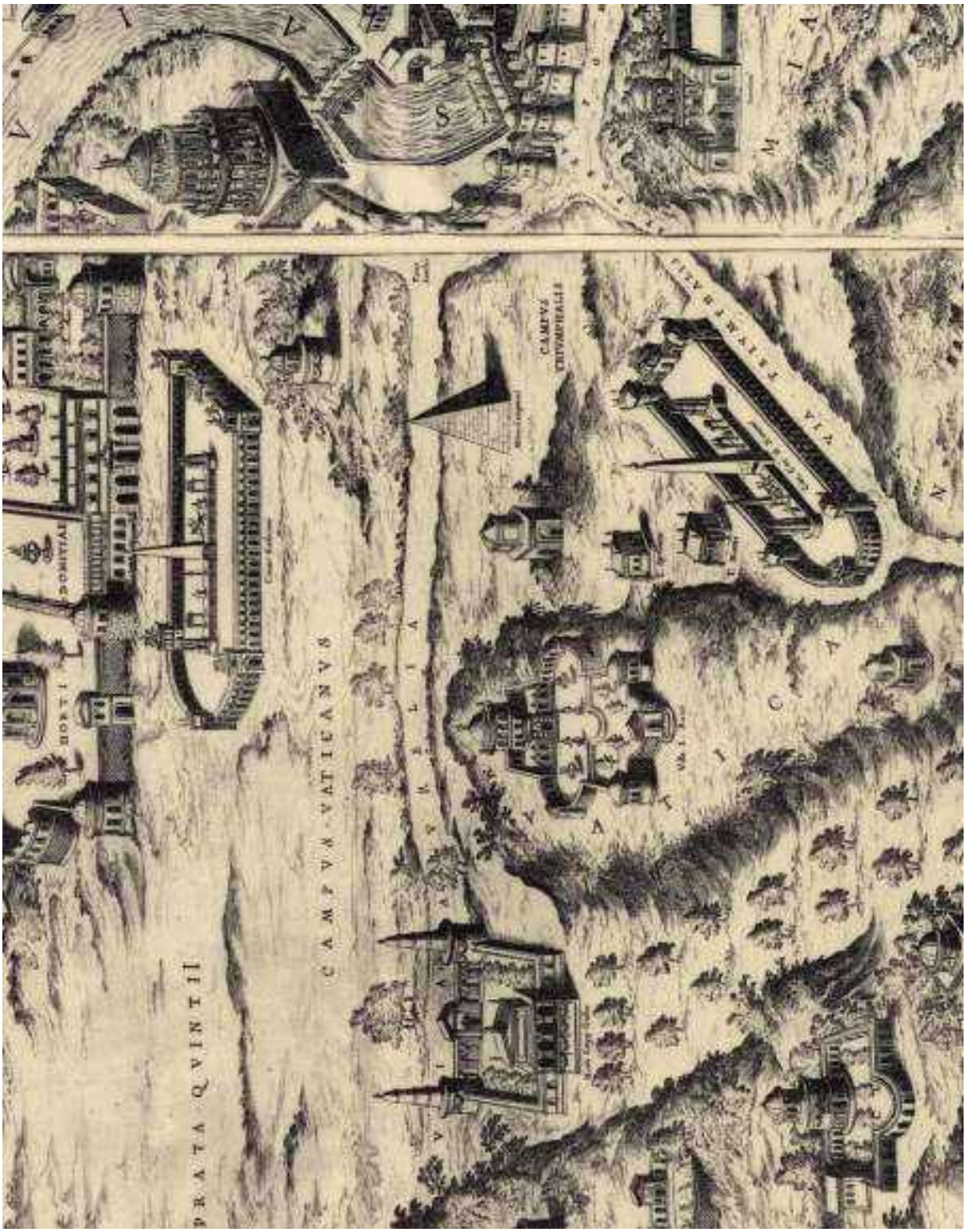


Figure 2.6b

Roma antica. Detail

Stefano Duperac, 1574

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 37

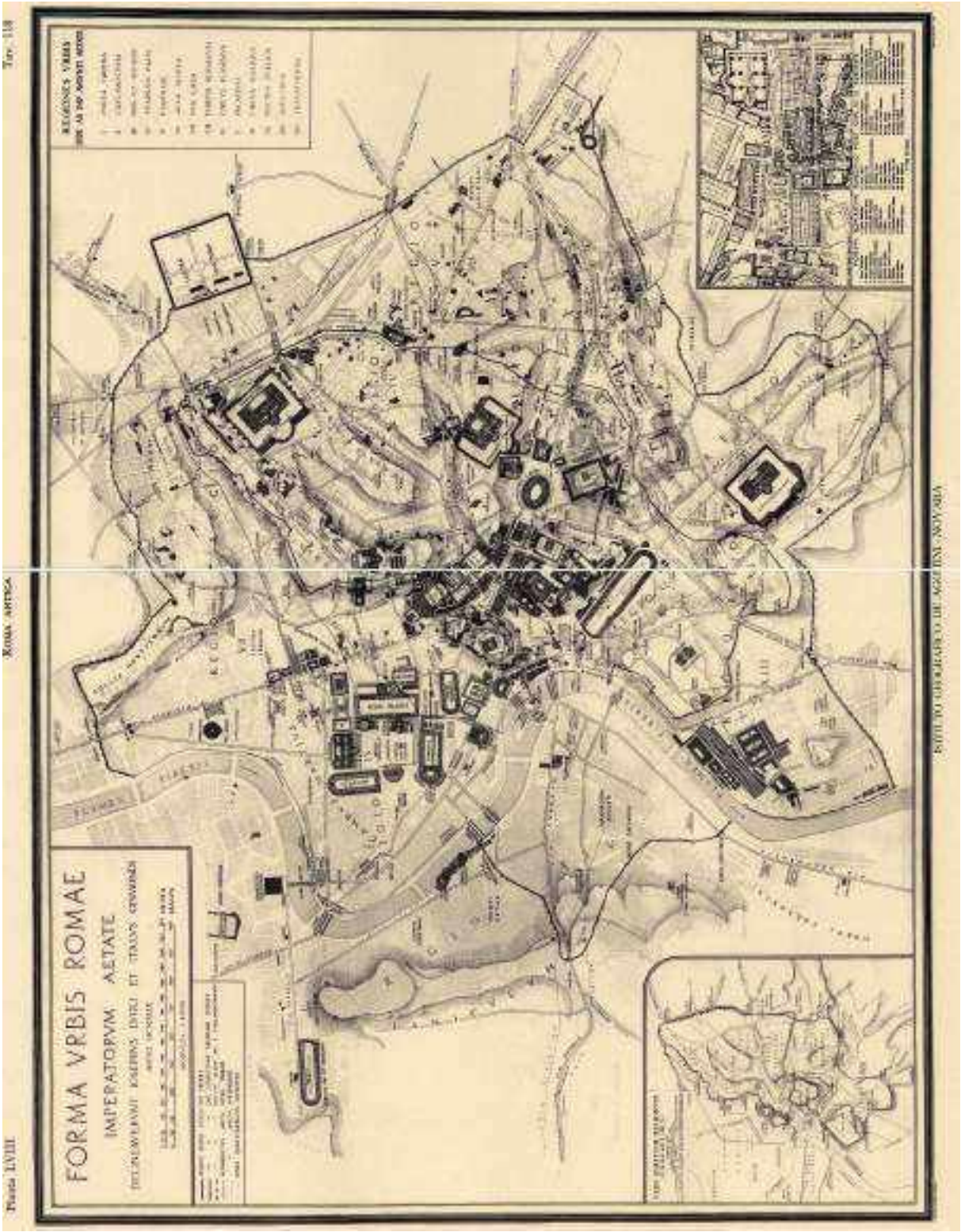


Figure 2.7a

Roma antica. *Forma Urbis Romae.* Detail.

Giuseppe Lugli and Italo Gismondi, 1949

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 118

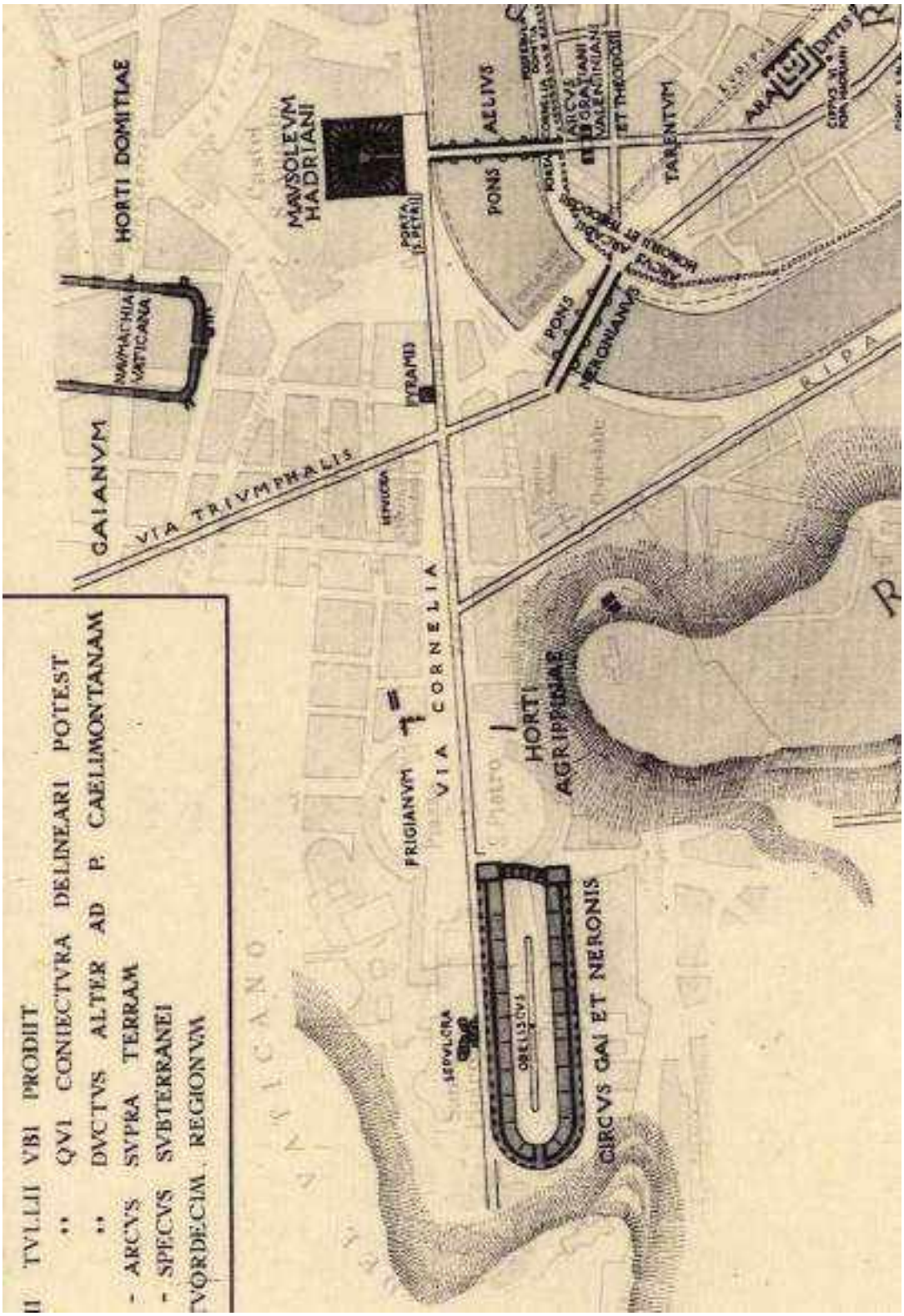


Figure 2.7b

Roma antica. Forma Urbis Romae. Detail

Giuseppe Lugli and Italo Gismondi, 1949

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 118

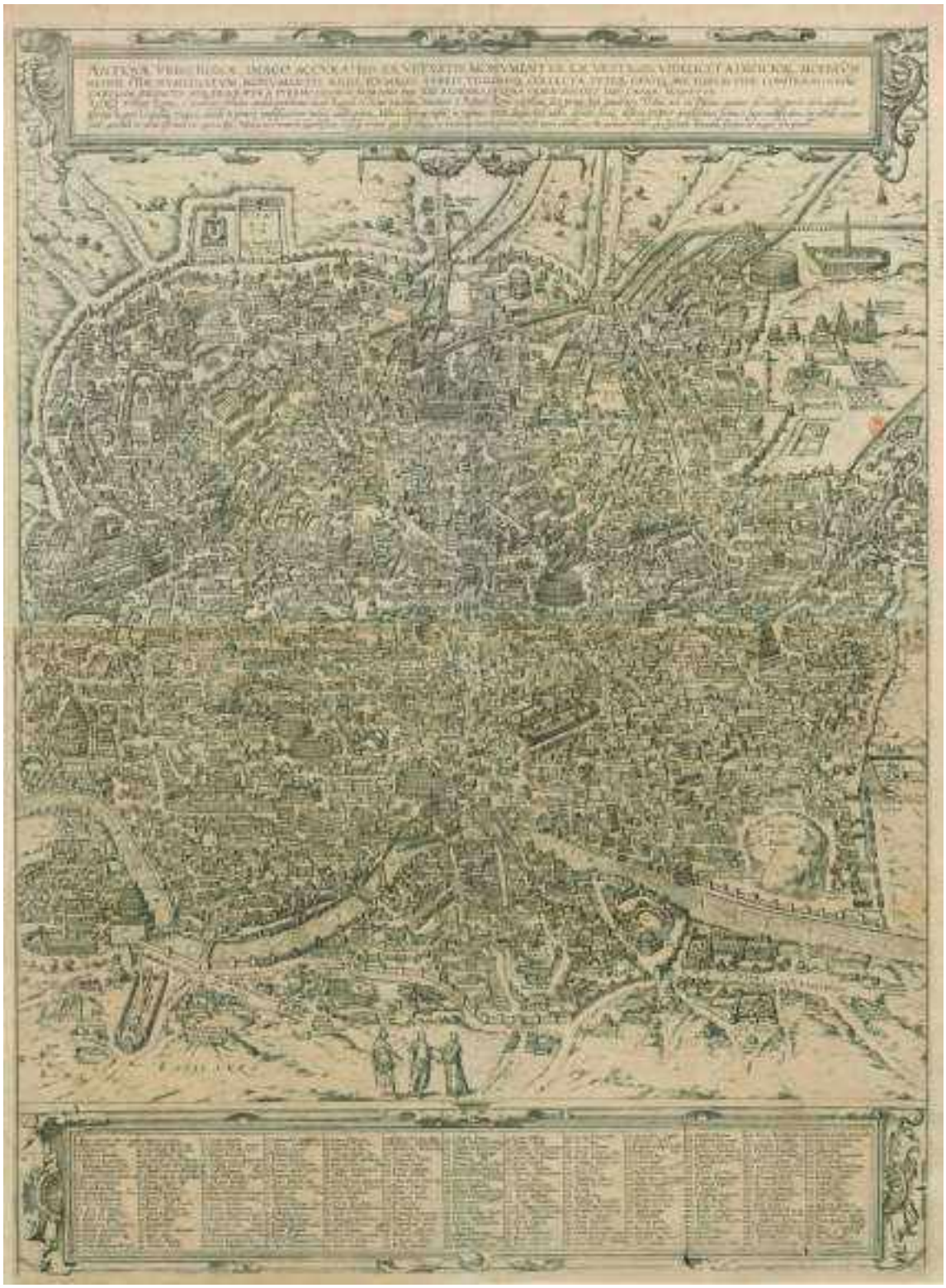


Figure 2.8a

Antiquae Urbis Romae Imago accuratissime ex vetustis monumentis formata

Pirro Ligorio in 1551, printed by Jacopo Rossi in 1561

Bibliothèque Nationale de France, cod. GE BB-246 (XII,158-159RES)

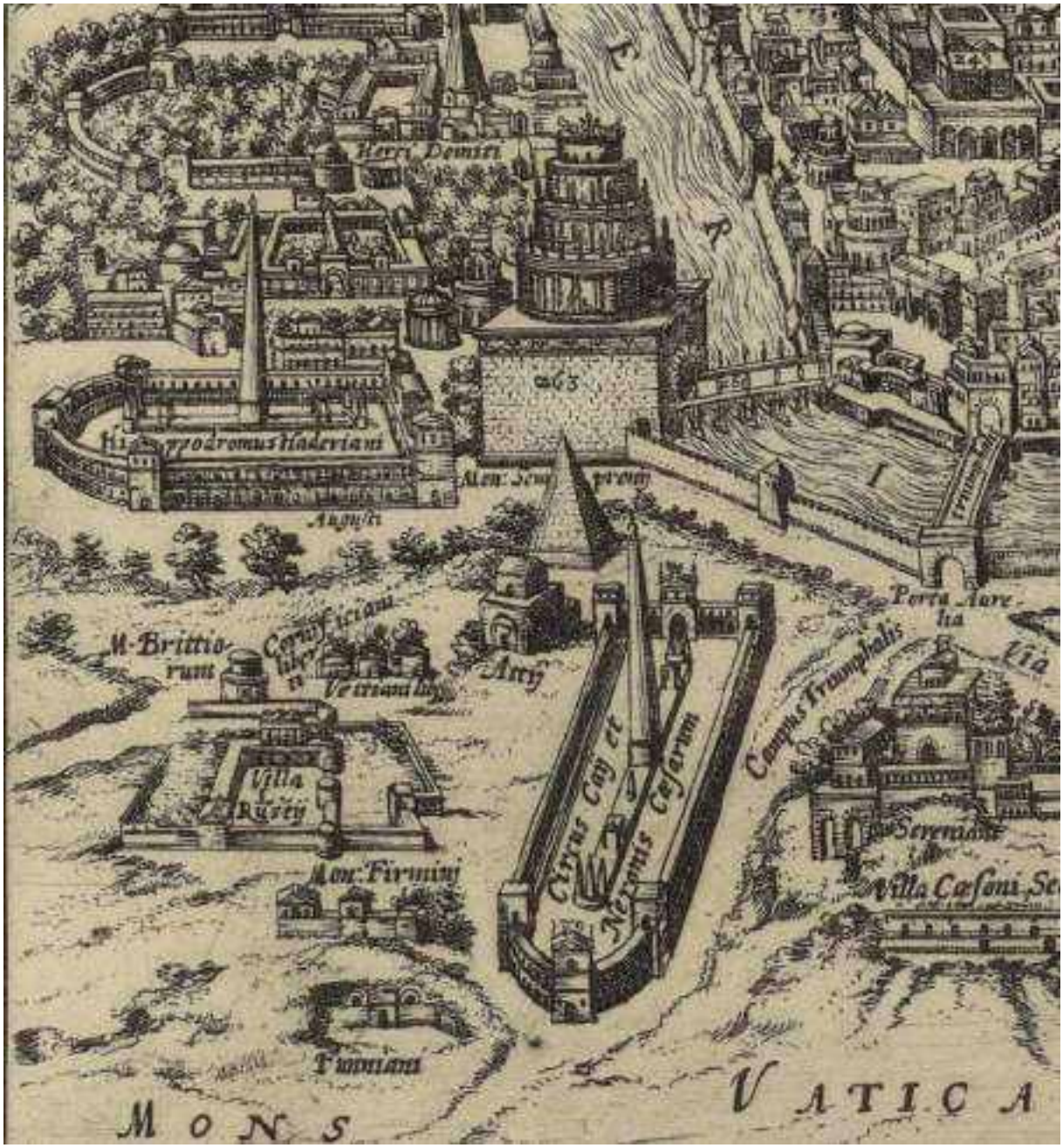


Figure 2.8b

Antiquae Urbis Romae Imago accuratissime ex vetustis monumentis formata. Detail

Pirro Ligorio in 1551, printed by Jacopo Rossi in 1561

Bibliothèque Nationale de France, cod. GE BB-246 (XII,158-159RES)

Figure 2.9a

Urbis Romae totius olim orbis domitricis situs, cum adhuc extantibus sacrosanetae vetustatis monumentis

Pirro Ligorio, 1570

Bibliothèque Nationale de France, cod. GE D-17740

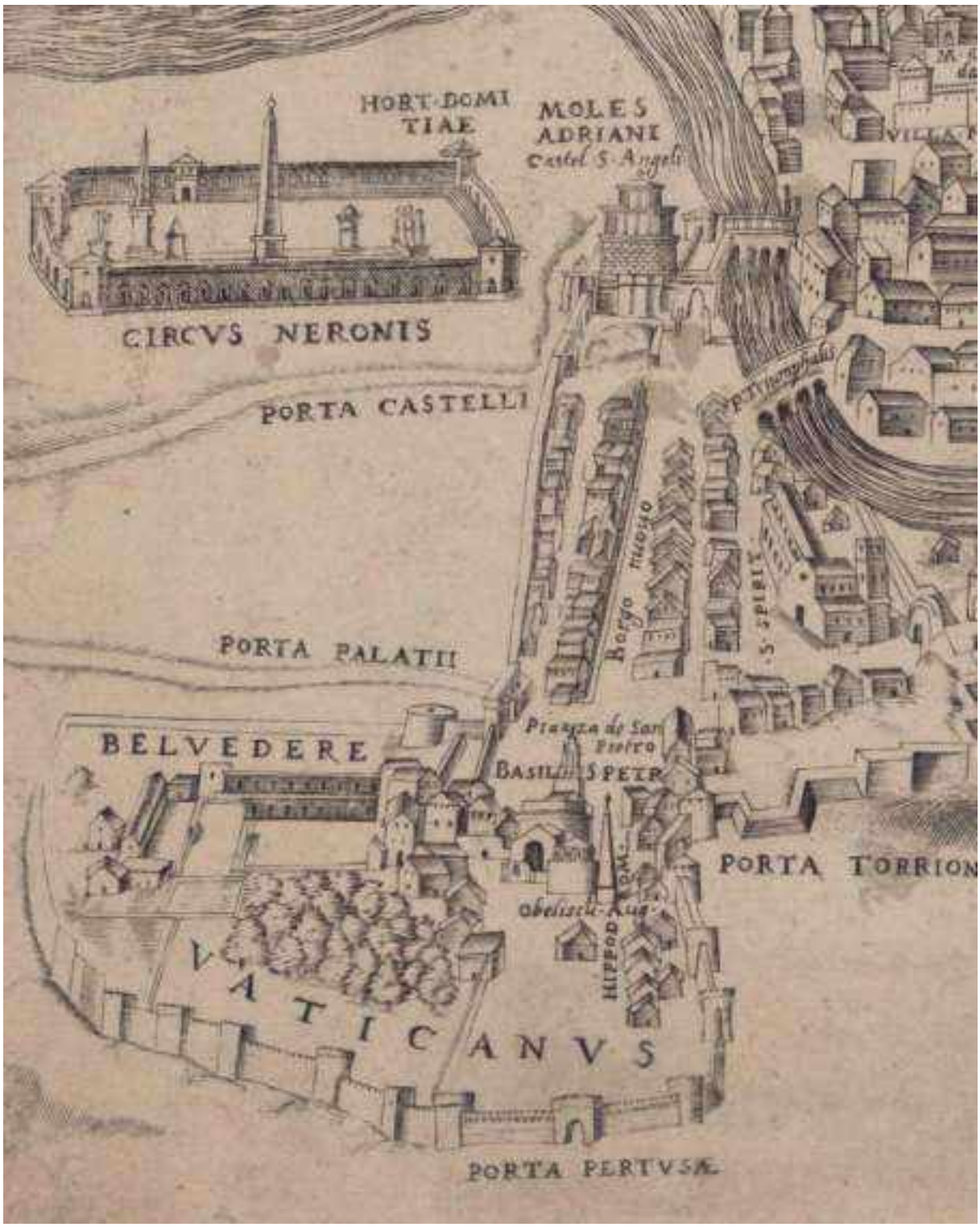


Figure 2.9b

Urbis Romae totius olim orbis domitricis situs, cum adhuc extantibus sacrosanetae vetustatis monumentis. Detail

Pirro Ligorio, 1570

Bibliothèque Nationale de France, cod. GE D-17740

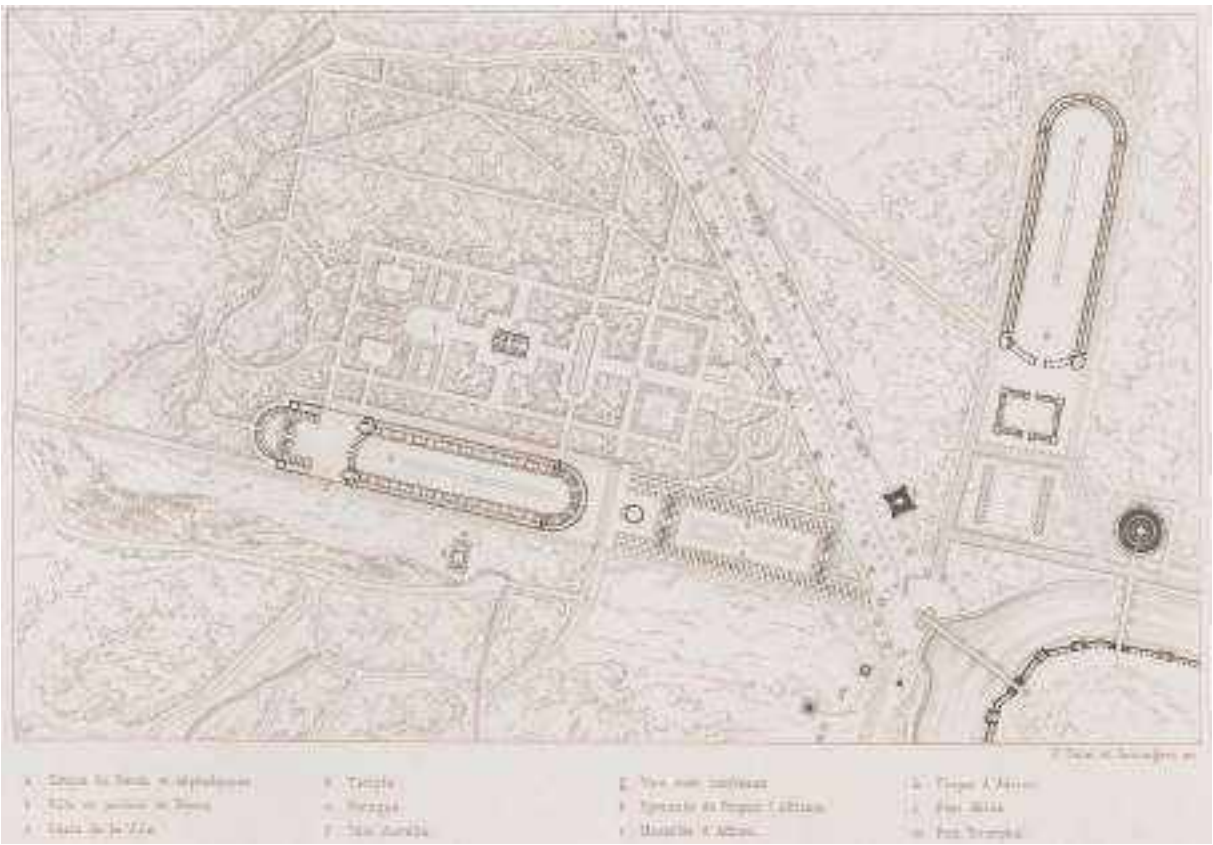


Figure 2.10

General plan of the ancient Vatican district in the 2nd century

Paul Marie Letarouilly, 1882

Letarouilly, Paul Marie. *Le Vatican et la basilique de Saint-Pierre de Rome*, vol.1, Paris (1882). Chapter Cirque de Caius Caligula et Neron, PL1, fig. 2

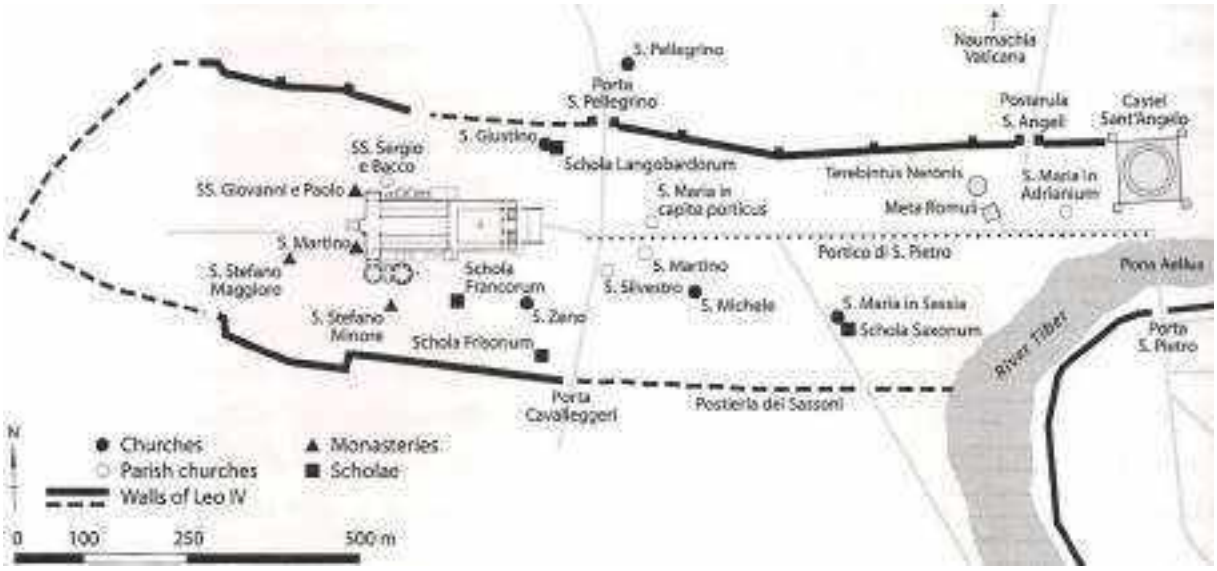


Figure 2.11

The medieval ecclesiastical institutions and classical structures in the environs of S. Peter´s

Rosamond McKitterick

Old Saint Peter´s Rome. Rome (2013), p. 274

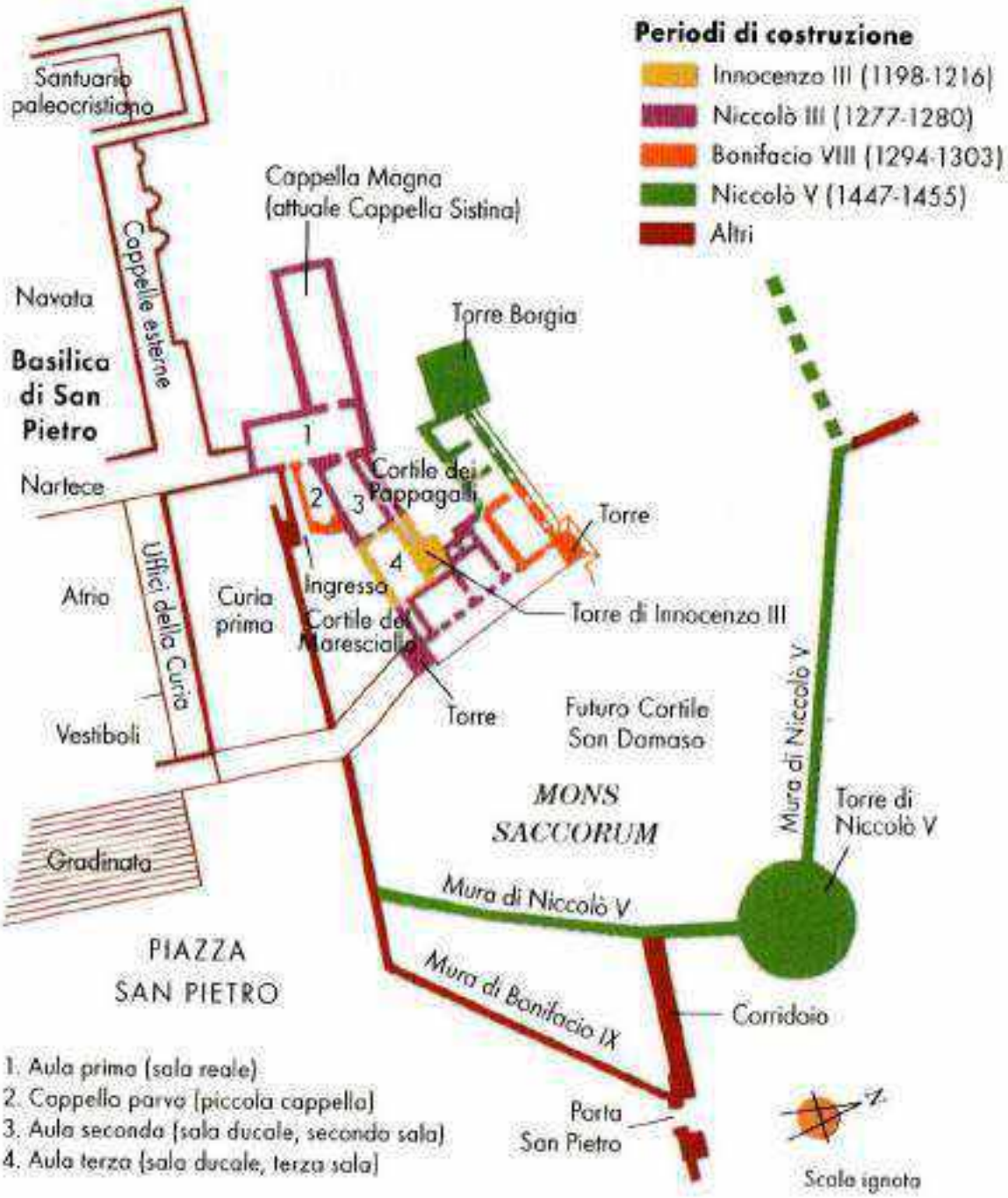


Figure 2.12

The evolution of the Vatican Palace (XII-XV century)

C. W. Westfall

C. W. Westfall. *L´invenzione della cittá* NIS La Nuova Italia Scientifica. Rome (1984), p. 76

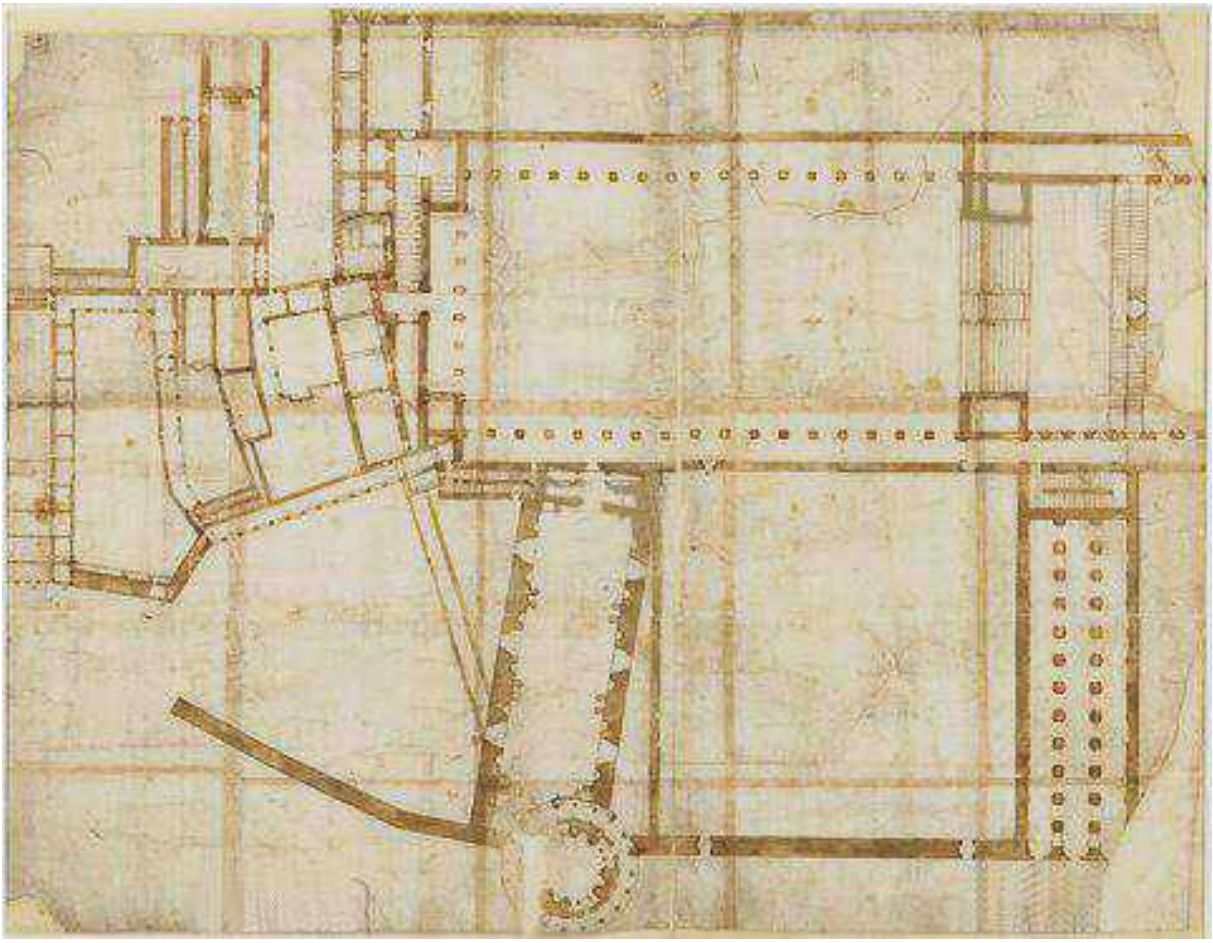


Figure 2.13

Plan of the Palazzo Vaticano in Rome

Donato Bramante

GDSU 287 Ar

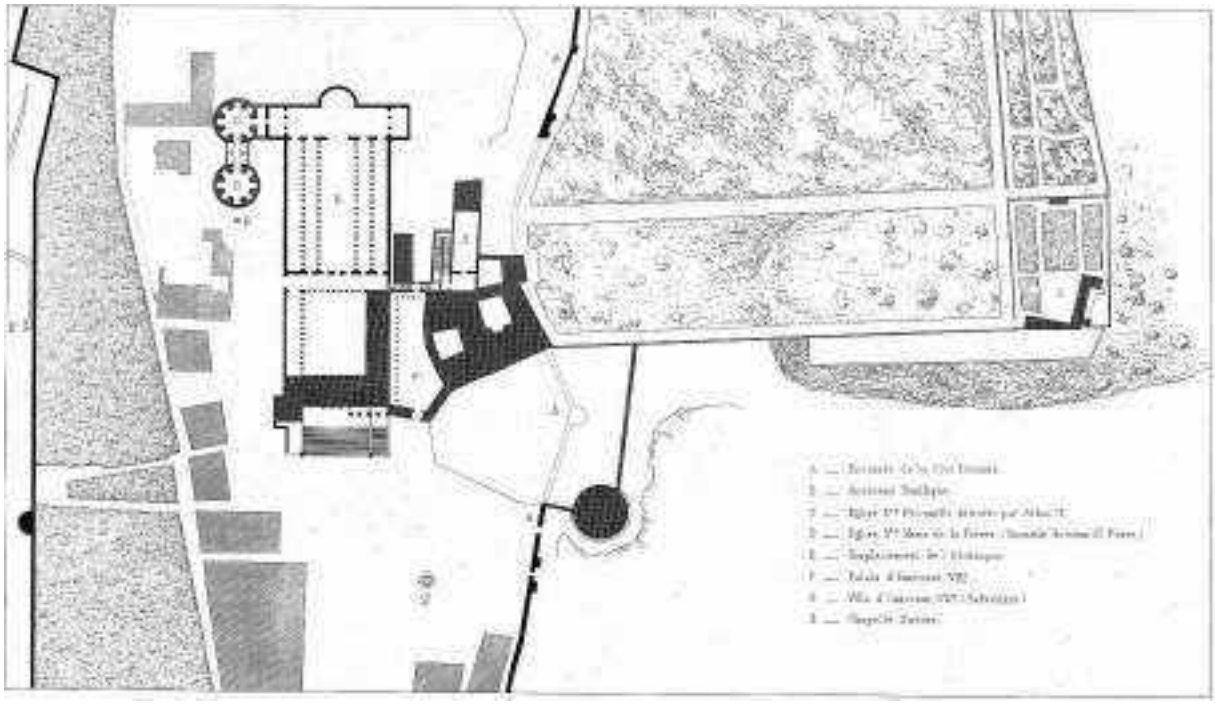


Figure 2.14

General plan for the Basilic of S. Peter in vatican, final of XV century

Paul Marie Letarouilly

Paul Marie Letarouilly. *Le Vatican et la basilique de Saint-Pierre de Rome*, vol.1. Paris (1882). Chapter, Projets divers pour la basilique de St. Pierre, PL 1

Detail

Figure 2.15

View of Rome, detail of Borgo, the Basilica of Saint Peter and the Papal Palace

Michael Wolgemut and Wilhelm Pleydenwurff

Hartmann Schedel. *Liber Chronicarum*, (1493), f. LVII verso and LVIII recto

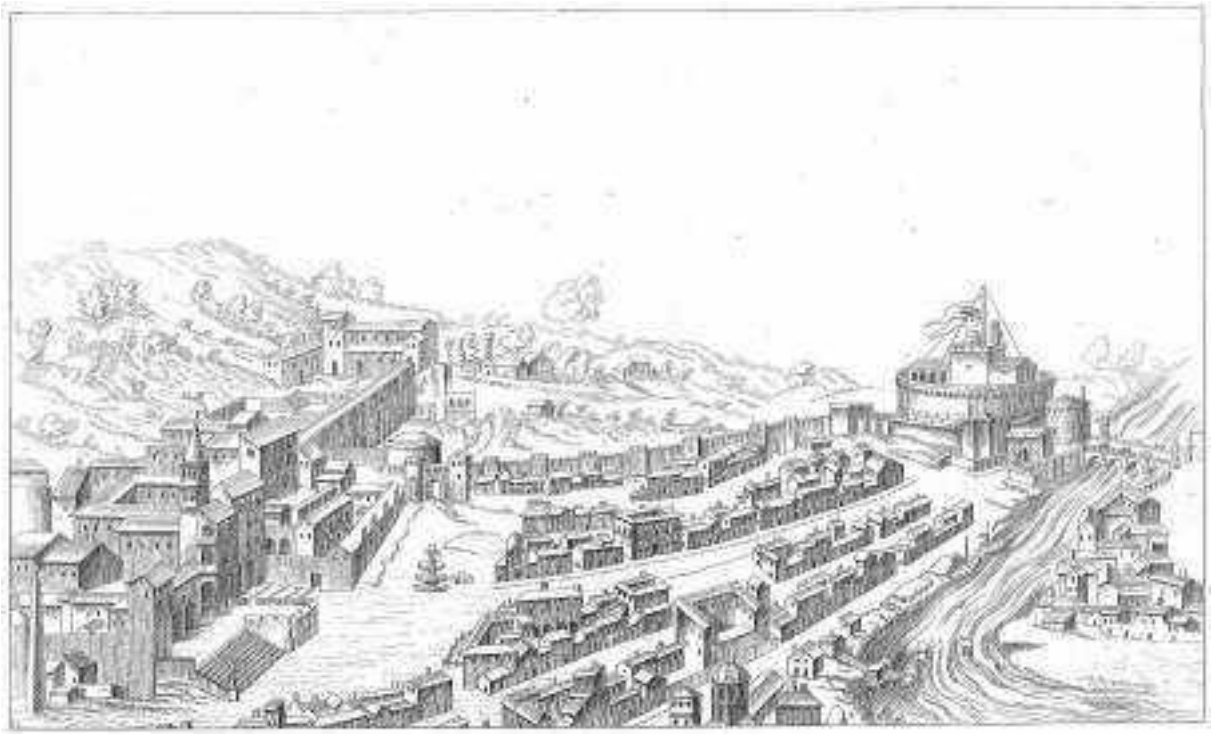


Figure 2.16

Fac-simile d'une gravure conserve á la Bibliothéque Ste. Geneviéve, 1558

Paul Marie Letarouilly

Paul Marie Letarouilly. *Le Vatican et la basilique de Saint-Pierre de Rome*, vol.1. Paris (1882). Chapter, Ancienne Basilique de Saint-Pierre, PL9

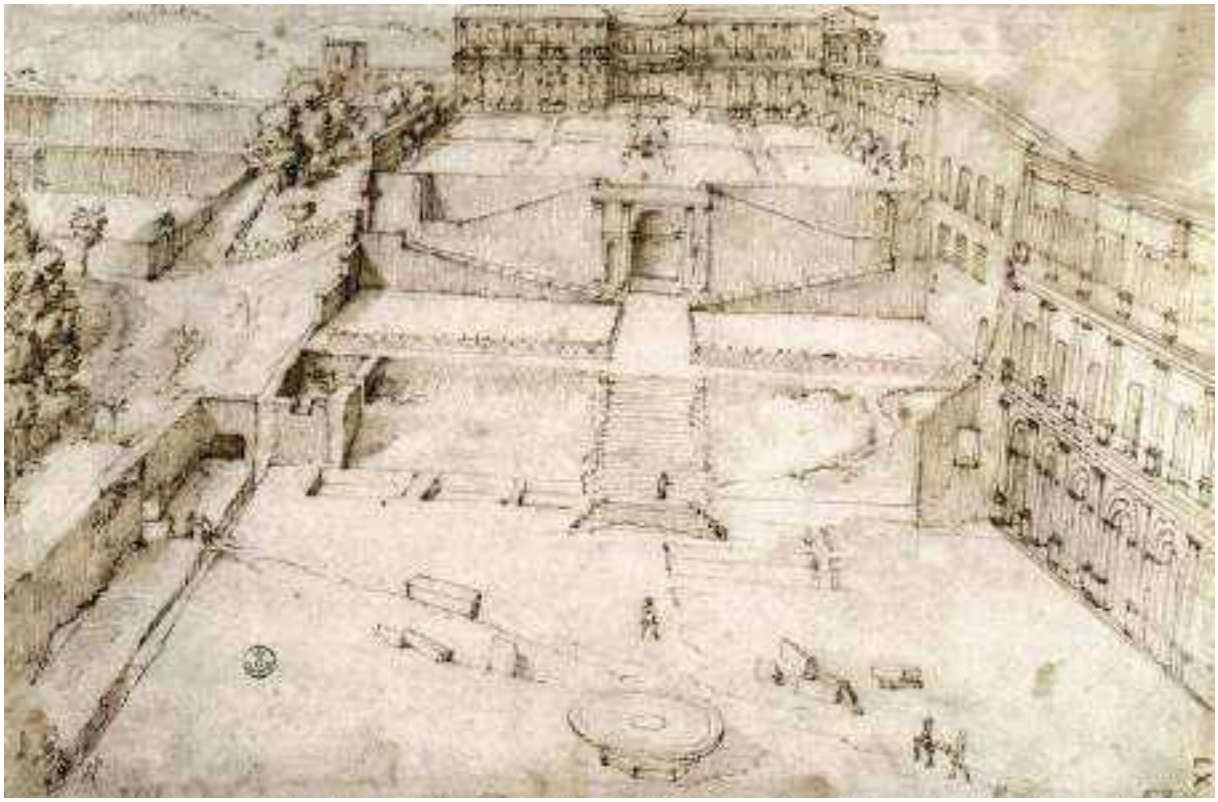


Figure 2.17

Belvedere courtyard according to the Bramante project

Dosio Giovanni Antonio, 1558-1561

GDSU 2559 A

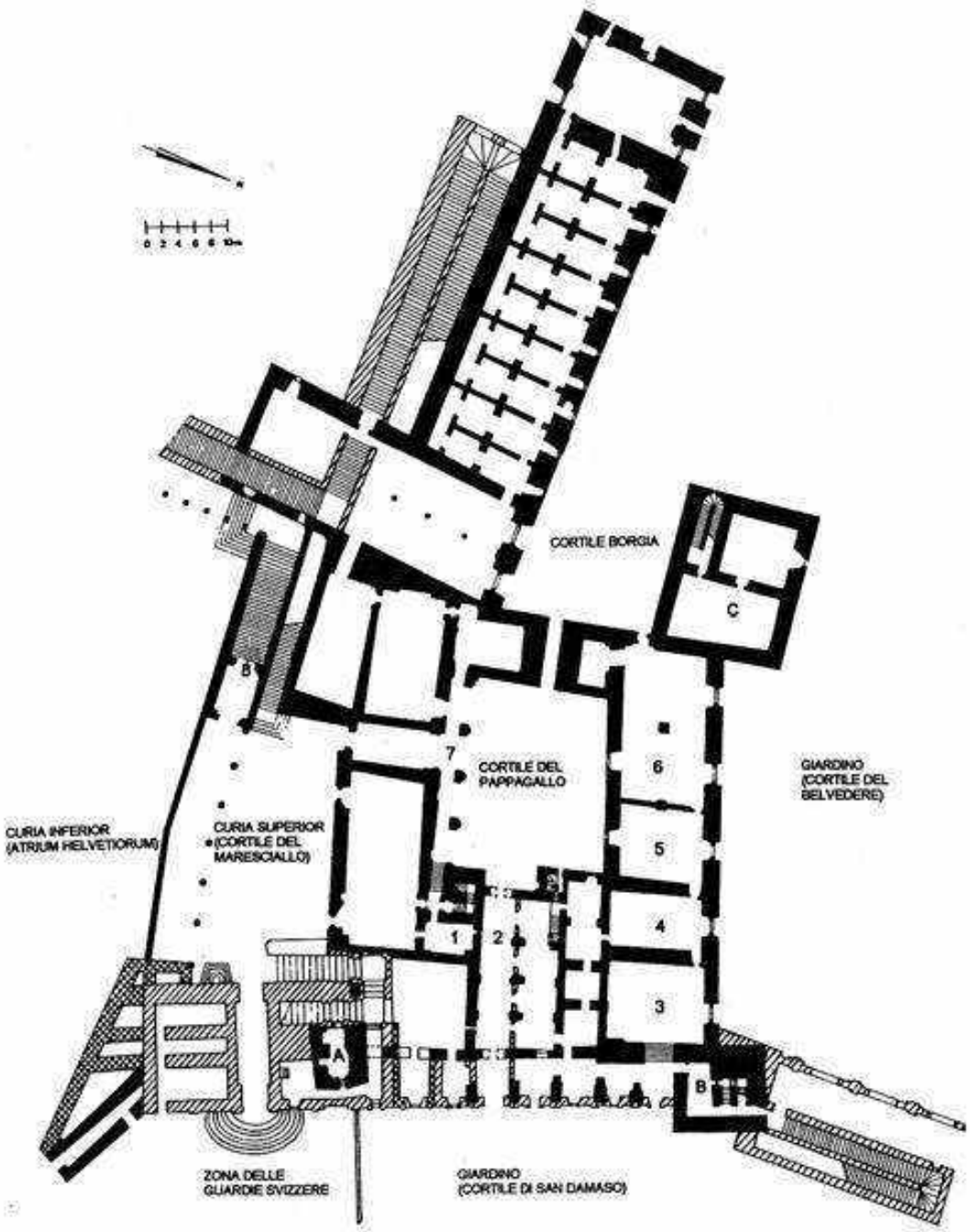


Figure 2.18a

The Vatican Palace, ground floor (reconstruction of the level, with connecting spaces, openings and passages, in the year 1521). A) south-east medieval tower, B) north-east medieval tower, C) Borgia tower, 1) Innocenzo III tower, 2) kitchens, 3) dining rooms (Sisto IV, Bibliotheca Pontificia o Magna secreta), 4) Bibliotheca secreta, 5) Bibliotheca greca, 6) Bibliotheca latina, 7) medieval loggia, 8) Turris scalarum
Christoph Luitpold Frommel, 1984

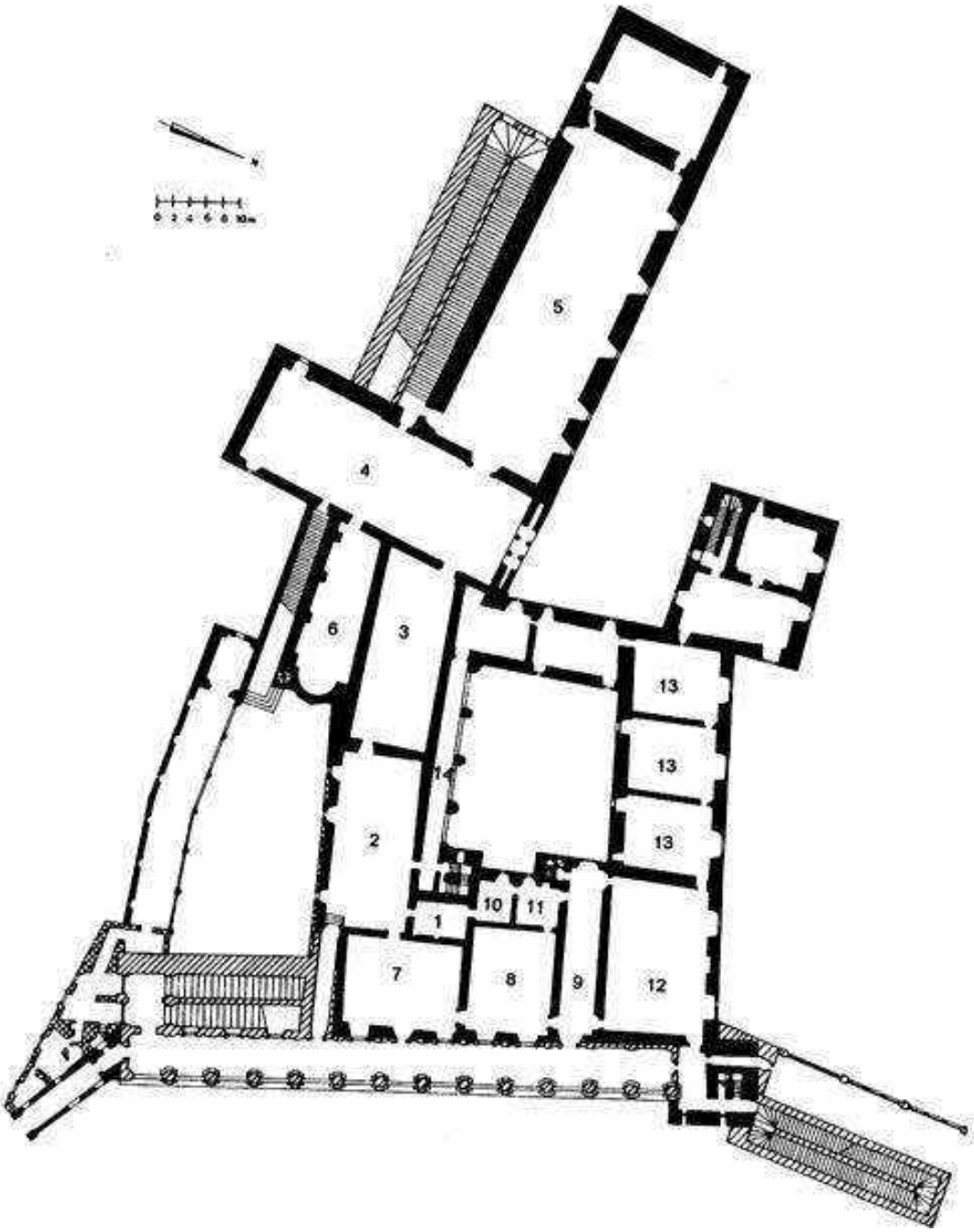


Figure 2.18b

The Vatican Palace, first floor (reconstruction of the level, with connecting spaces, openings and passages, in the year 1521). 1) tower of Innocenzo III, 2) Ducale room (aula tertia), 3) Ducale room (aula secunda), 4) Sala regia (aula prima), 5) Palatine Chapel (cappella magna), replaced and enlarged in the time of Sixto IV with the Sixtine Chapel, 6) Chapel of San Nicola (cappella parva). 7) room of the vestments, 8) camera del pappagallo, 9) Galleriola, 10) Cubicolo de Niccolò V, 11) stanza della falda, 12) room of the pontiffs, 13) Borgia apartment, 14) medieval loggia

Christoph Luitpold Frommel, 1984

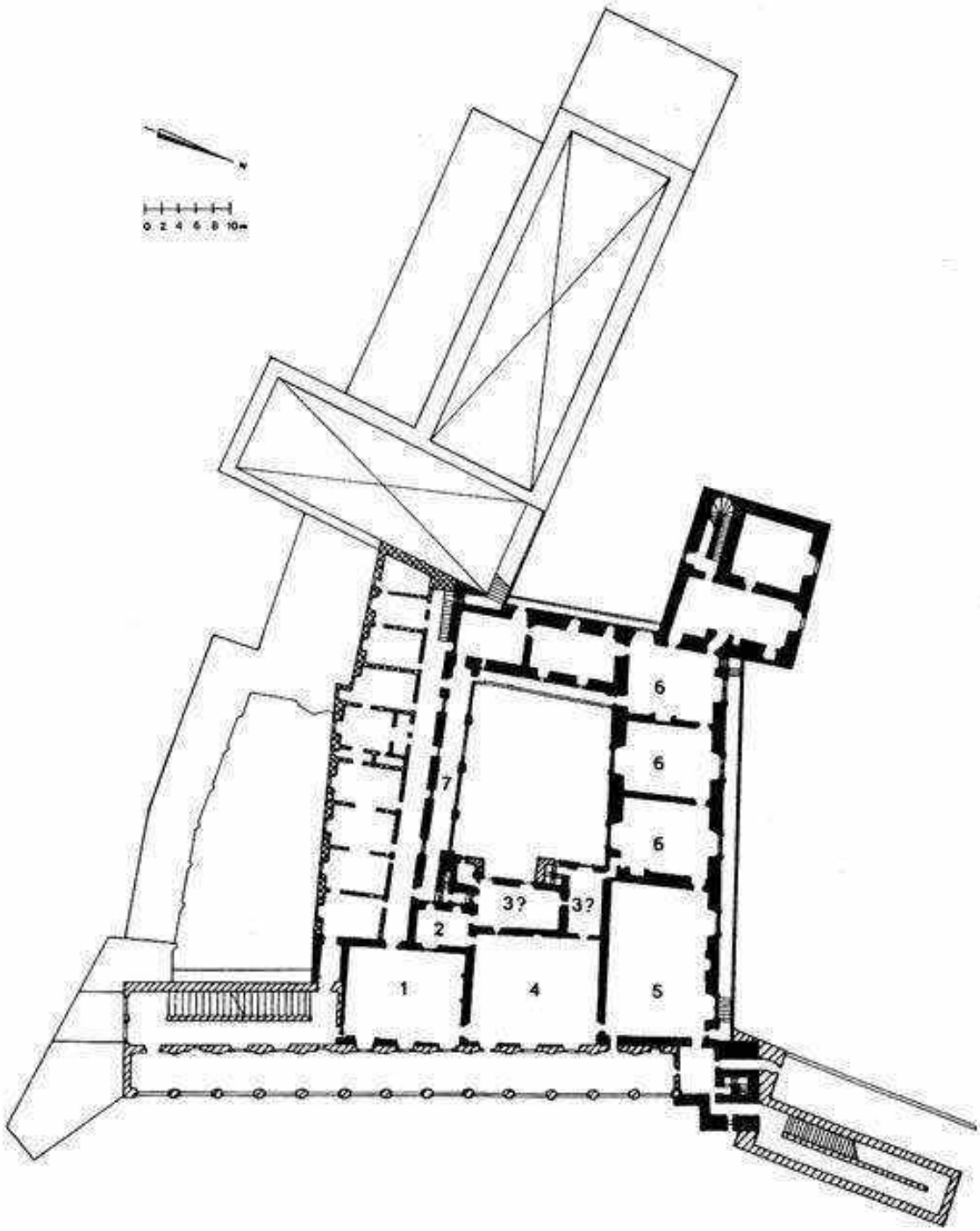
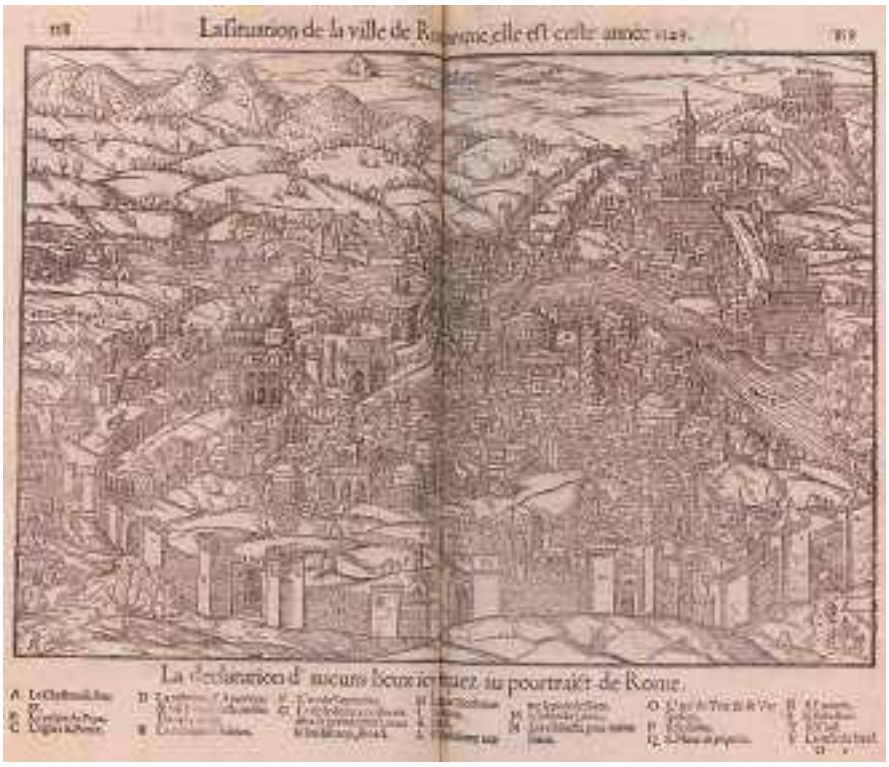


Figure 2.18c

The Vatican Palace, second floor (reconstruction of the level, with the connecting spaces, the openings and the passages, in the year 1521). 1) old room of the Swiss, 2) Chapel of Niccolò V, 3) Studio of Niccolò V, 4) Sala dei chiaroscuri, 5) Sala de Costantino, 6) rooms of Raffaello, 7) medieval loggia

Christoph Luitpold Frommel, 1984



Detail

Figure 2.19

The situation of the city of Rome, in year 1549

Sebastian Münster, 1550

Sebastian Münster. *La Cosmographie Universelle, contenant la situation de tout es les parties du monde, avec leur propietez & appartenances.* Basel: H. Pierre (1552), f. 158-159

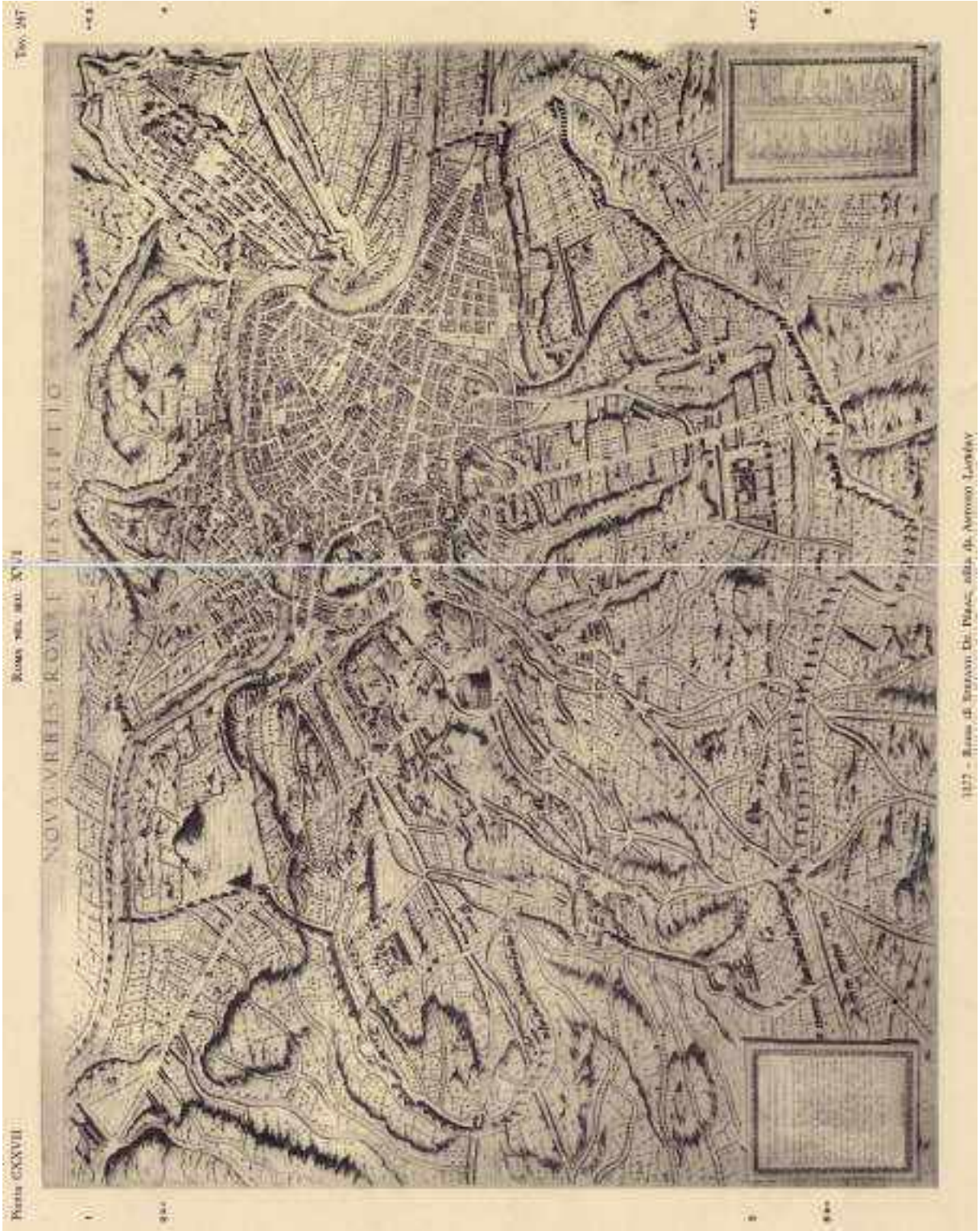


Figure 2.20a

Roma nel sec. XVI

Stefano Duperac, 1577, edited by Antonio Lafreri

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 247

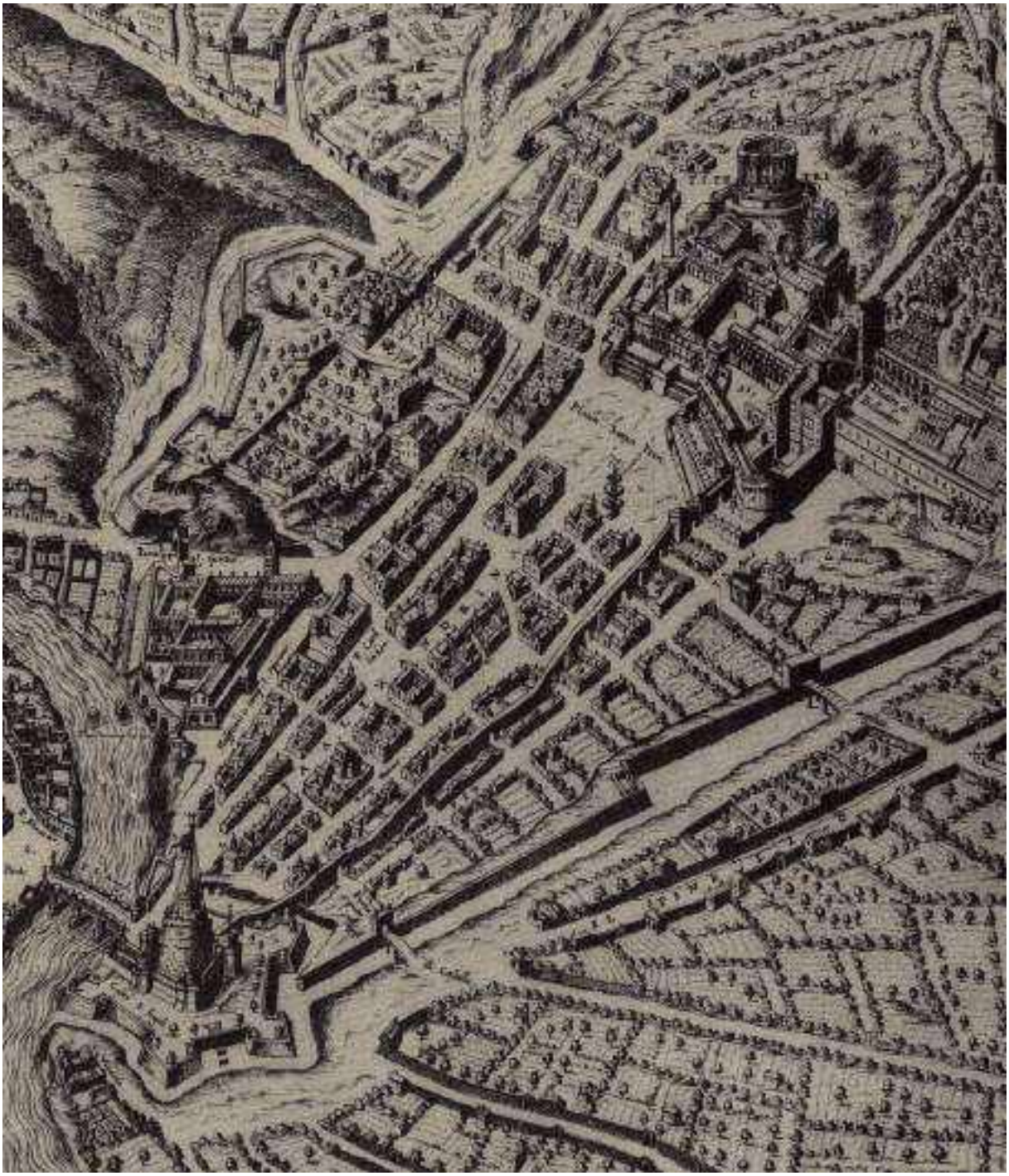


Figure 2.20b

Roma nel sec. XVI. Detail

Stefano Duperac, 1577, edited by Antonio Lafreri

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 247

Figure 2.21

View of S. Peter's square. Engraving

Antonio Lafreri, 1567-1572

The British Museum, nro. 1871,0812.774

Detail

Figure 2.22

The bird's-eye view is derived from Fabio Licinio's view of Rome, dated 1557

Leon Pitor, 1568

Anna Laetitia Pecci-Blunt print collection of views of Rome

Repositary: The Getty Research Institute, cod. P850002** (6)

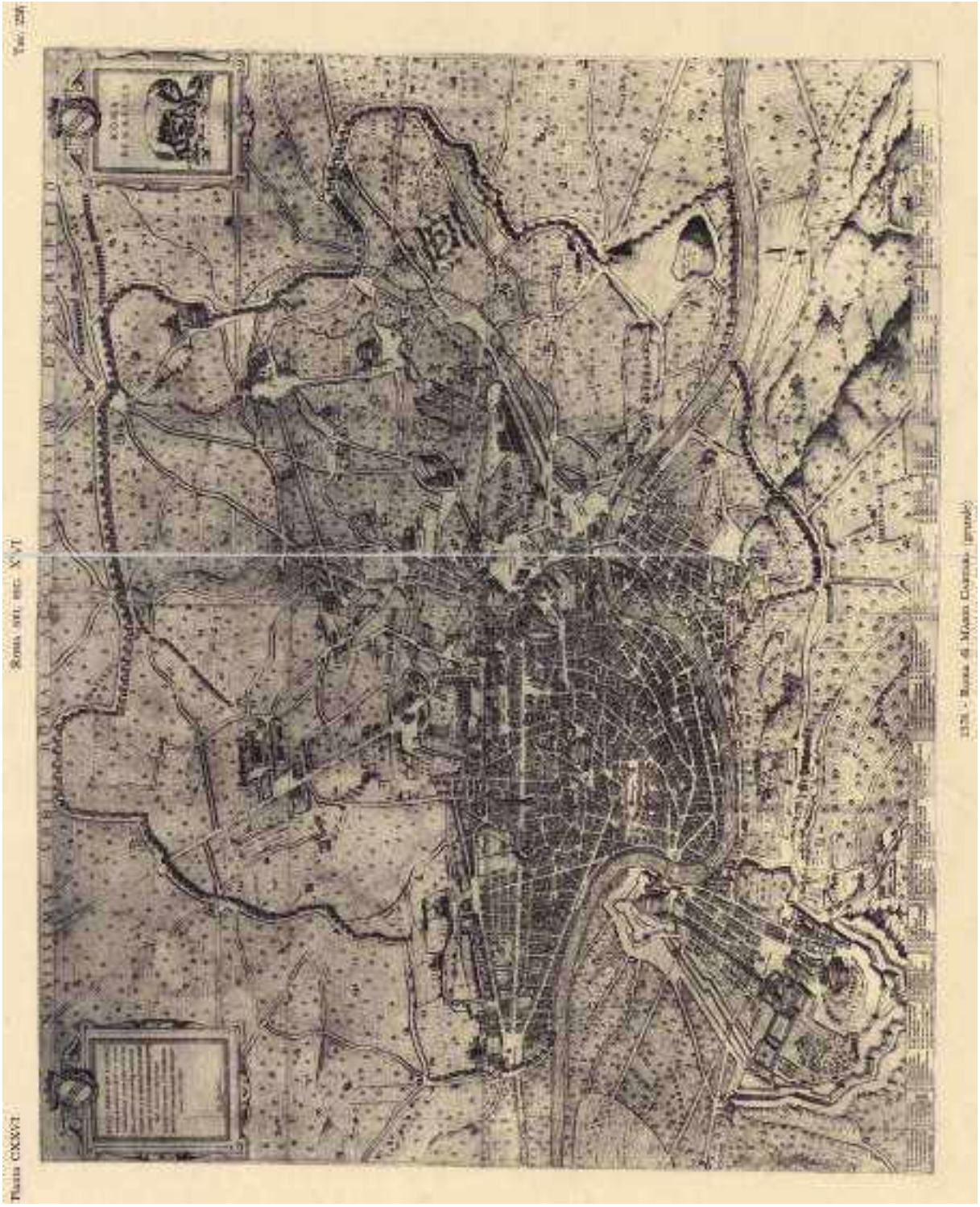


Figure 2.23a

Roma nel sec. XVI

Mario Cartaro, 1576

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 238

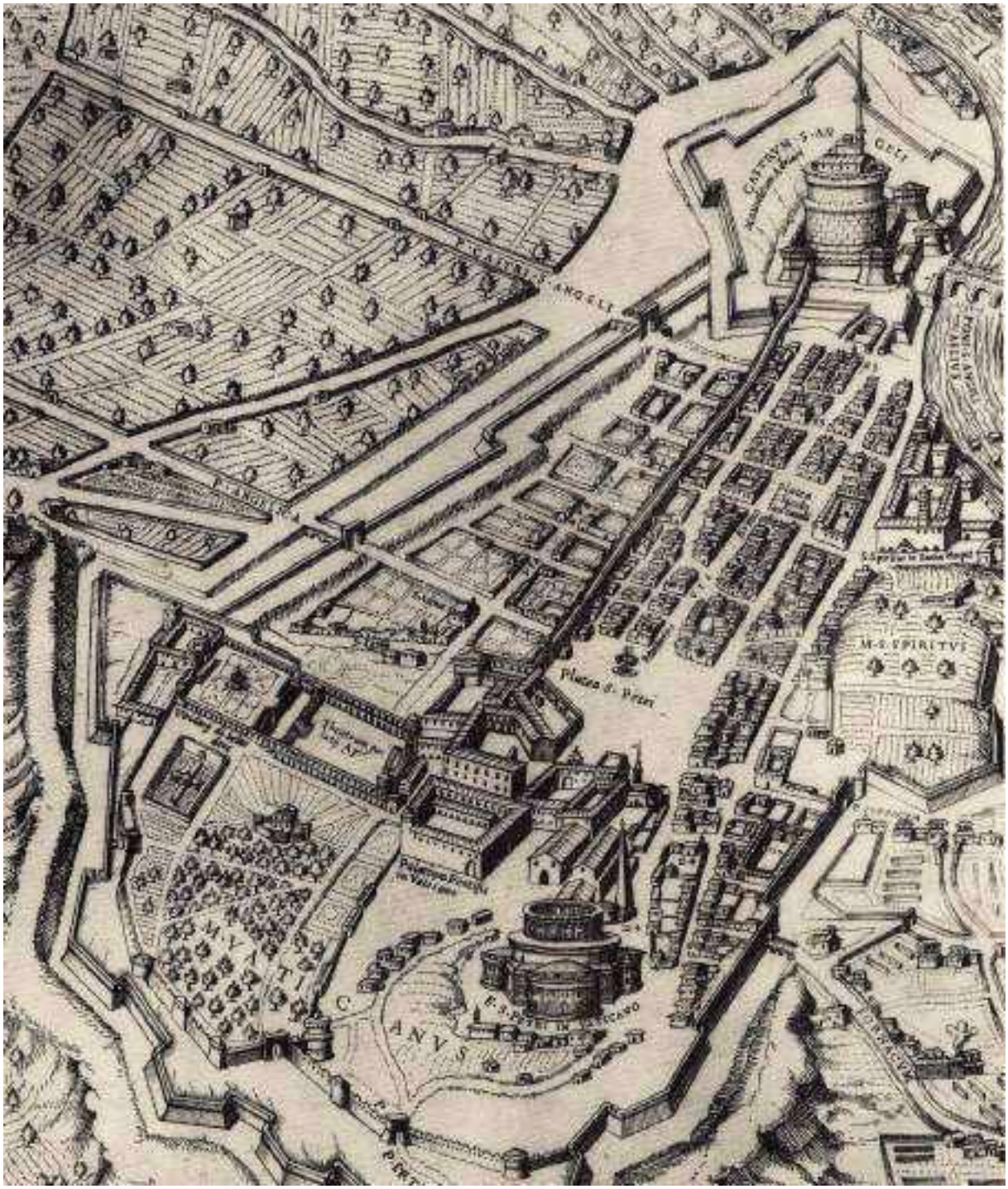


Figure 2.23b

Roma nel sec. XVI. Detail

Mario Cartaro, 1576

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 238

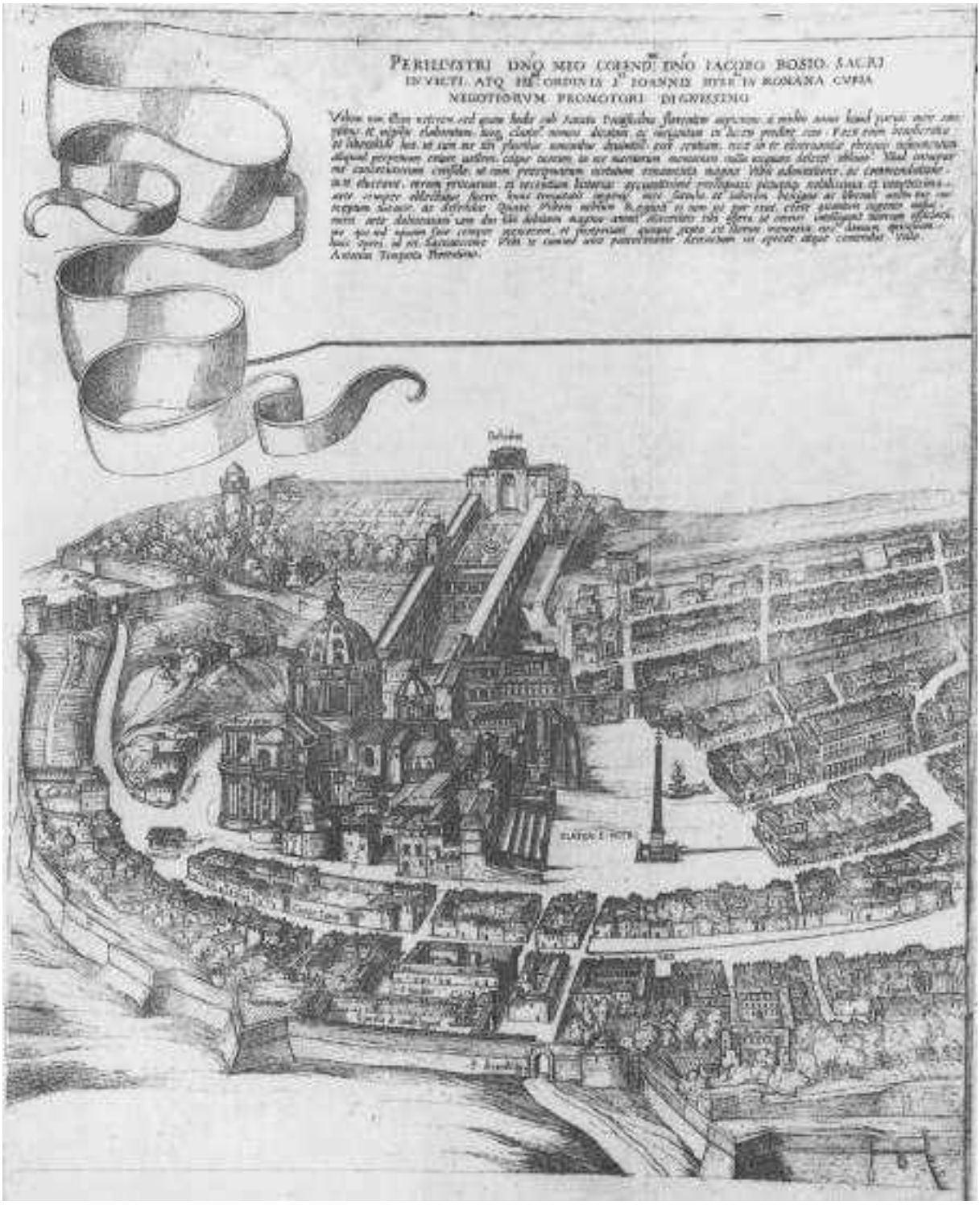


Figure 2.24

View of S. Peter's square

Antonio Tempesta, 1593

Christof Thoenes. *Fabbrica di San Pietro nelle incisioni dal Cinquecento all'Ottocento*

Italy: Edizioni il Polifilo (2000), p. 75

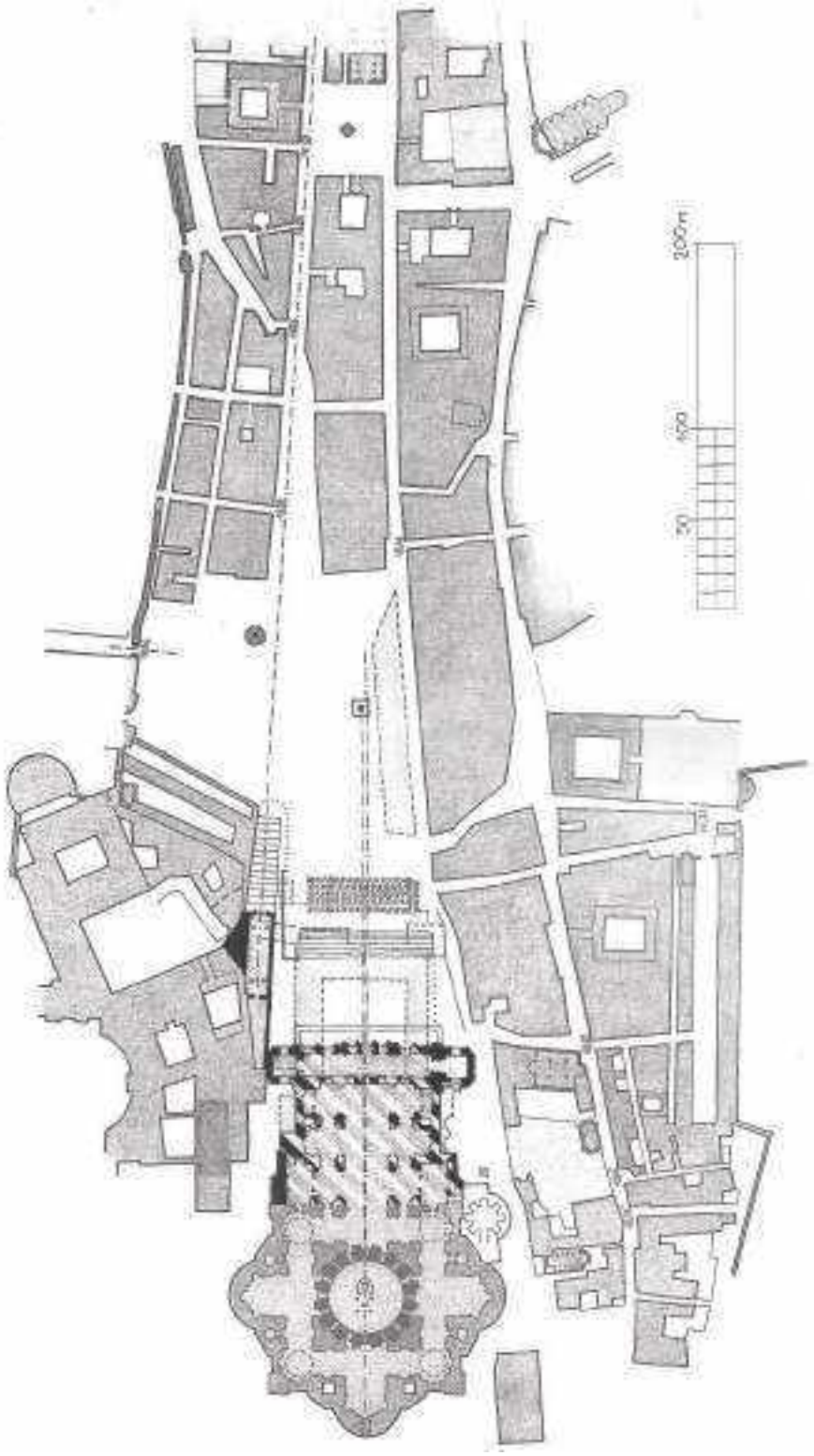


Figure 2.25

The interventions in S. Peter's square from Pio IV to Paolo V (drawing by the author)

In dark gray the preserved buildings, in black those added and in light gray those demolished

Leonardo Benevolo. *San Pietro e la città di Roma*. Ed. Laterza, (2004), p. 36-37

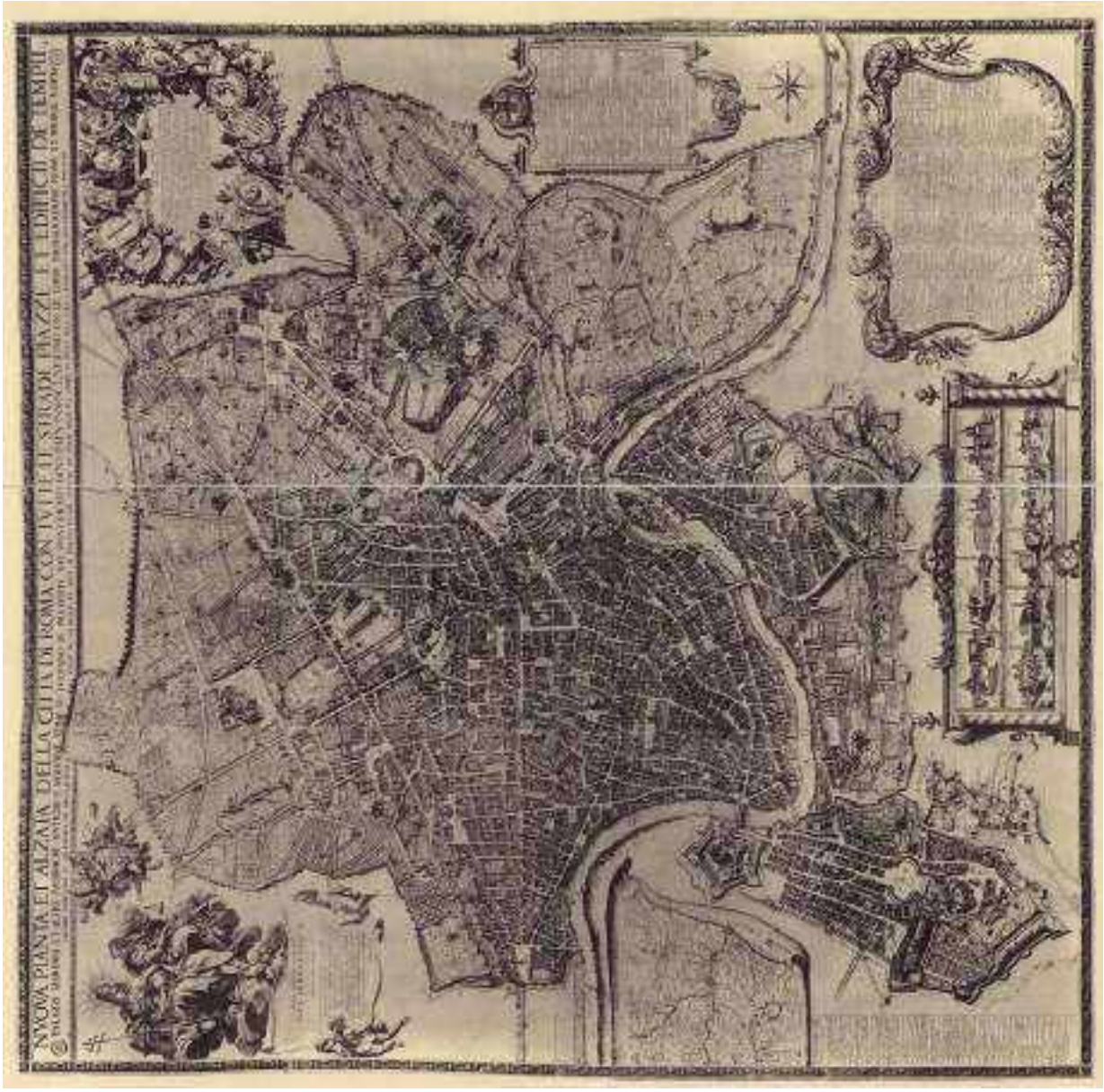


Figure 2.26a

Roma nel sec. XVII

Giovanni Batista Falda, 1676

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 357

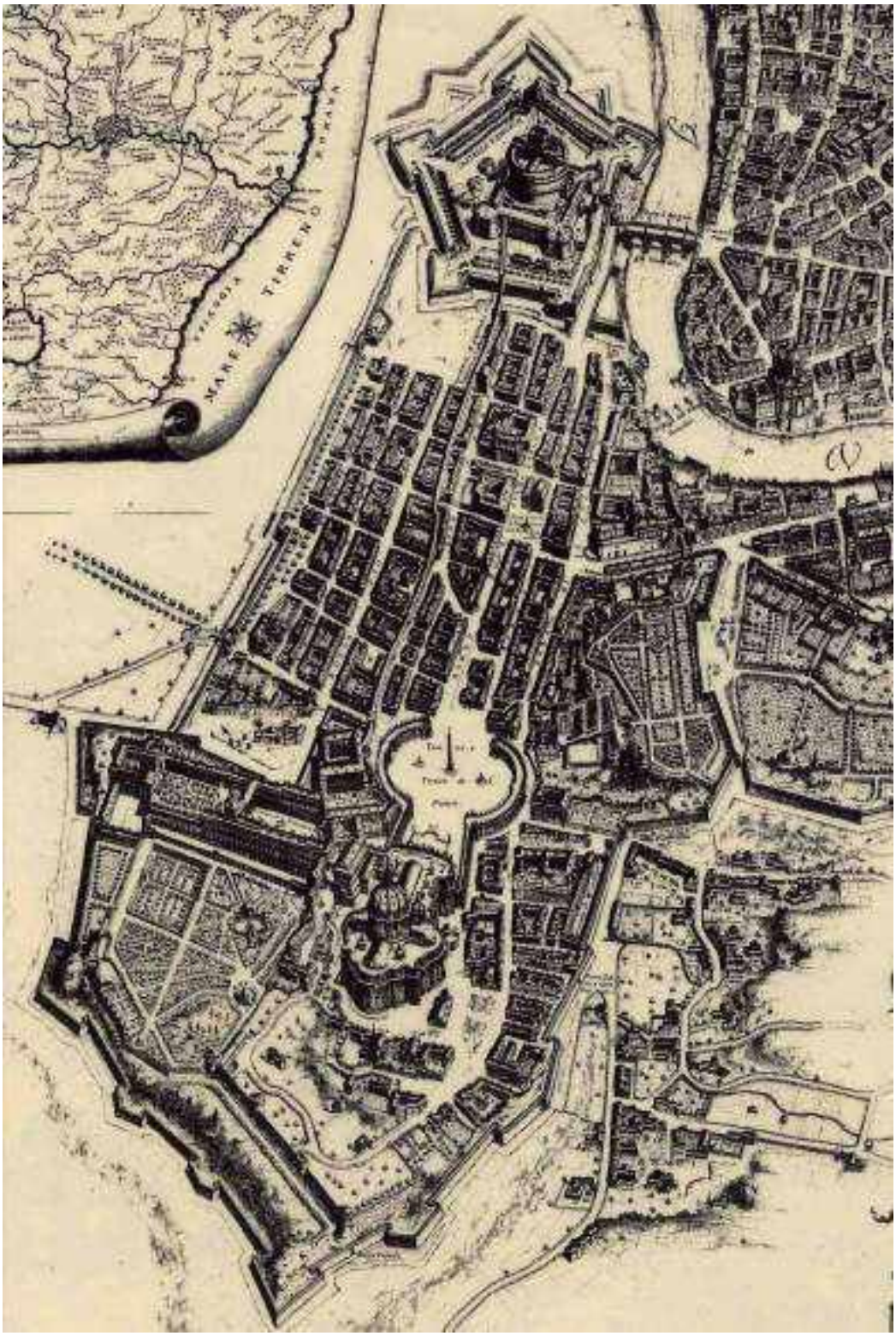


Figure 2.26b

Roma nel sec. XVII. Zona del Vaticano e di piazza Navona. Detail

Giovanni Batista Falda, 1676

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 361

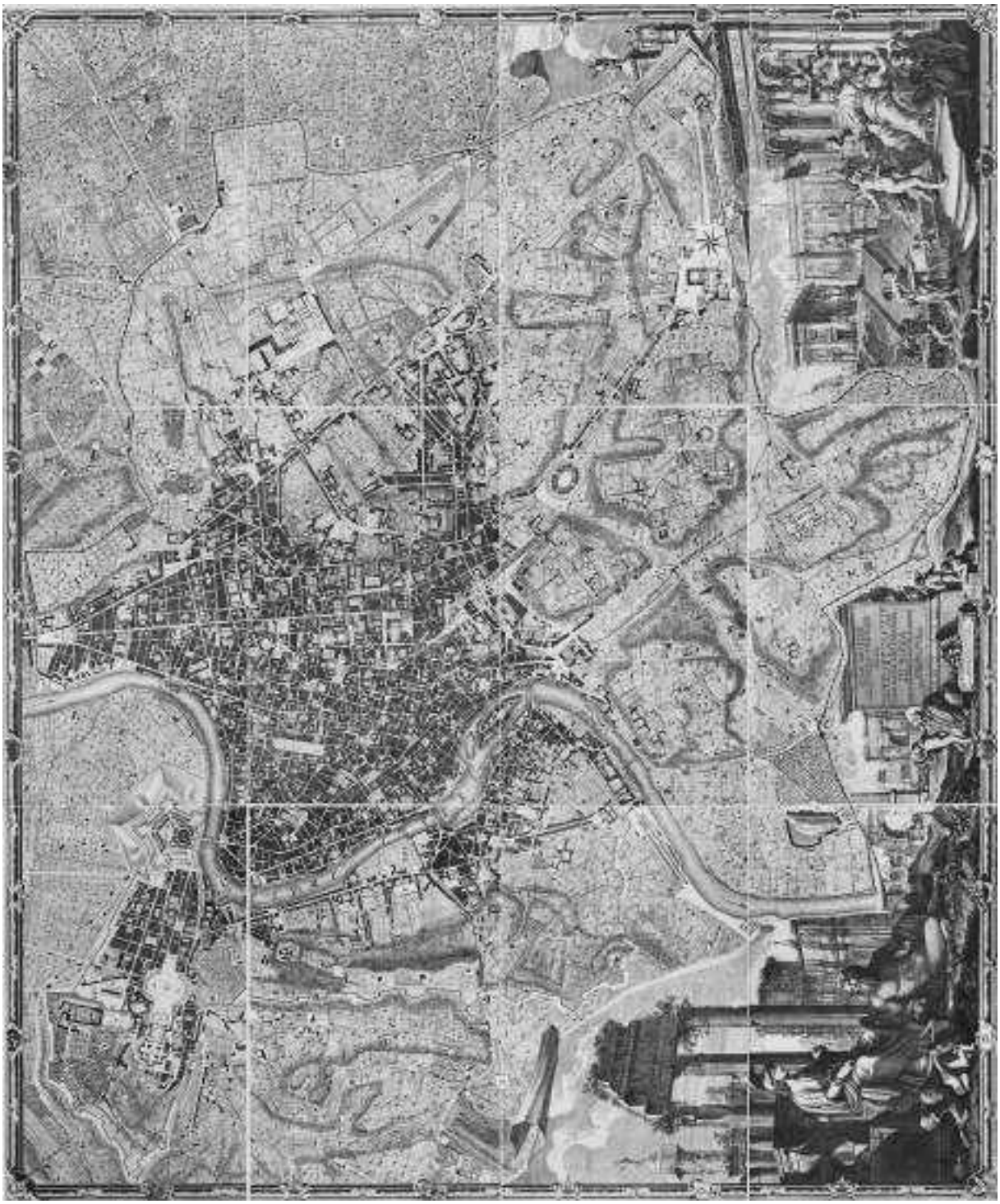


Figure 2.27a

Nuova pianta di Roma, data in luce da Giambattista Nolli, L'Anno MDCCXLVIII

Plan of Rome

Giovanni Batista Nolli, 1748

Biblioteca Nacional de España, bdh0000241493

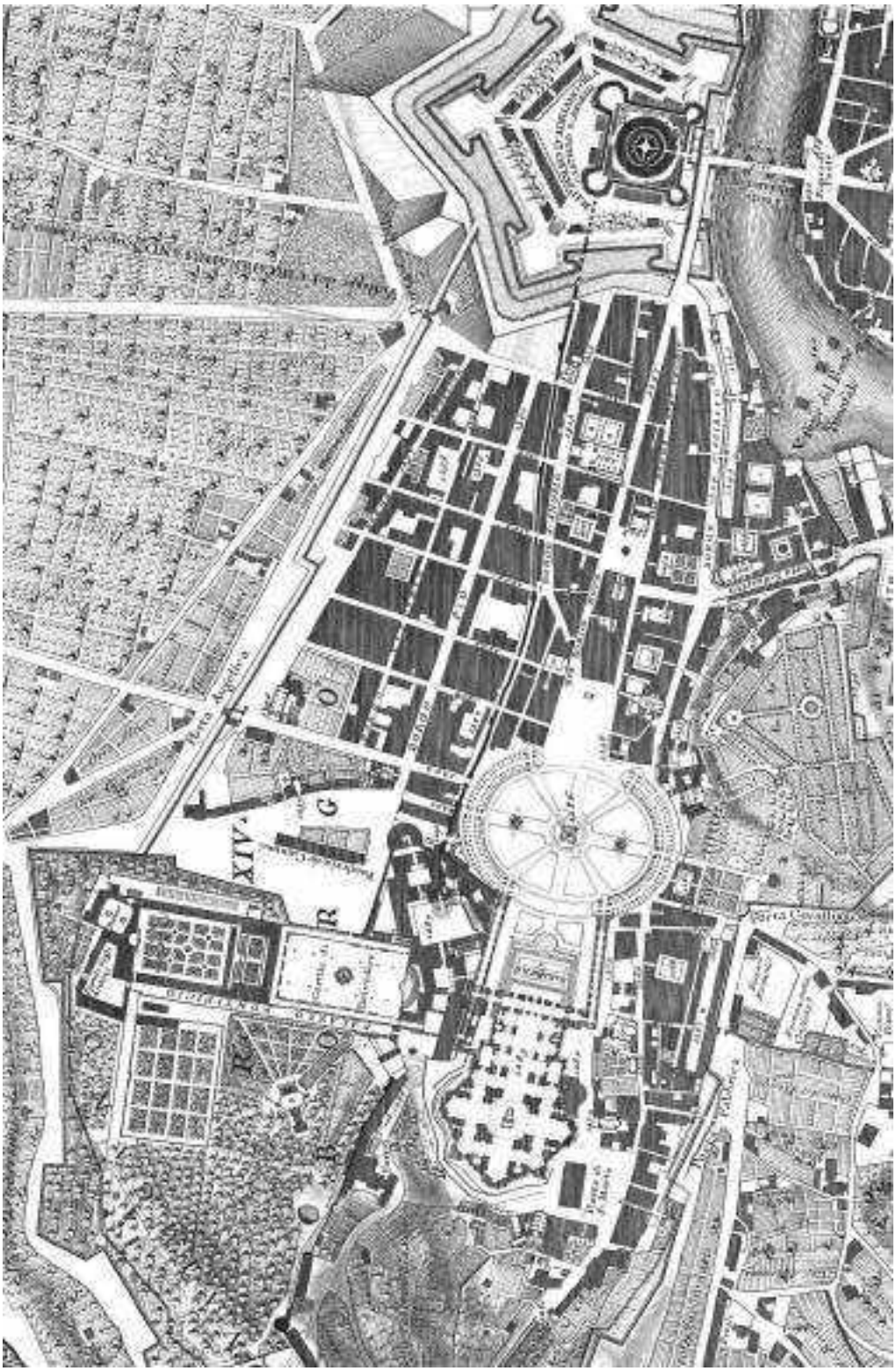


Figure 2.27b

Nuova pianta di Roma, data in luce da Giambattista Nolli, L'Anno MDCCXLVIII

Plan of Rome. Detail

Giovanni Batista Nolli, 1748

Biblioteca Nacional de España, bdh0000241493

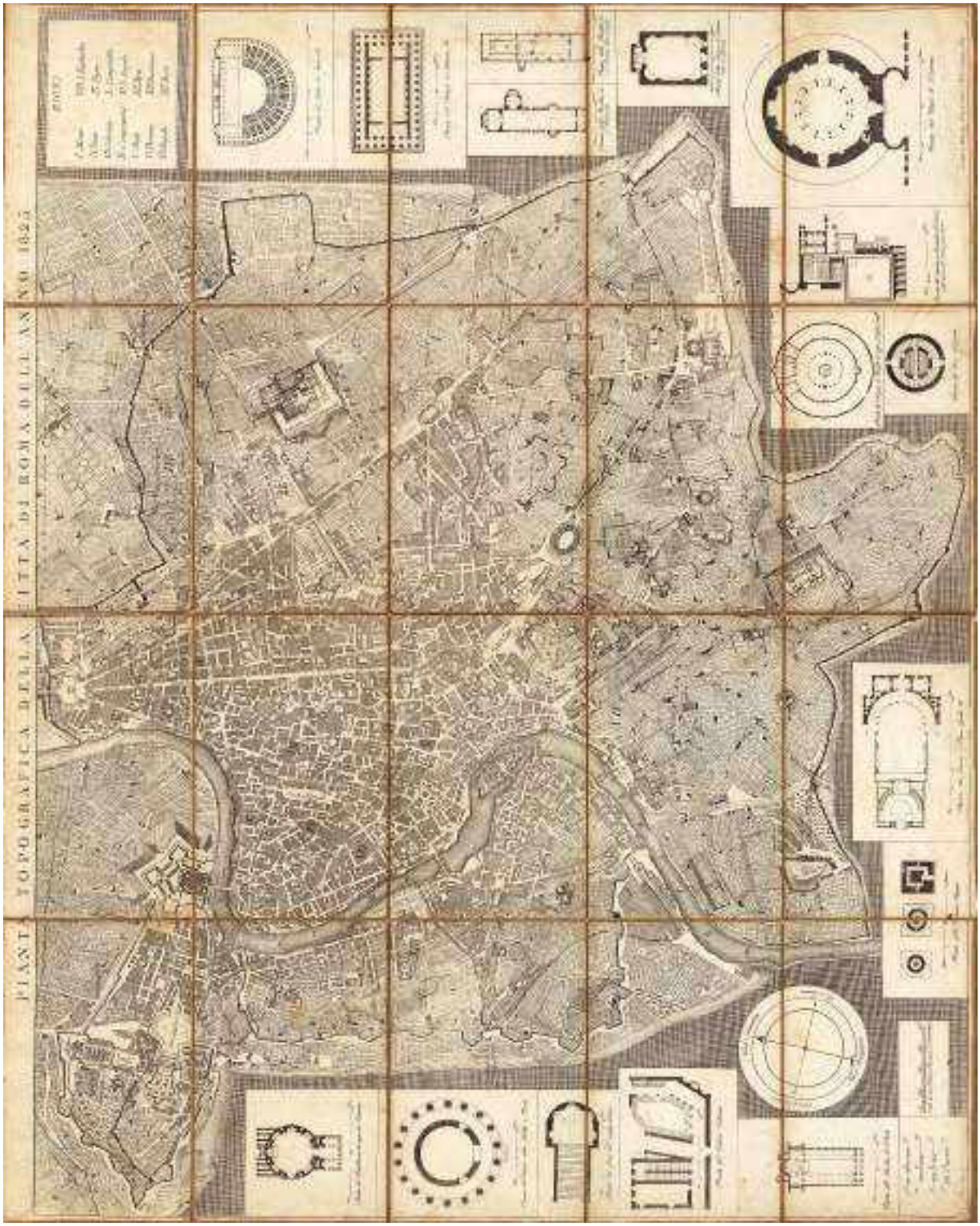


Figure 2.28a

Pianta topografica della città di Roma dell'anno 1823

Pietro Ruga, 1823

Yale University (2019): Yale University Library, Beinecke rare book & manuscript library (EUA), cod. 40 R66 1823

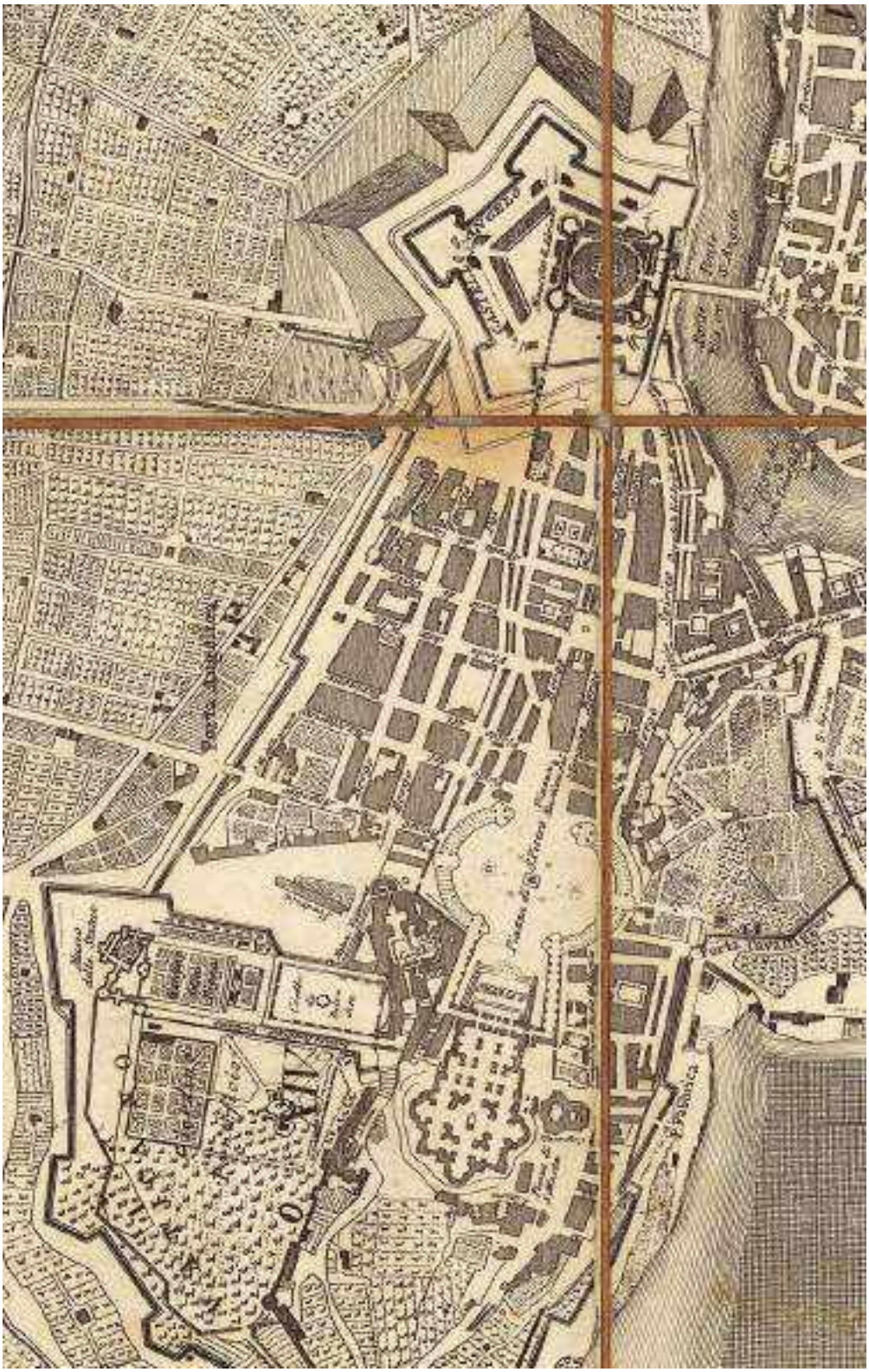


Figure 2.28b

Pianta topografica della città di Roma dell'anno 1823. Detail

Pietro Ruga, 1823

Yale University (2019): Yale University Library, Beinecke rare book & manuscript library (EUA), cod. 40 R66 1823

Figure 2.29a

Plan de Rome modern

Paul Marie Letarouilly, 1838

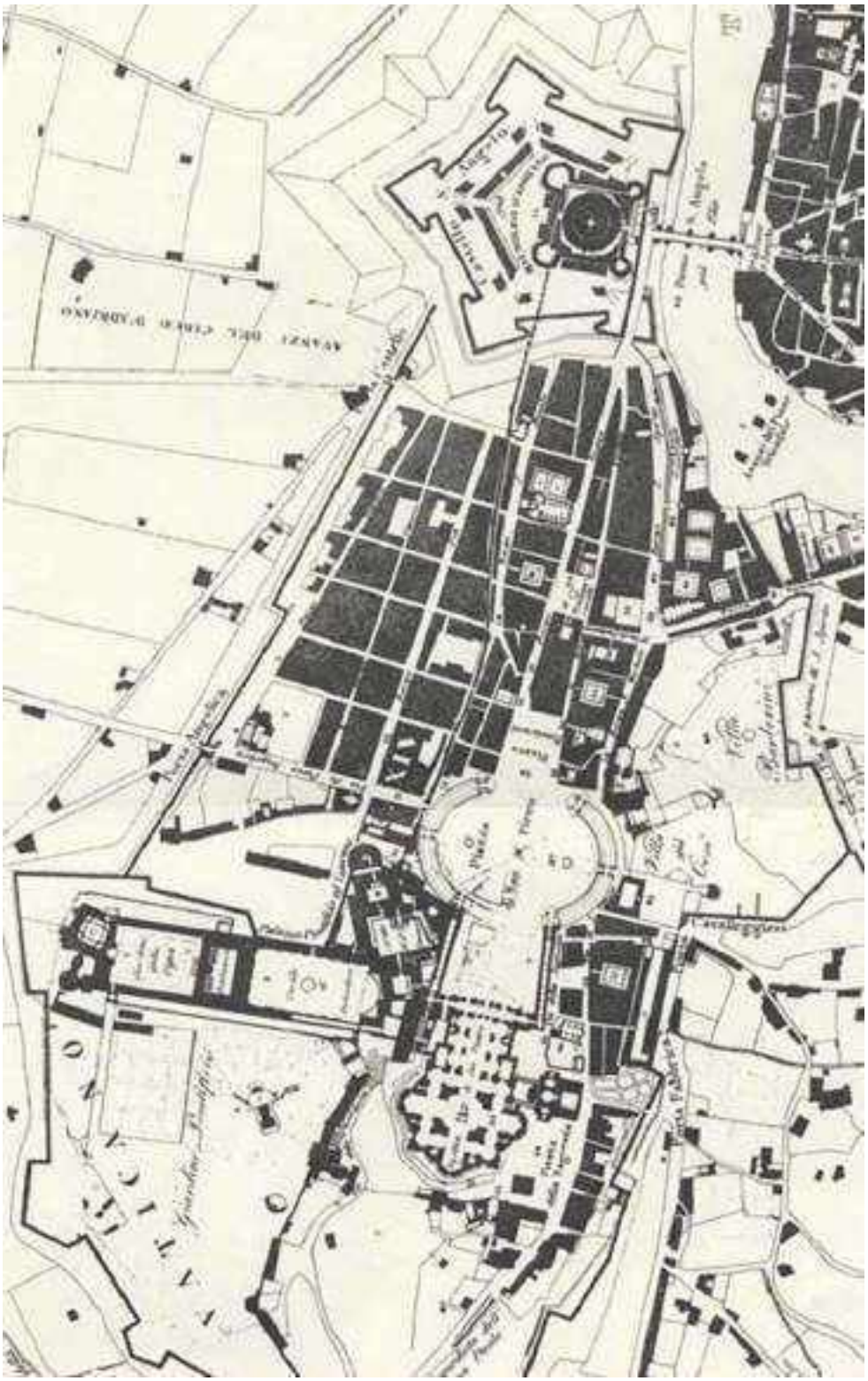


Figure 2.29b

Plan de Rome modern. Detail

Paul Marie Letarouilly, 1838

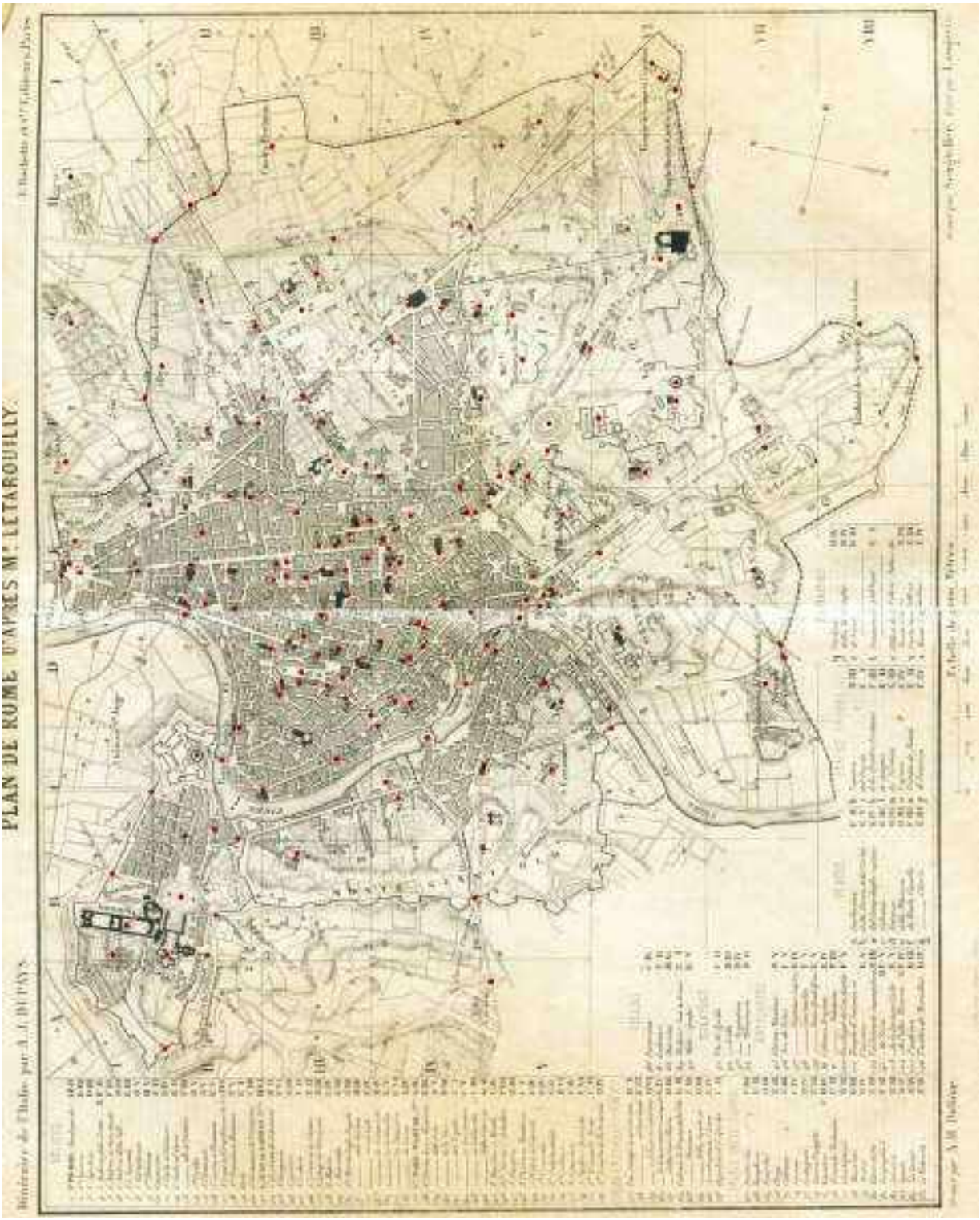


Figure 2.30a

This map of Rome was included in a French Guide to Rome of 1852 and is based on a larger 1841 map by Paul Letarouilly. It shows Rome as it was before the development of railway and the annexation of 1870 to the kingdom of Italy

Paul Marie Letarouilly, 1852

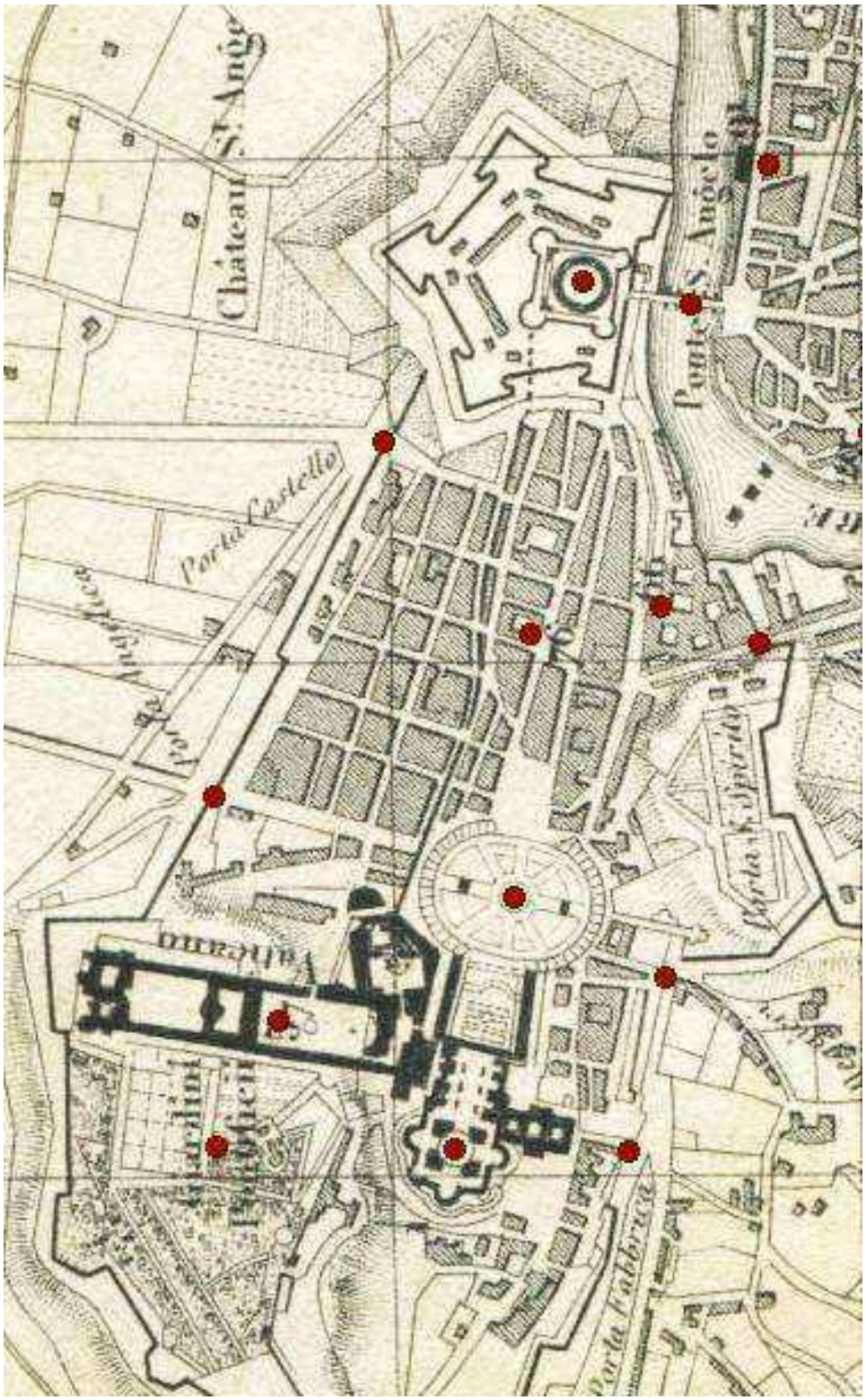


Figure 2.30b

This map of Rome was included in a French Guide to Rome of 1852 and is based on a larger 1841 map by Paul Letarouilly. It shows Rome as it was before the development of railway and the annexation of 1870 to the kingdom of Italy. Detail

Paul Marie Letarouilly, 1852

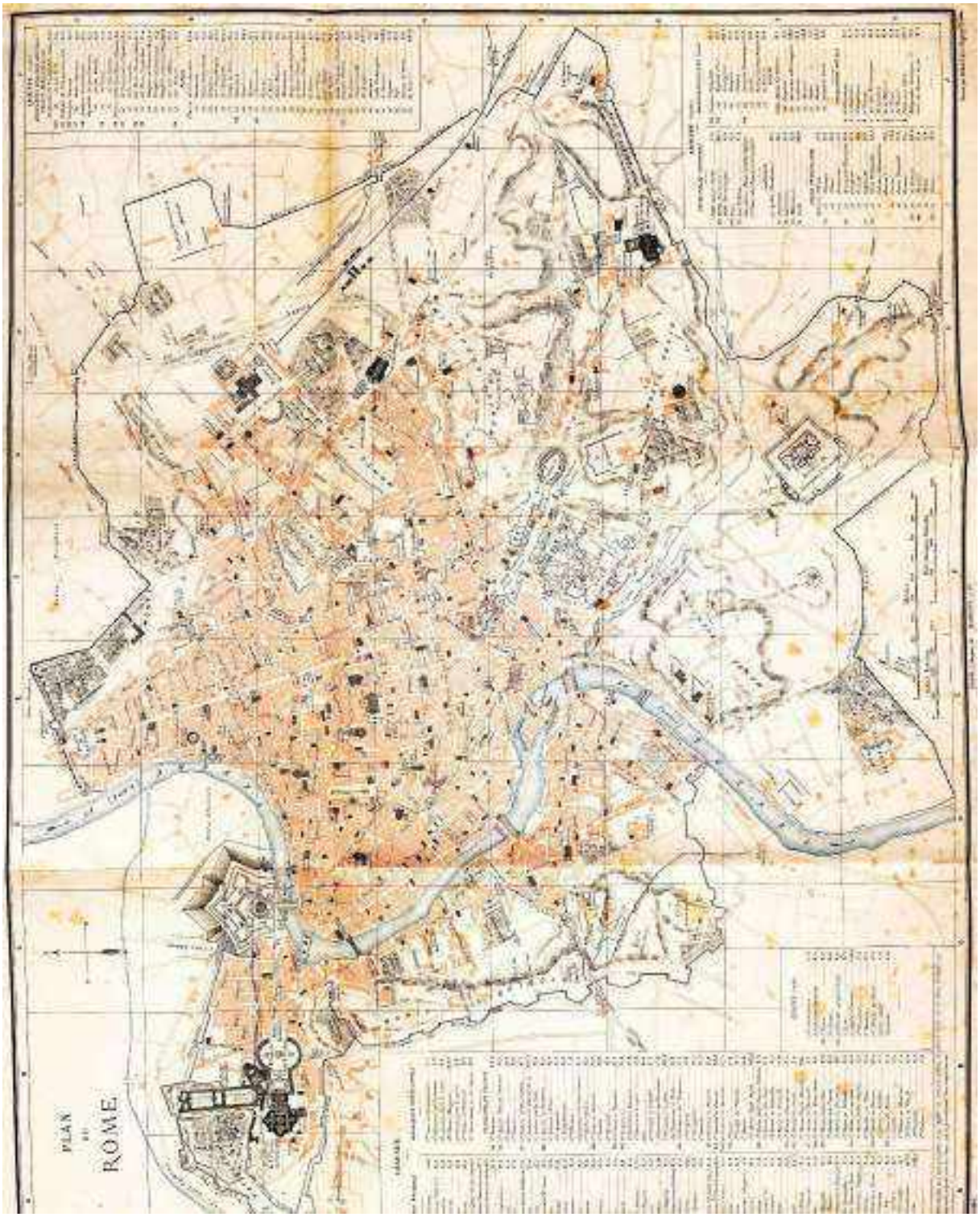


Figure 2.31a

Town development and expansion plan

Augusto Thiollet, 1873

Librairie Hachette et Cie Editeurs (Ed.), Paris

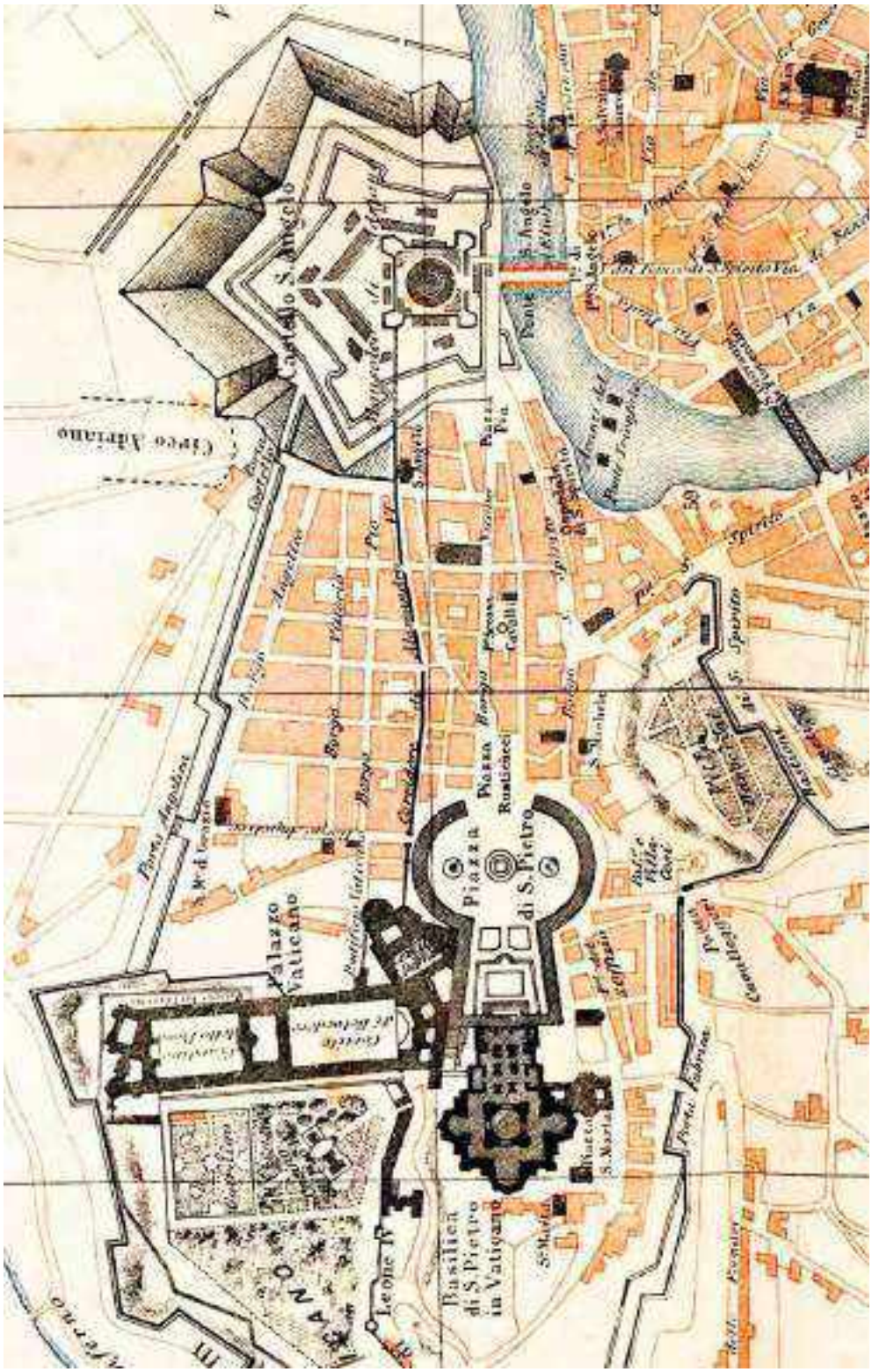


Figure 2.31b

Town development and expansion plan. Detail

Augusto Thiollet, 1873

Librairie Hachette et Cie Editeurs (Ed.), Paris

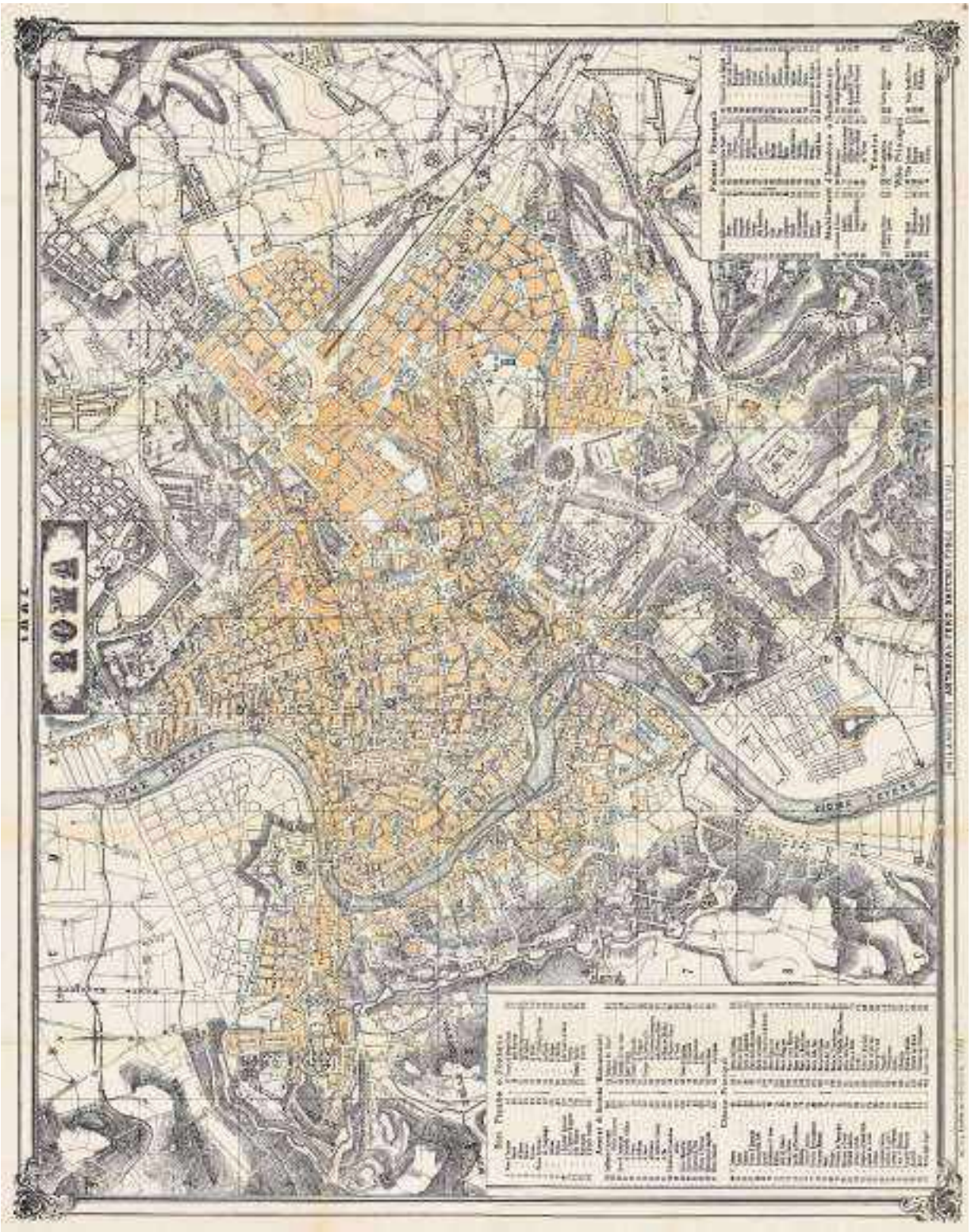


Figure 2.32a

Plan of Rome, 1884

Publisher Artaria di Ferd. Sacchi e Figli

Yale University (2019): Yale University Library, Beinecke rare book & manuscript library (EUA), cod. 40 R66 1884

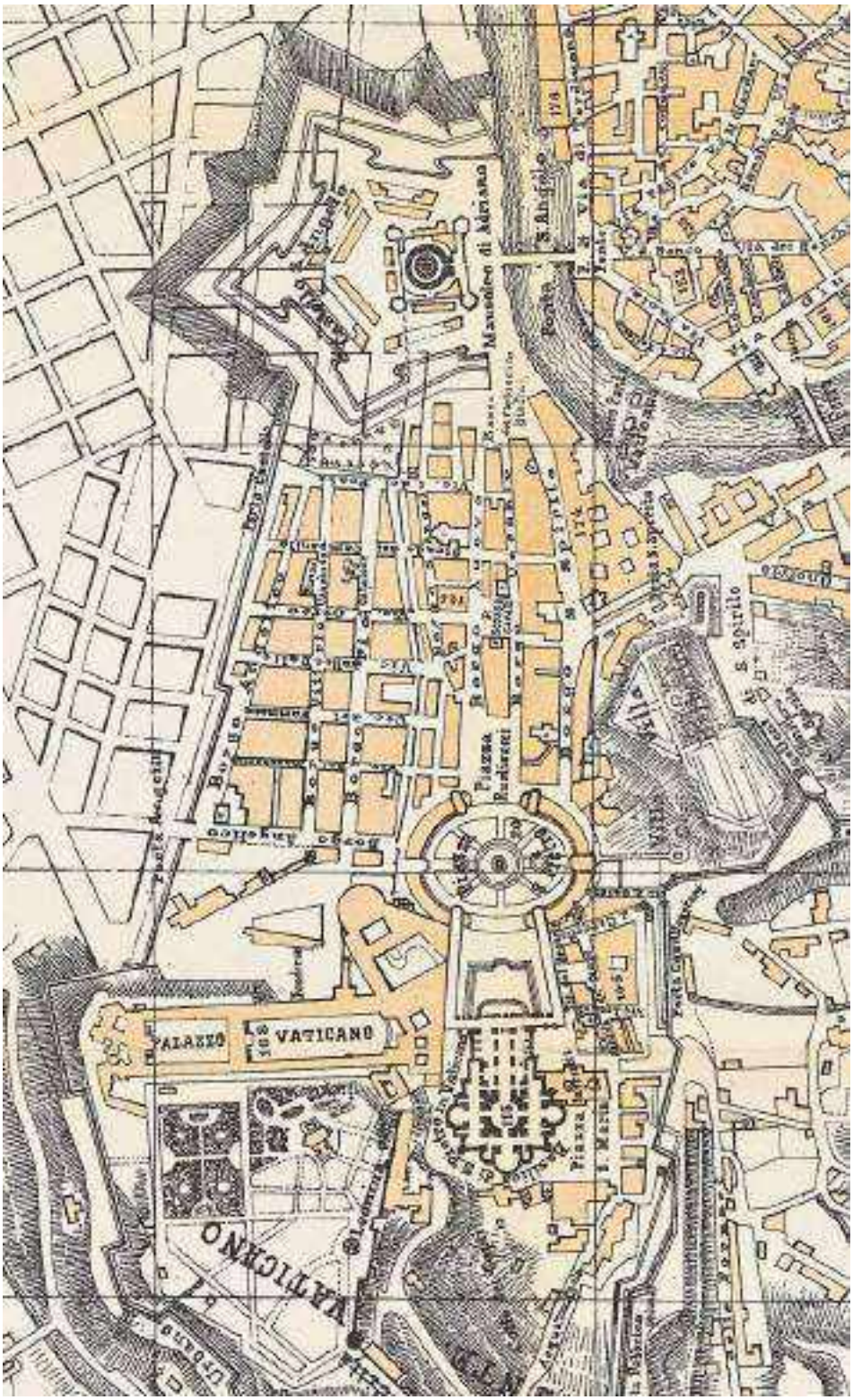


Figure 2.32b

Plan of Rome, 1884. Detail

Publisher Artaria di Ferd. Sacchi e Figli

Yale University (2019): Yale University Library, Beinecke rare book & manuscript library (EUA), cod. 40 R66 1884

Figure 2.33

Extension of the Borgo District city plan with provisions of the 1883 plan

R. Stab- Cartogr. C. Virano, Rome, 1888

A. Pietro Frutaz. *Le piante di Roma*. Rome: Istituto di Studi Romani (1962), tav. 536-537

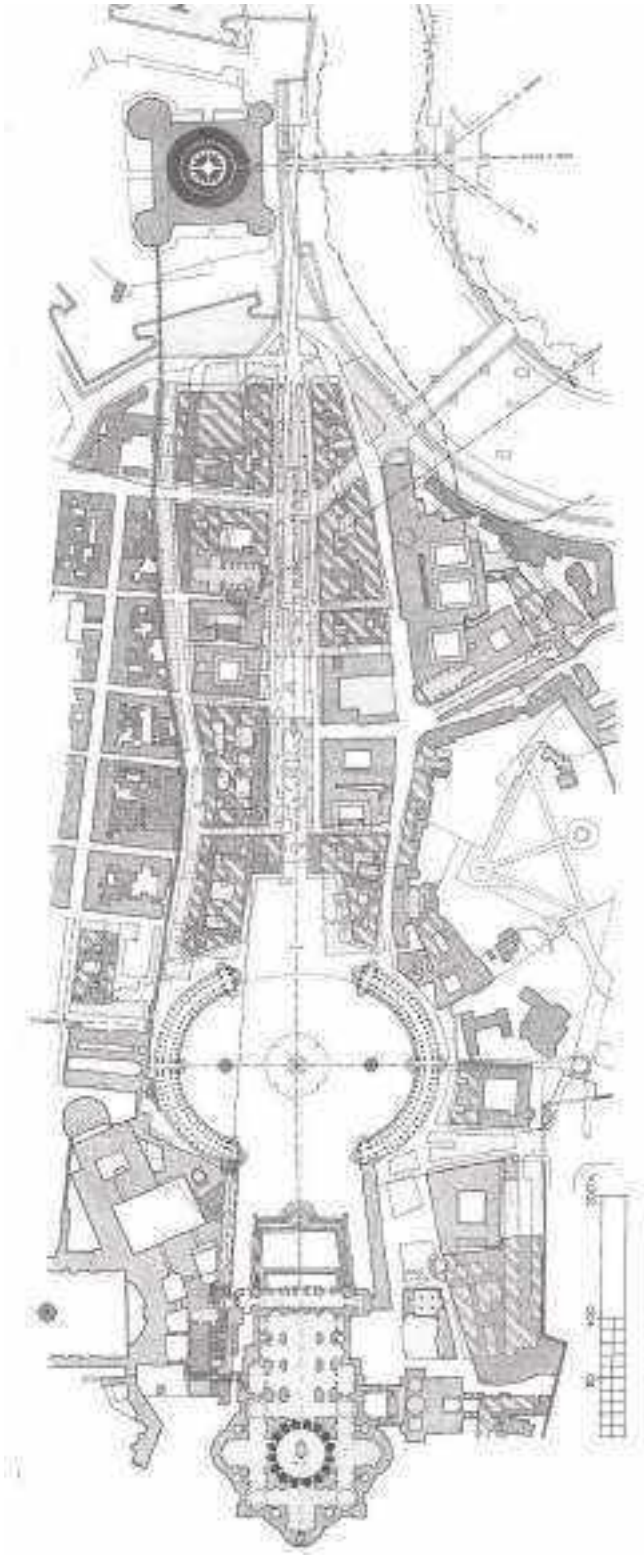
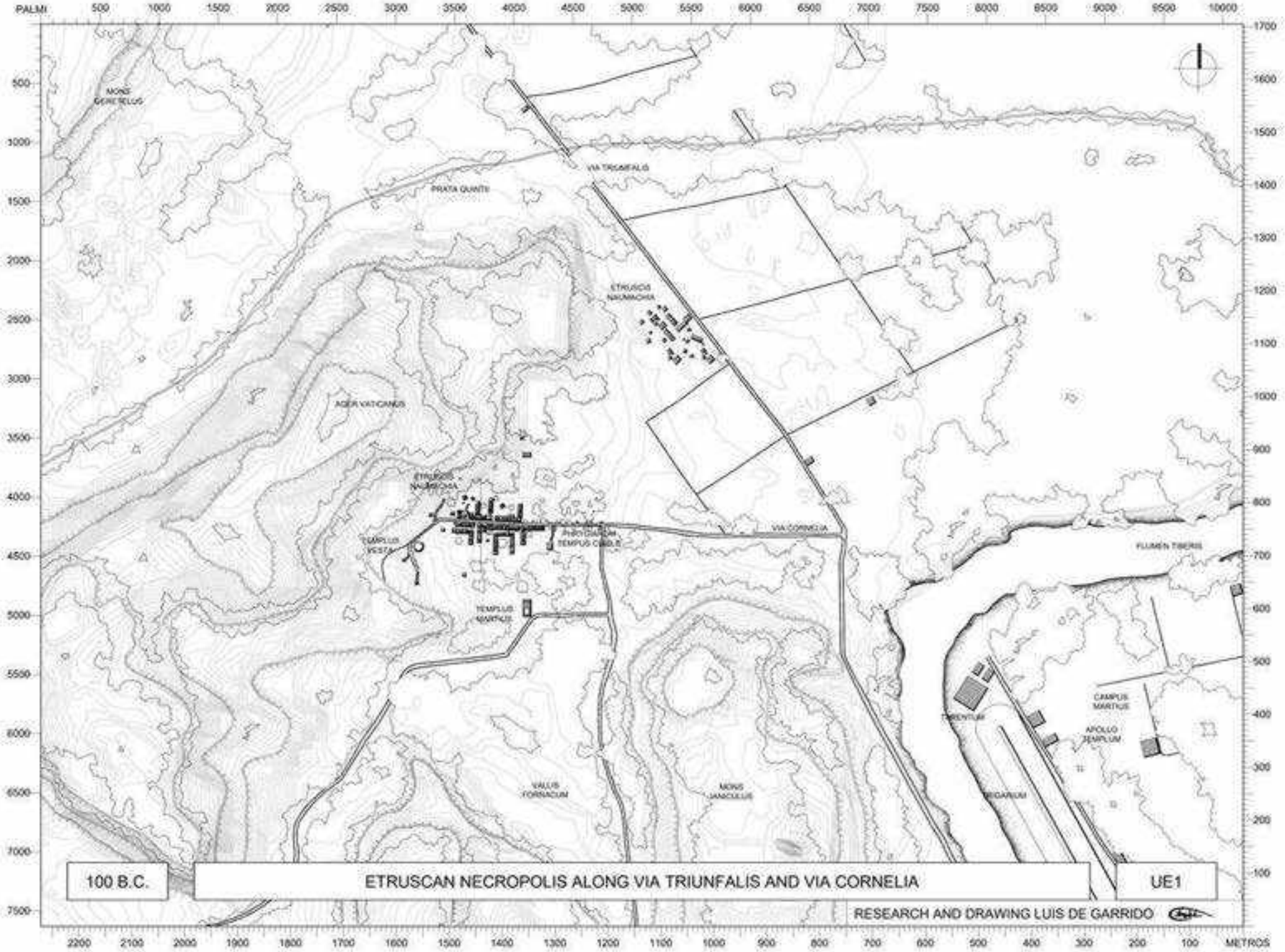


Figure 2.34

The gutting of Borgo in the 1930s. The surviving buildings are in gray, those added in dark gray, those demolished in light gray

Leonardo Benevolo. *San Pietro e la città di Roma*. Ed. Laterza, (2004), p. 92-93

LAYOUTS 2


PALMI
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AGER VATICANUS
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TEMPLUM VESTA
PHRYGIANUM
TEMPUS CIBELE
VIA CORNELIA
TEMPLUM MARTIUS
FLUMEN TIBERIS
CAMPUS MARTIUS
APOLLO TEMPLUM
TIBERTIUM
VALLIS FORNACUM
MONS JANICULUS
VEGARIUM
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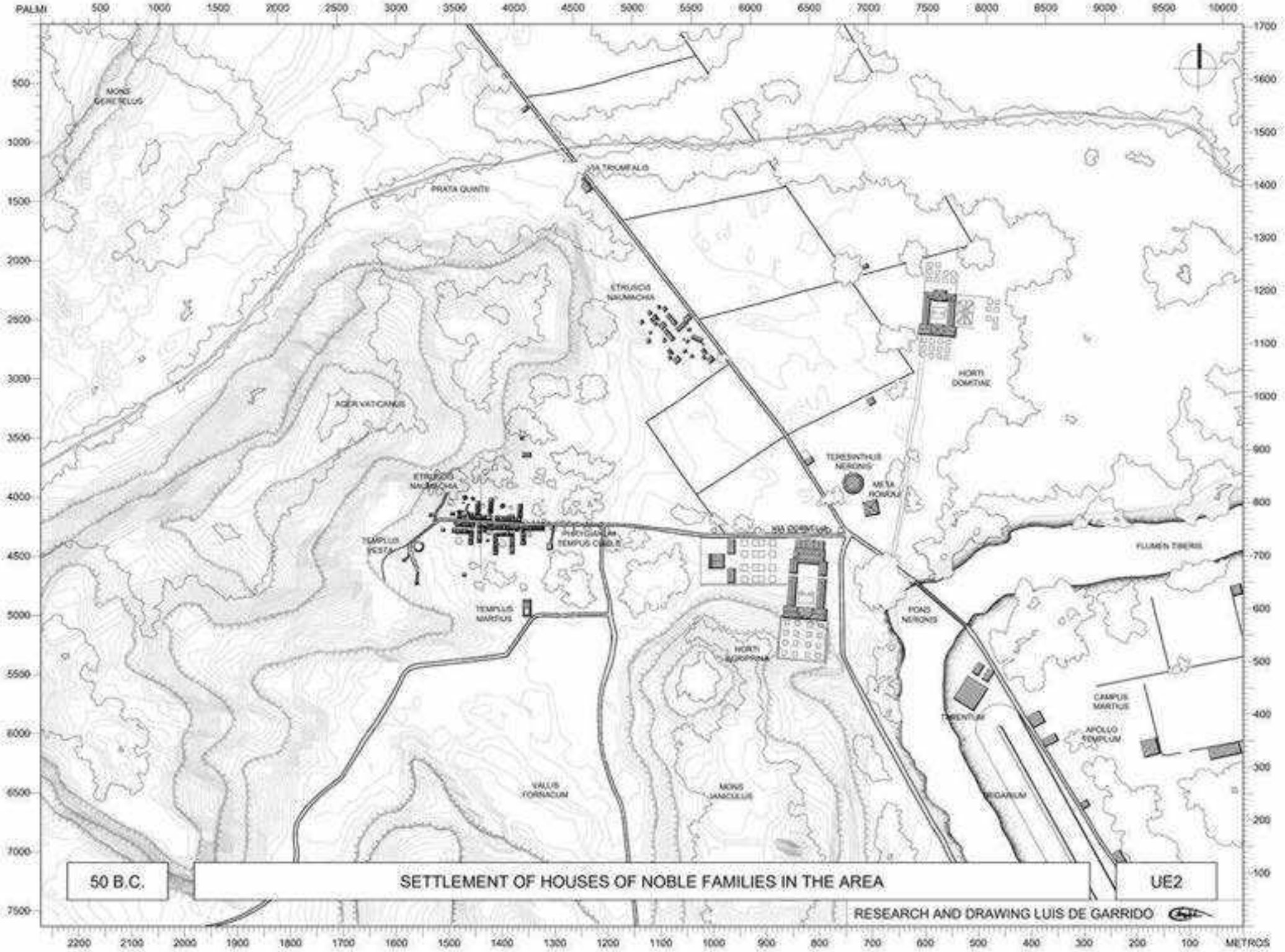
ETRUSCAN NECROPOLIS ALONG VIA TRIUNFALIS AND VIA CORNELIA
UE1
RESEARCH AND DRAWING LUIS DE GARRIDO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META ROMULI
ETRUSCIS NAUMACHIA
TEMPLUM VESTAE
PERYGIARUM TEMPLUM CIBELE
VIA CORNELIA
FLUMEN TIBERIS
TEMPLUM MARTIUS
POAS NERONIS
HORTI AGRIPPINAE
CAMPUS MARTIUS
TIBERTUM
APOLLO TEMPLUM
VALLIS FORNACUM
MONS JANICULUS
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50 B.C.
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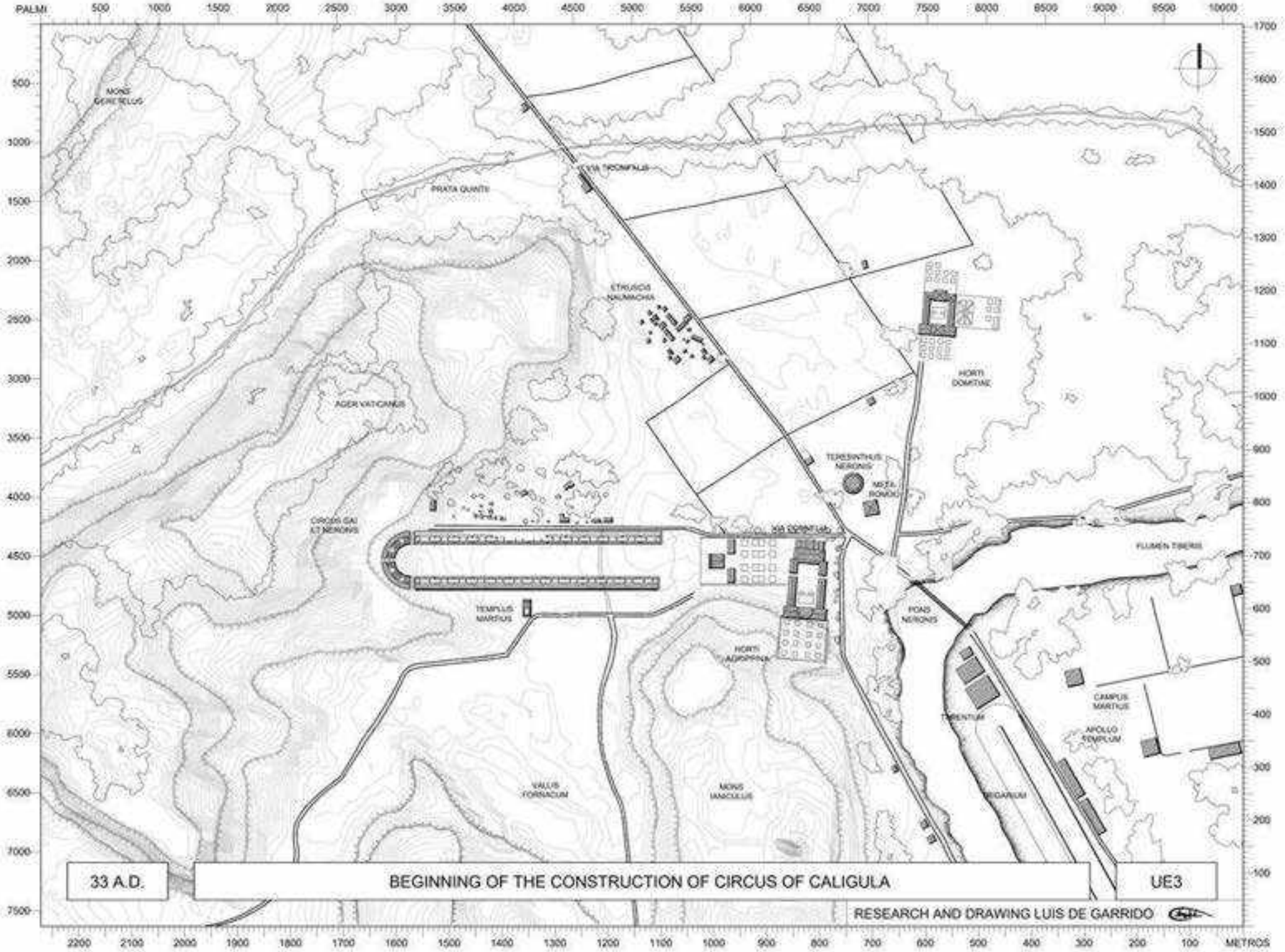
RESEARCH AND DRAWING LUIS DE GARRIDO

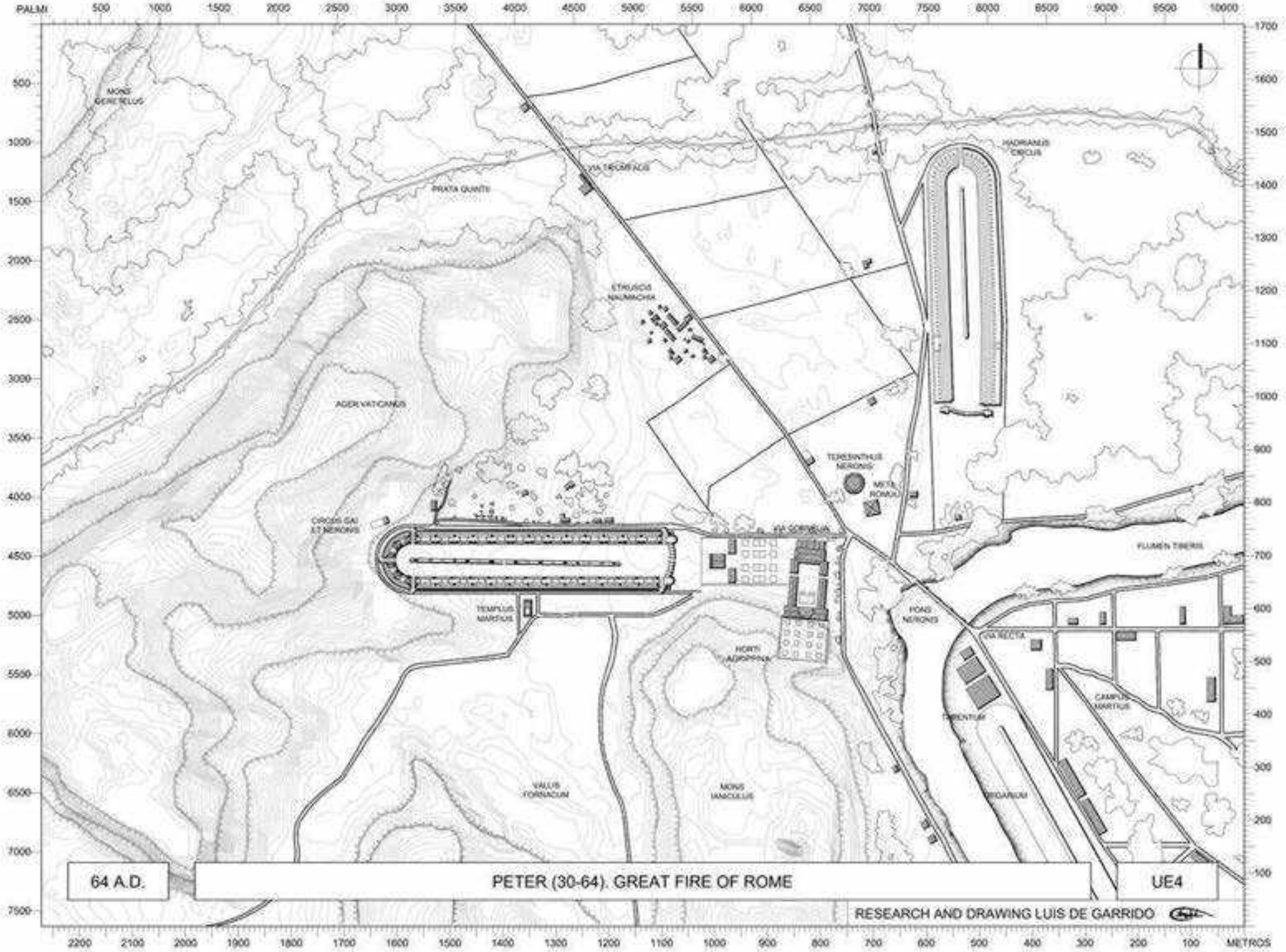


33 A.D.

BEGINNING OF THE CONSTRUCTION OF CIRCUS OF CALIGULA

UE3

RESEARCH AND DRAWING LUIS DE GARRIDO

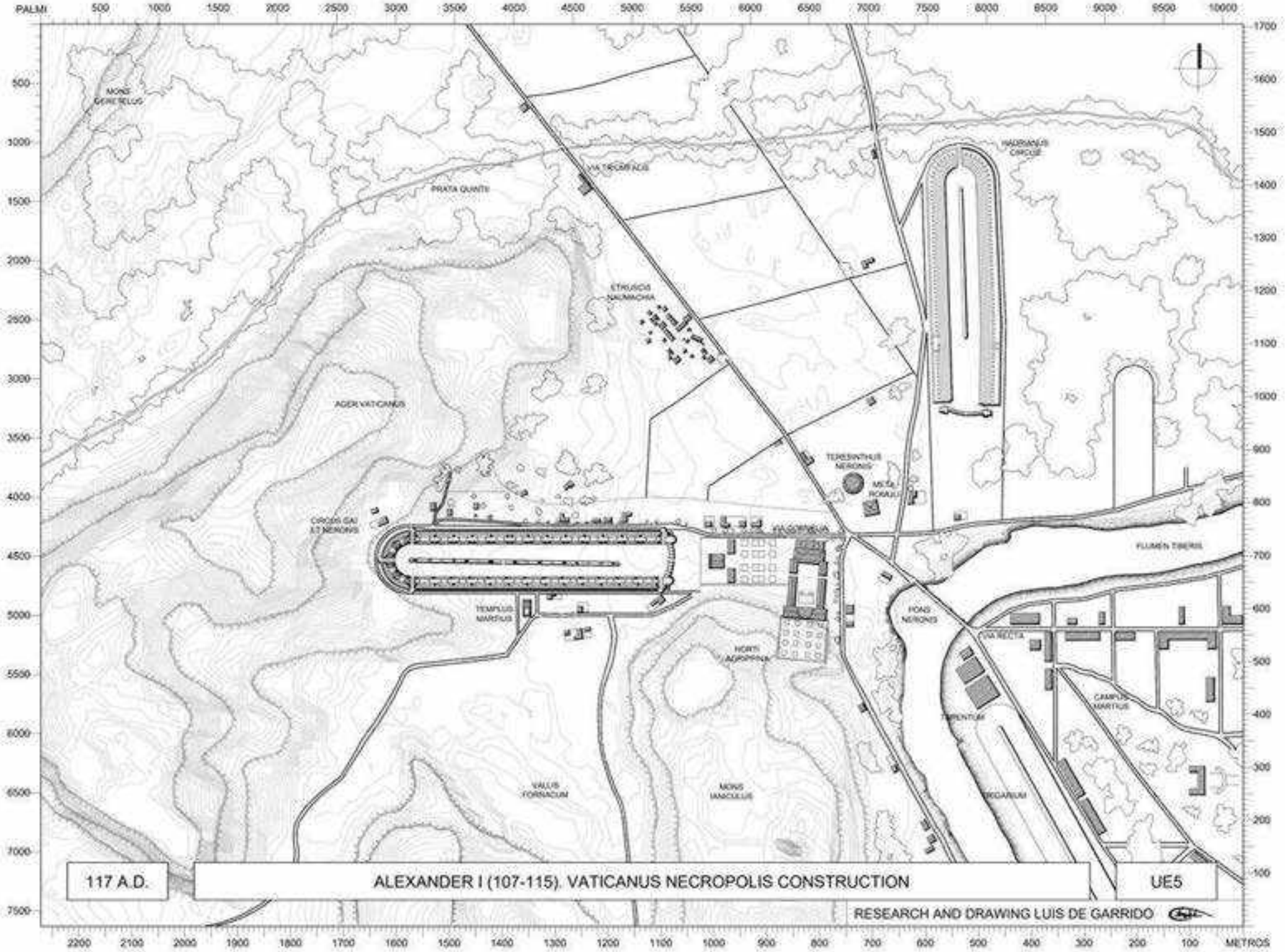


64 A.D.

PETER (30-64). GREAT FIRE OF ROME

UE4

RESEARCH AND DRAWING LUIS DE GARRIDO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PRATA QUINTI
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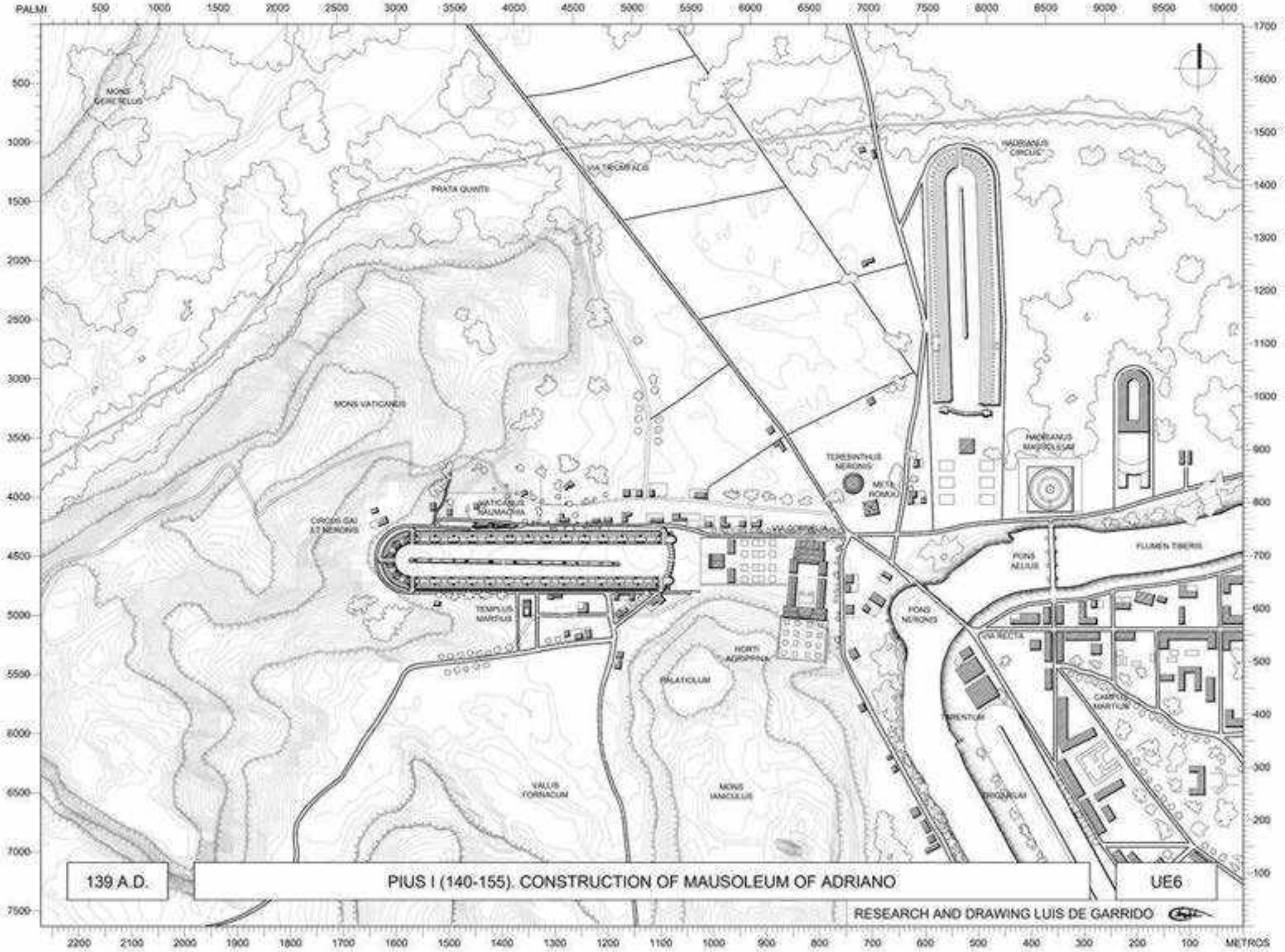
TEREBINTHUS NERONIS
MUTA RORALIS
CIRCUS GAI ET NERONIS
VIA CORNELIA
FLUMEN TIBERIS
TEMPLUM MARTIUS
POAS NERONIS
VIA RECTA
HORTI AGRIPPINA
CAMPUS MARTIUS
TIBERTIUM
VALLIS FORNACUM
MONS IANICULUS
ROGARIUM
117 A.D.
ALEXANDER I (107-115). VATICANUS NECROPOLIS CONSTRUCTION
UE5
RESEARCH AND DRAWING LUIS DE GARRIDO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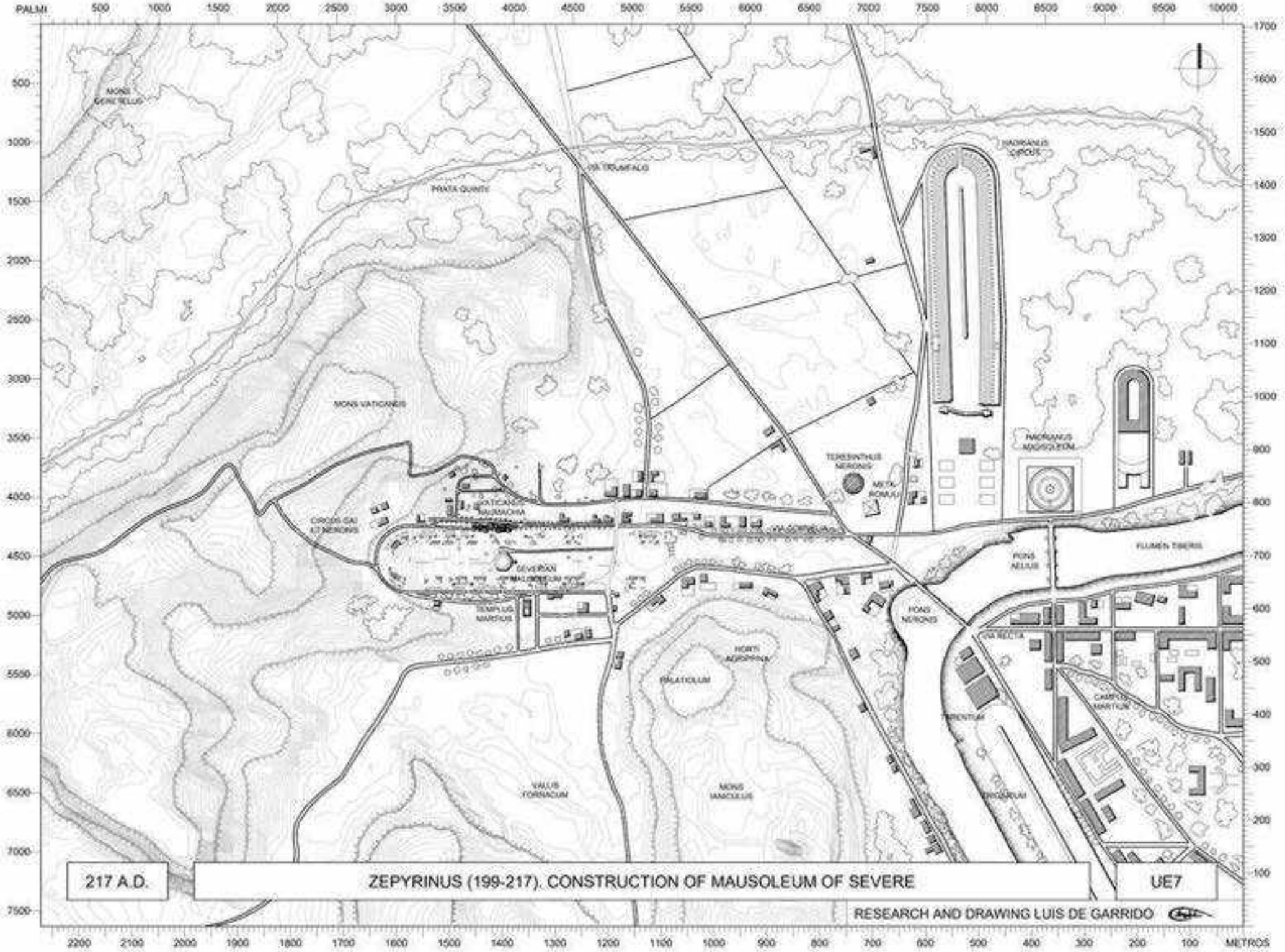
MONS VATICANUS
HADRIANUS MAUSOLEUM
TEREBINTHUS NERONIS
META ROMULI
CIRCUS GAI ET NERONIS
VATICANUS GALINACRIA
VIA CORNELIA
PONS AELIUS
FLUMEN TIBERIS
TEMPLUM MARTIUS
PONS NERONIS
VIA RECTA
HORTI AGRIPPINA
PALATIOLUM
CAMPUS MARTIUS
TIBERTIUM
VALLIS FORNACUM
MONS IANICULUS
TRIGARIUM
139 A.D.
PIUS I (140-155). CONSTRUCTION OF MAUSOLEUM OF ADRIANO
UE6
RESEARCH AND DRAWING LUIS DE GARRIDO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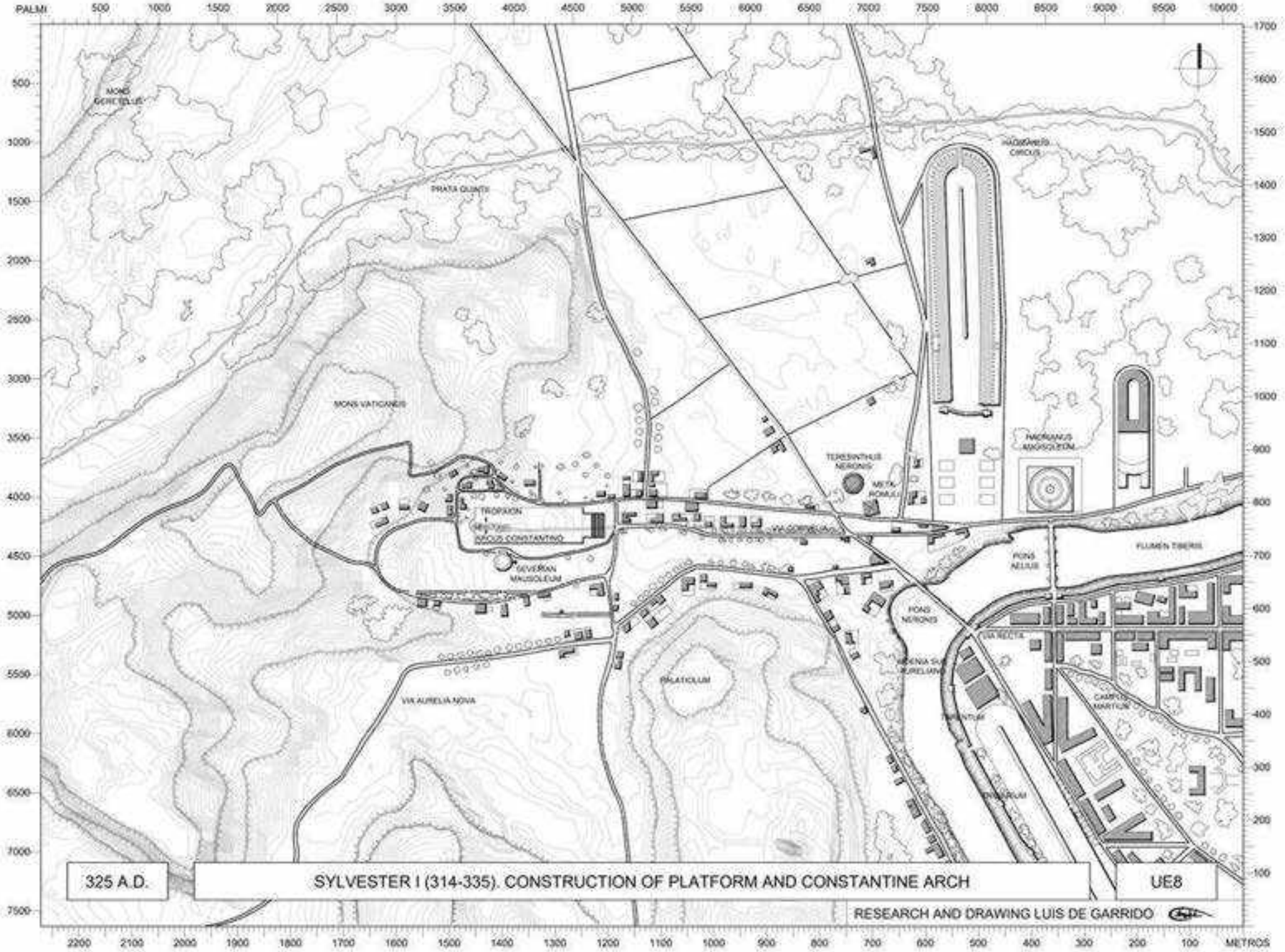
MONS VATICANUS
TEREBINTHUS NERONIS
META ROMULI
HADRIANUS MAUSOLEUM
CIRCUS GAI ET NERONIS
VATICANUS NAUMACHIA
VIA CORNELIA
SEVERIAN MAUSOLEUM
TEMPLUM MARTIUS
PONS AELIUS
FLUMEN TIBERIS
PONS NERONIS
VIA RECTA
HORTI AGRIPPINAE
PALATIUM
CAMPUS MARTIUS
TRIDENTUM
VALLIS FORNACUM
MONS IANICULUS
217 A.D.
ZEPYRINUS (199-217). CONSTRUCTION OF MAUSOLEUM OF SEVERE
UE7
RESEARCH AND DRAWING LUIS DE GARRIDO

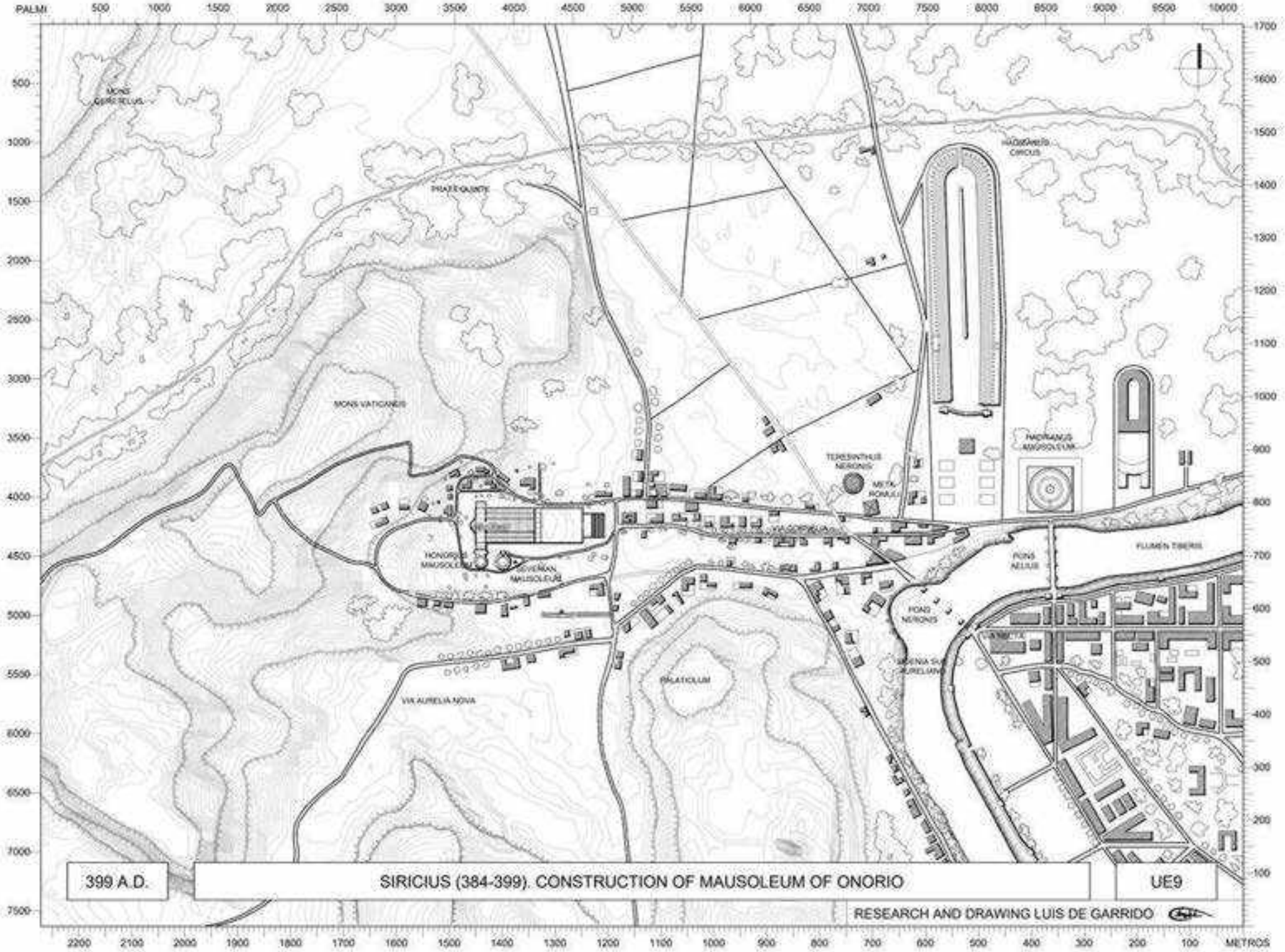


325 A.D.

SYLVESTER I (314-335). CONSTRUCTION OF PLATFORM AND CONSTANTINE ARCH

UE8

RESEARCH AND DRAWING LUIS DE GARRIDO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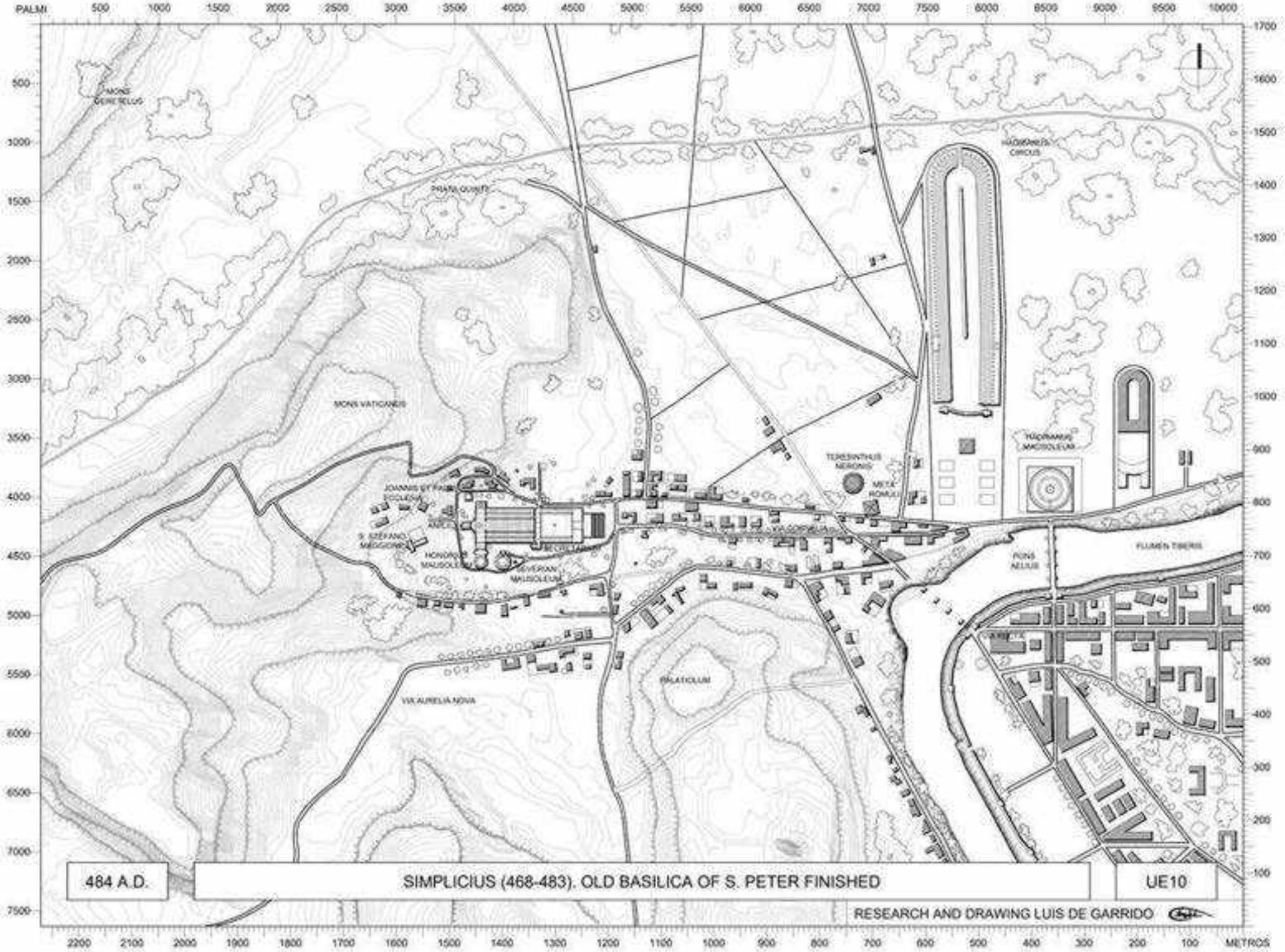
HADRIANUS CIRCUS
HADRIANUS MAUSOLEUM
TEREBINTHUS NERONIS
PONS AELIUS
FLUMEN TIBERIS
PALATIOLUM
VIA AURELIA NOVA
399 A.D.
SIRICIUS (384-399). CONSTRUCTION OF MAUSOLEUM OF ONORIO
UE9
RESEARCH AND DRAWING LUIS DE GARRIDO
METROS

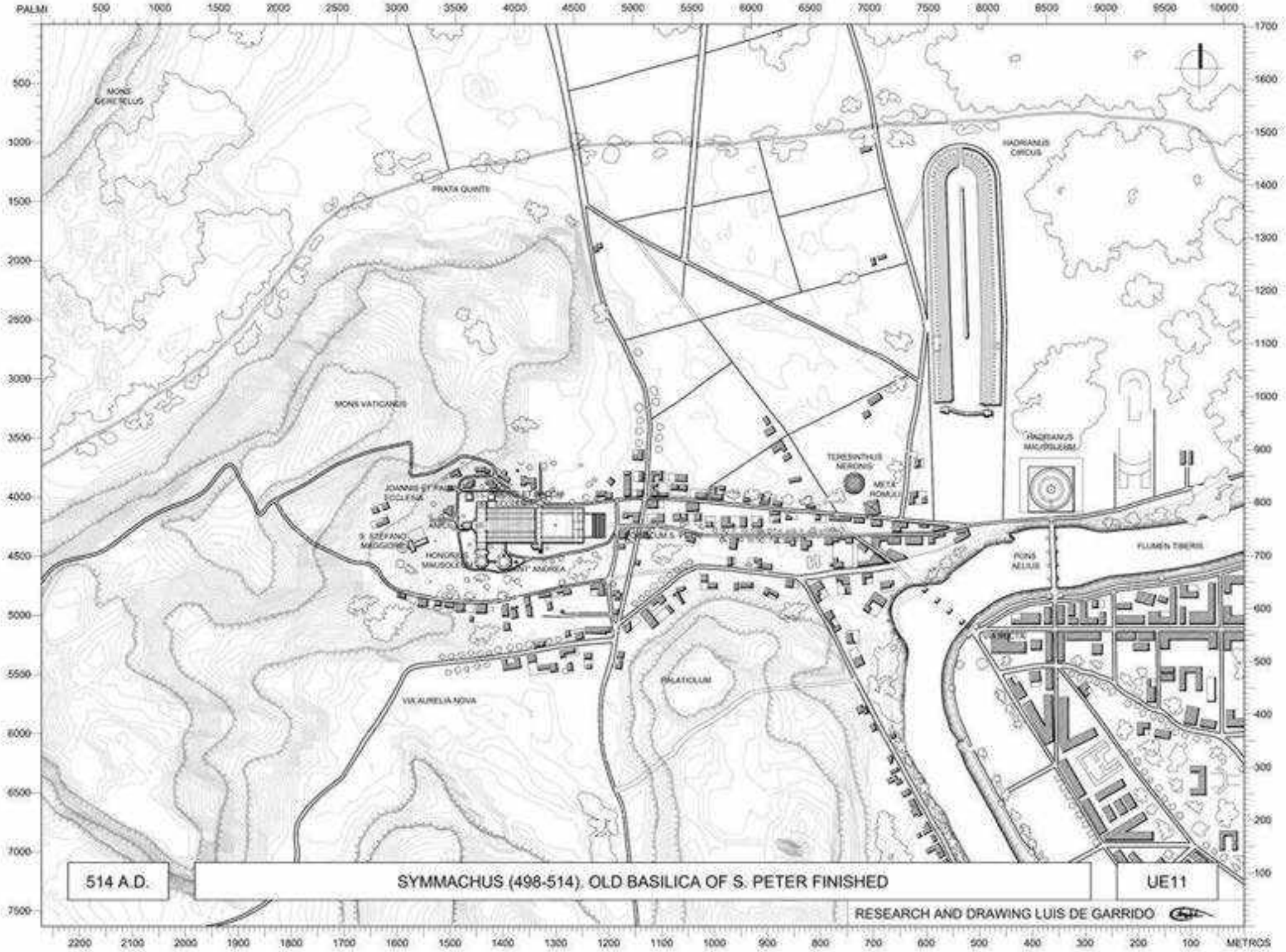


484 A.D.

SIMPLICIUS (468-483). OLD BASILICA OF S. PETER FINISHED

UE10

RESEARCH AND DRAWING LUIS DE GARRIDO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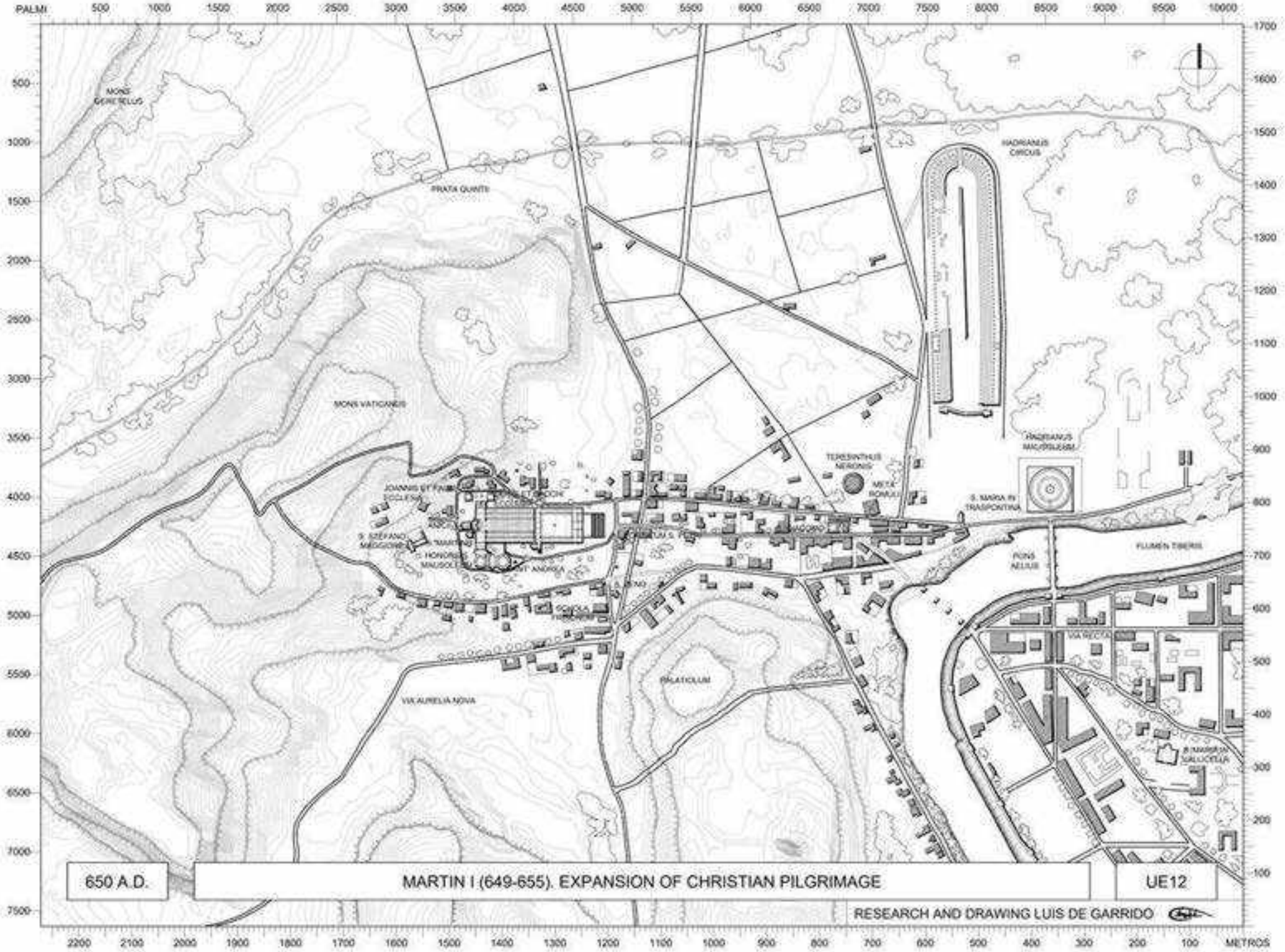
PRATA QUINTI
MONS VATICANUS
HADRIANUS CIRCUS
HADRIANUS MAUSOLEUM
TERENTINTHUS NERONIS
META ROMULI
JOANNIS STYRAE SCOLENA
S. STEFANO MAGGIORE
HONORI MAUSOLEUM
S. ANDREA
PONS AELIUS
FLUMEN TIBERIS
PALATIOLUM
VIA AURELIA NOVA
514 A.D.
SYMMACHUS (498-514). OLD BASILICA OF S. PETER FINISHED
UE11
RESEARCH AND DRAWING LUIS DE GARRIDO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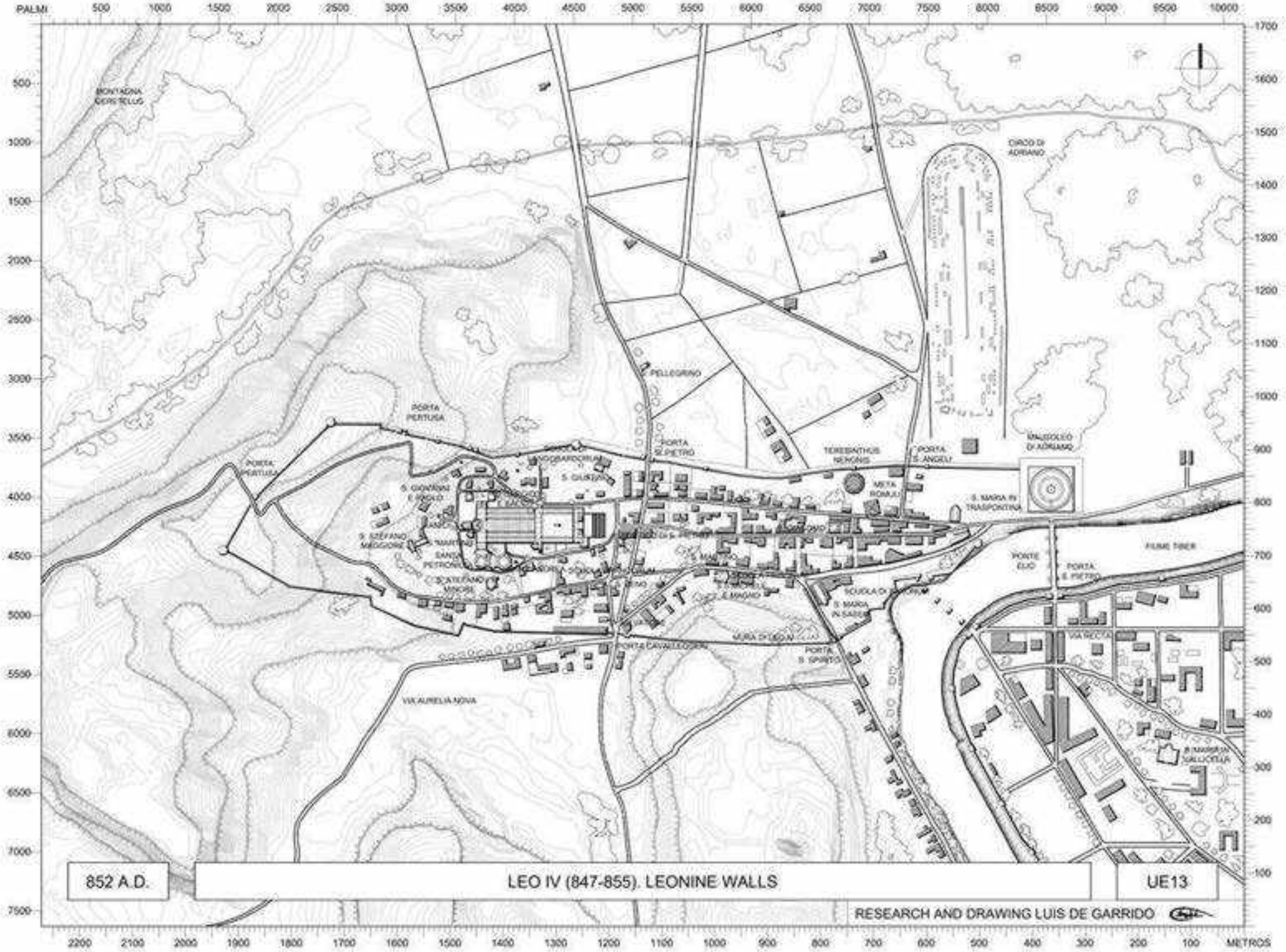
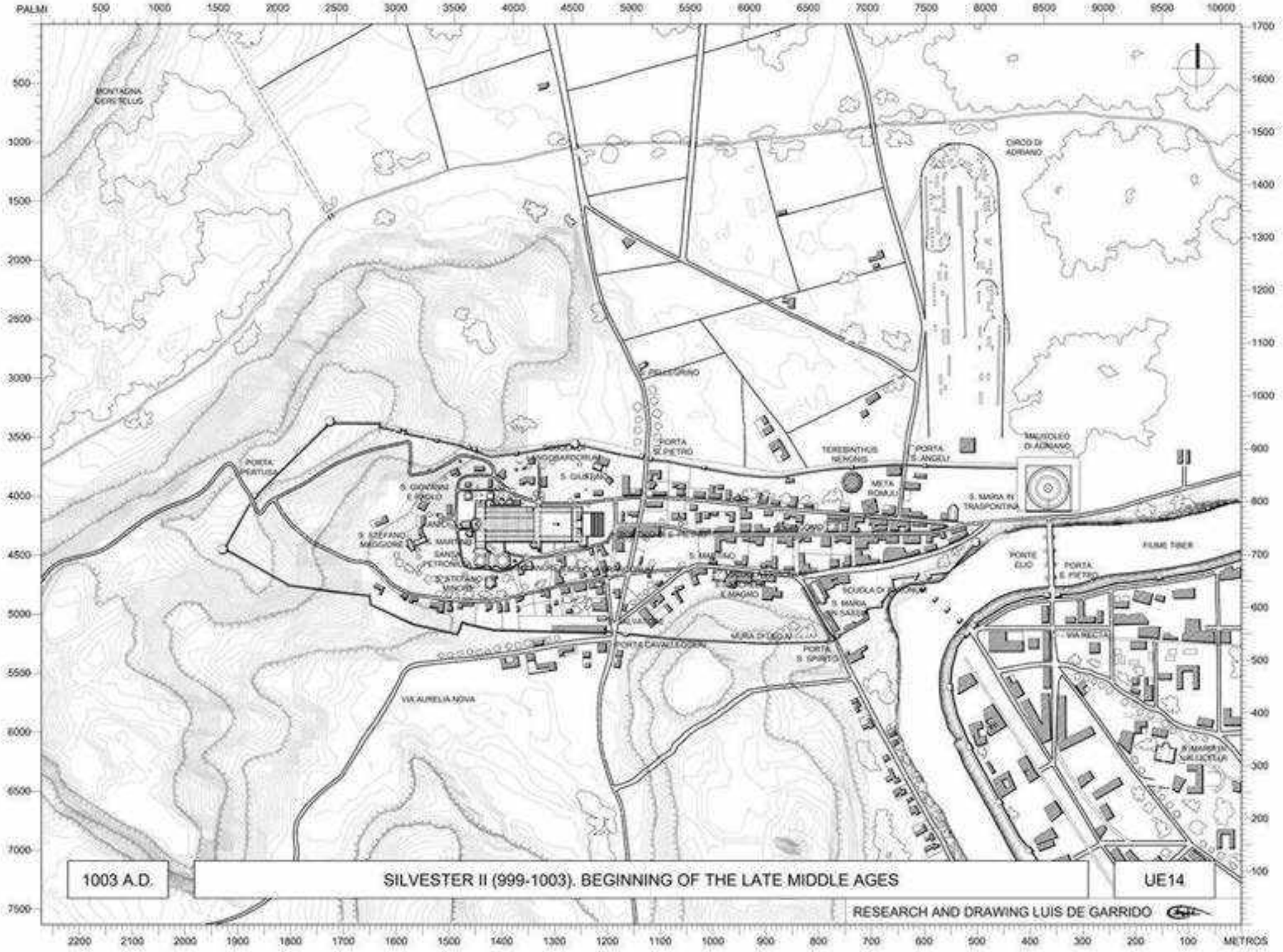
META ROMULI
S. MARIA IN TRASPONTINA
PONS AELIUS
FLUMEN TIBERIS
VIA RECTA
PALATIOLUM
VIA AURELIA NOVA
S. MARIA IN SALUTELLA
650 A.D.
MARTIN I (649-655). EXPANSION OF CHRISTIAN PILGRIMAGE
UE12
RESEARCH AND DRAWING LUIS DE GARRIDO
METROS


PALMI
METROS
MONTAGNA DEI SETTE LUCI
CIRCO DI ADRIANO
PELLEGRINO
PORTA PERTUSA
PORTA PERTUSA
PORTA S. PIETRO
TEREBINTHUS NERONIS
PORTA S. ANGELI
MAUSOLEO DI ADRIANO
S. MARIA IN TRASPONTINA
S. GIUSTINA
S. GIOVANNI E PAOLO
S. STEFANO MAGGIORE
S. STEFANO MINORE
S. MARCO
SCUOLA DI ADRIANO
S. MARIA IN SASSIA
PORTE ELIO
PORTA S. PIETRO
FIUME TIBER
VIA RECTA
PORTA S. SPIRITO
PORTA CAVALLEGGERI
VIA AURELIA NOVA
S. MARIA IN SALLOTTA
852 A.D.
LEO IV (847-855). LEONINE WALLS
UE13
RESEARCH AND DRAWING LUIS DE GARRIDO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META ROMULI
S. MARIA IN TRASPONTINA
PORTA PERTUSA
S. GIOVANNI E PAOLO
S. GIUSTINA
S. STEFANO MAGGIORE
S. ANTONIO MINORE
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FIUME TIBER
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VIA RECTA
MURA D'ADRIANO
PORTA CAVALLEGGERI
PORTA S. SPIRITO
VIA AURELIA NOVA
S. MARIA IN VALICELLA
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SILVESTER II (999-1003). BEGINNING OF THE LATE MIDDLE AGES
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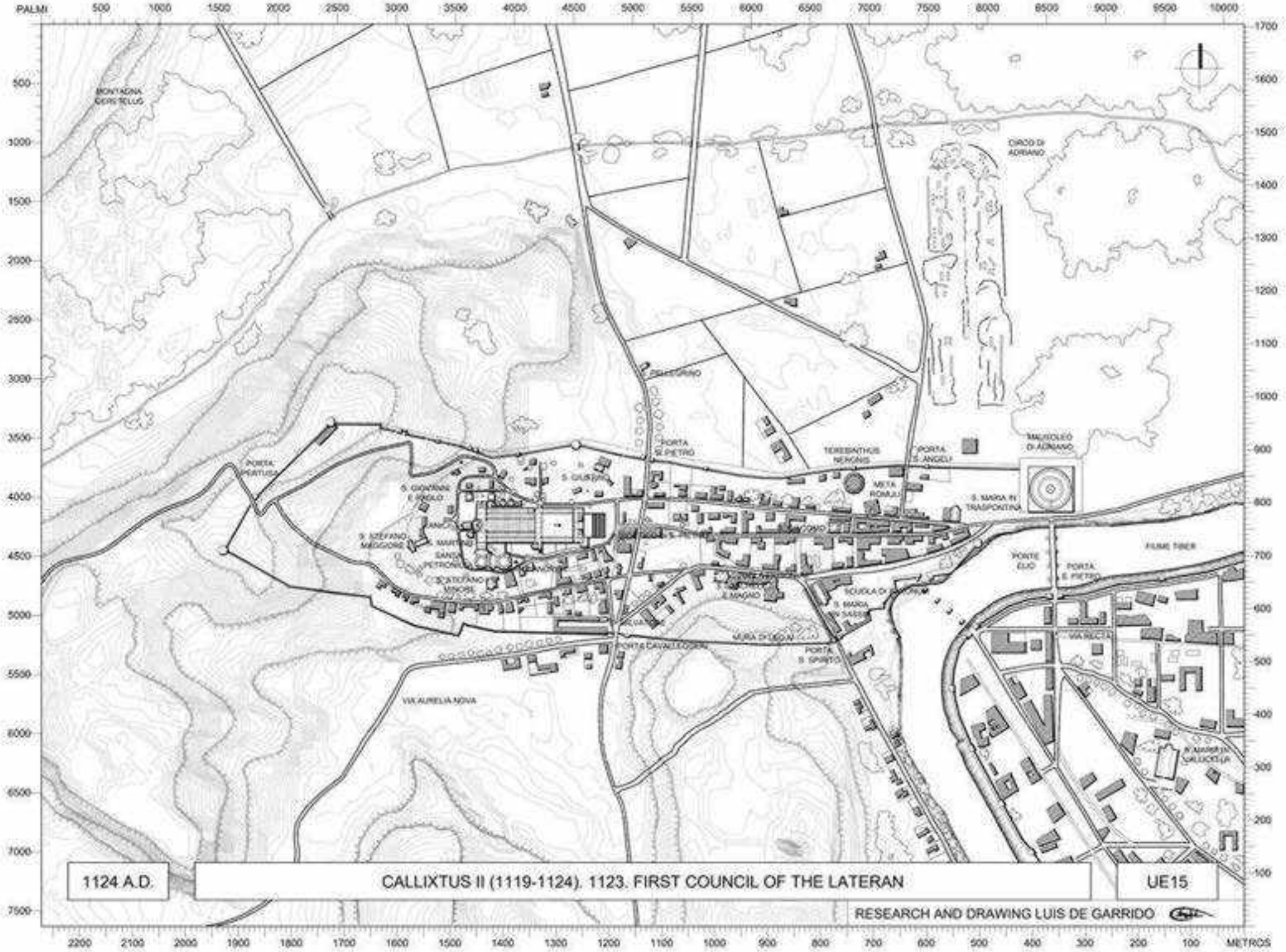
RESEARCH AND DRAWING LUIS DE GARRIDO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CALLIXTUS II (1119-1124). 1123. FIRST COUNCIL OF THE LATERAN
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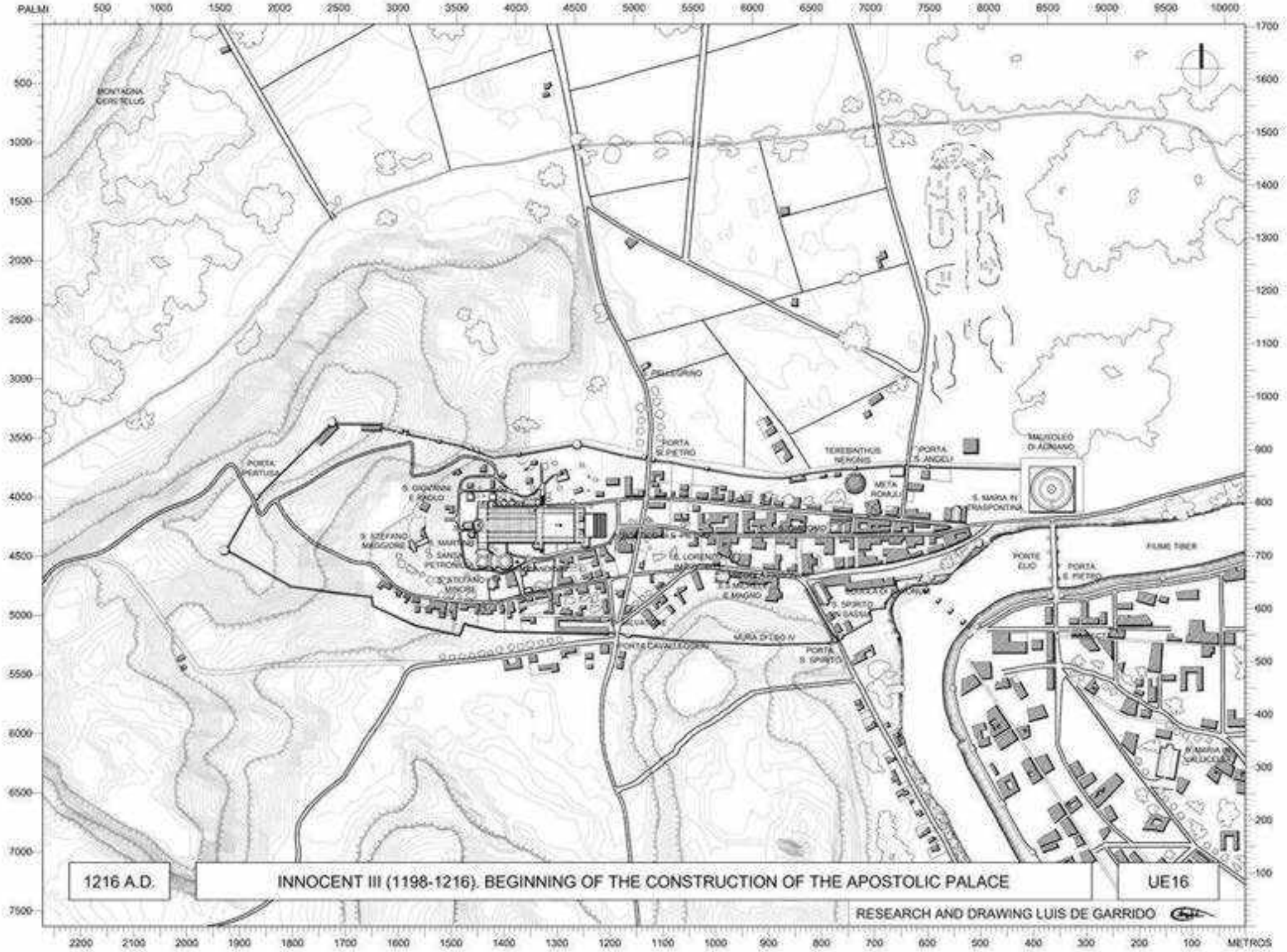
RESEARCH AND DRAWING LUIS DE GARRIDO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S. MARIA IN MONTE MIRANO
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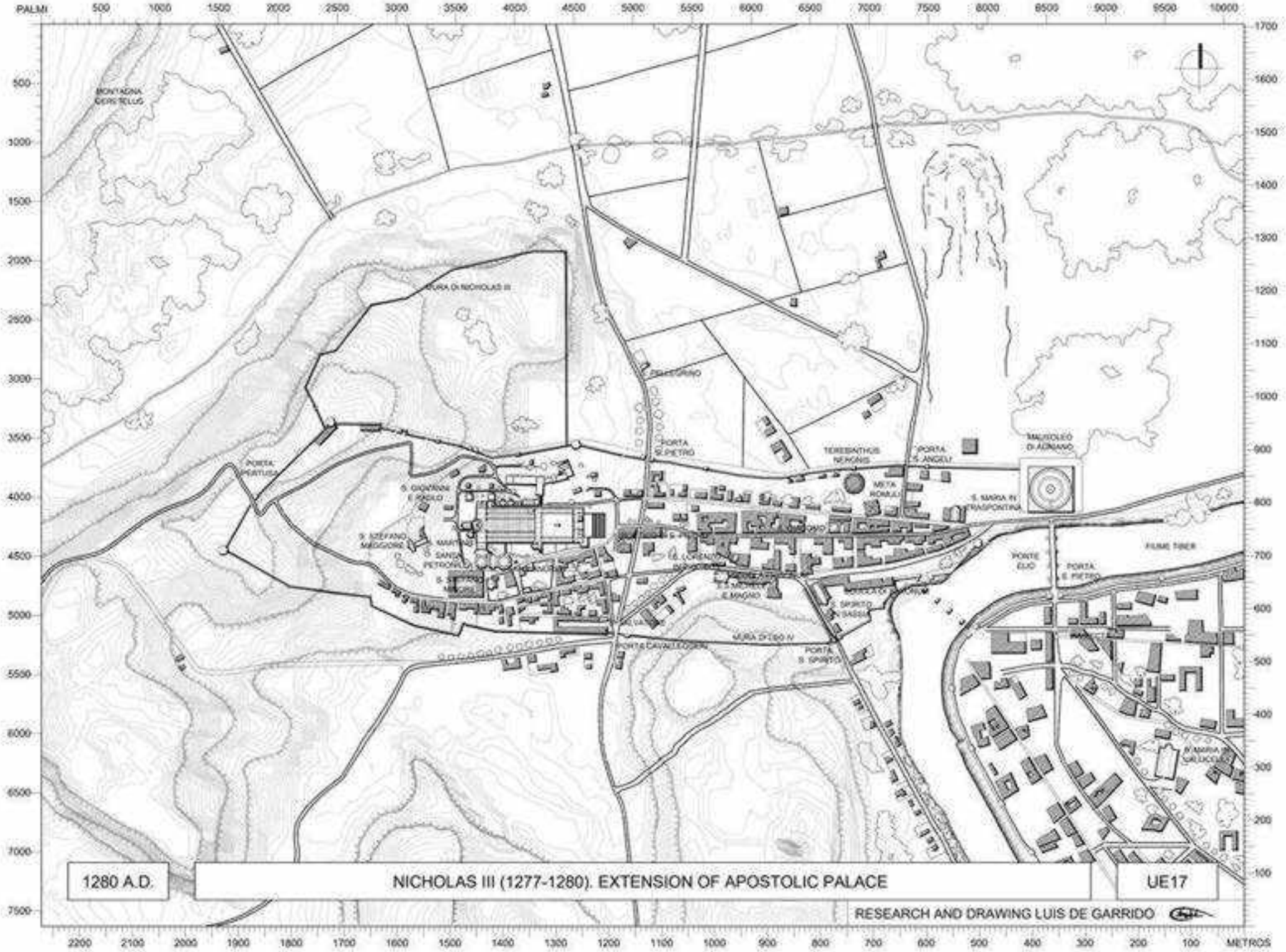
INNOCENT III (1198-1216). BEGINNING OF THE CONSTRUCTION OF THE APOSTOLIC PALACE
UE16
RESEARCH AND DRAWING LUIS DE GARRIDO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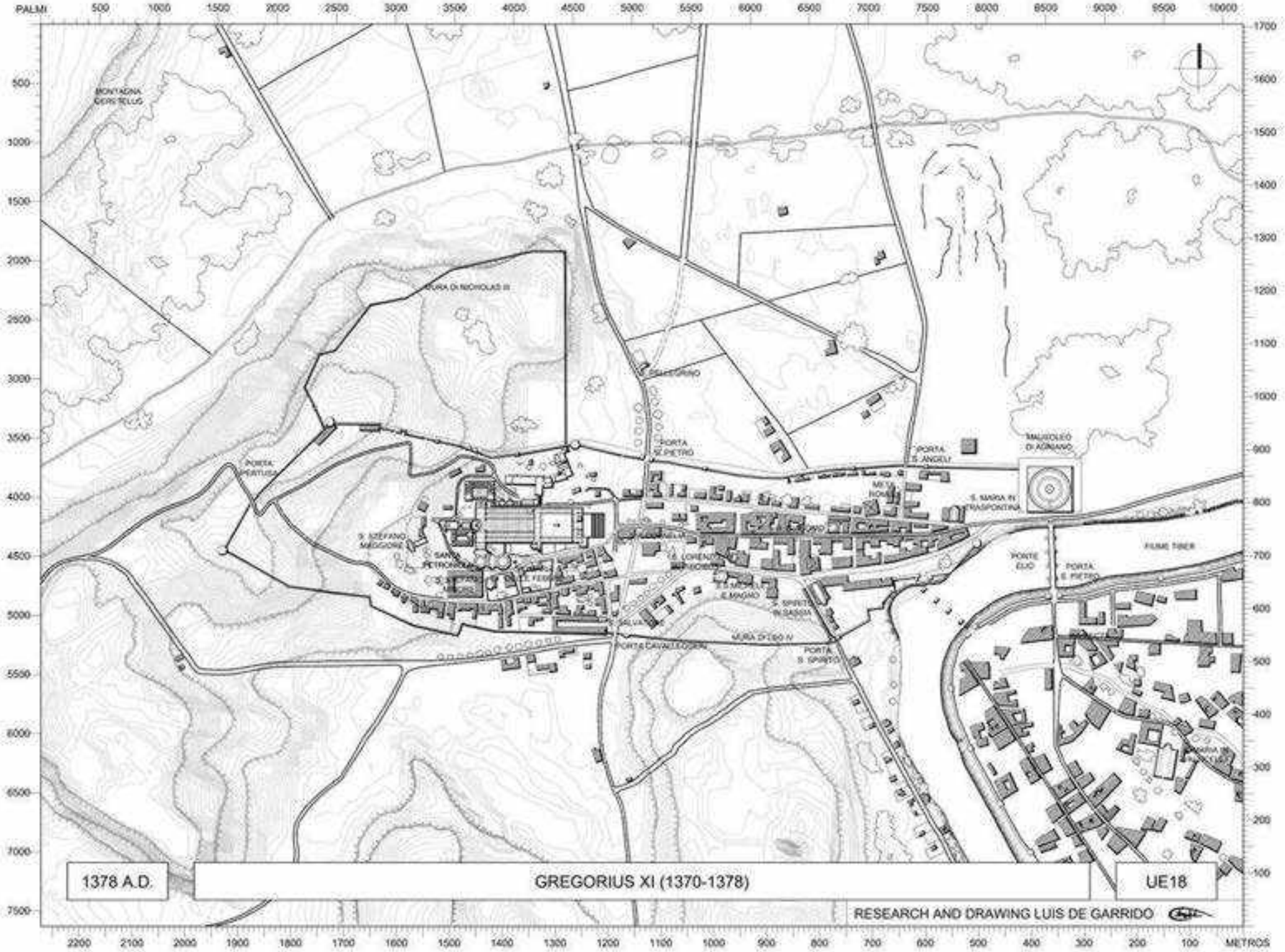
NICHOLAS III (1277-1280). EXTENSION OF APOSTOLIC PALACE
UE17
RESEARCH AND DRAWING LUIS DE GARRIDO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1378 A.D.
GREGORIUS XI (1370-1378)
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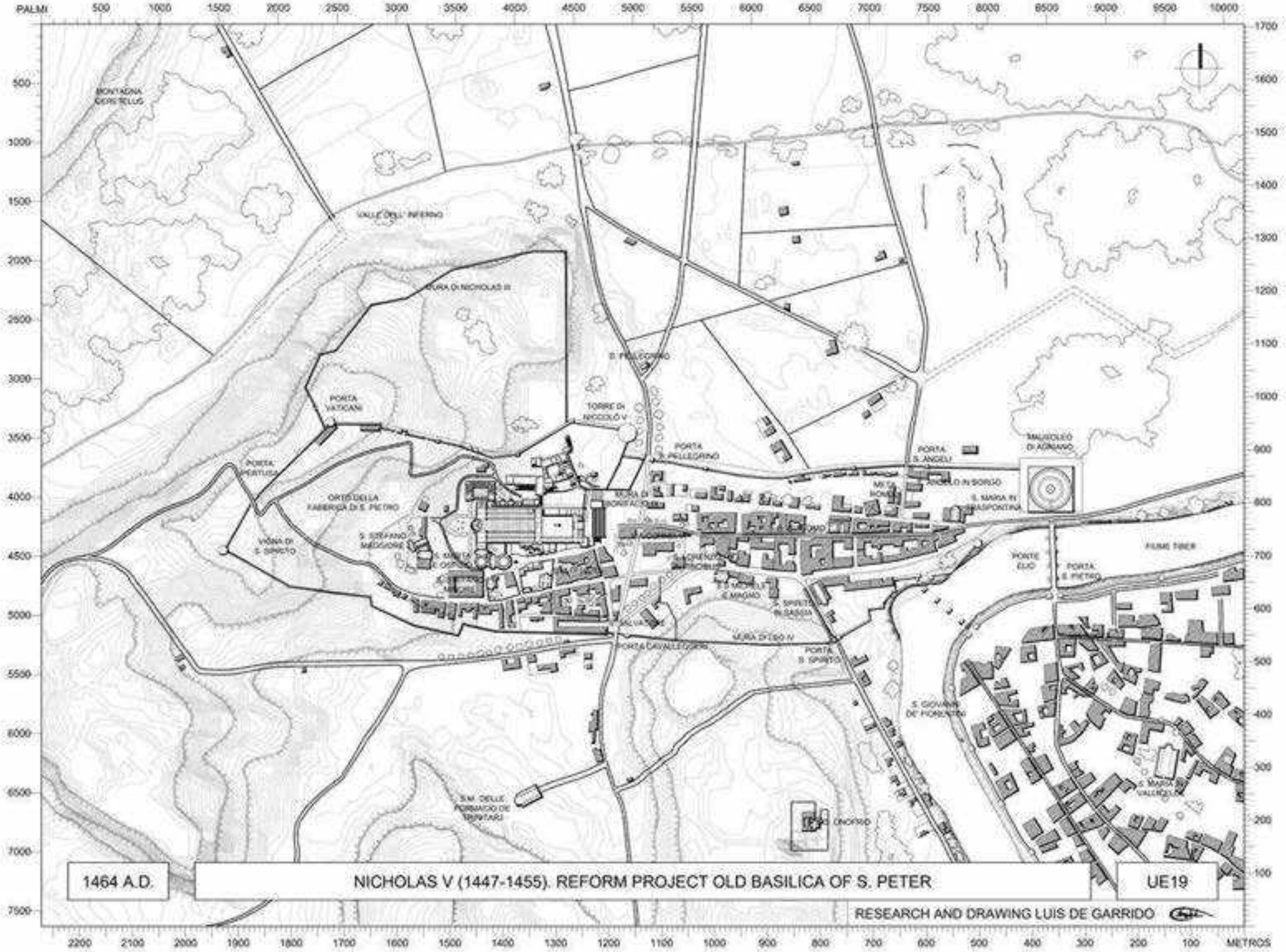
RESEARCH AND DRAWING LUIS DE GARRIDO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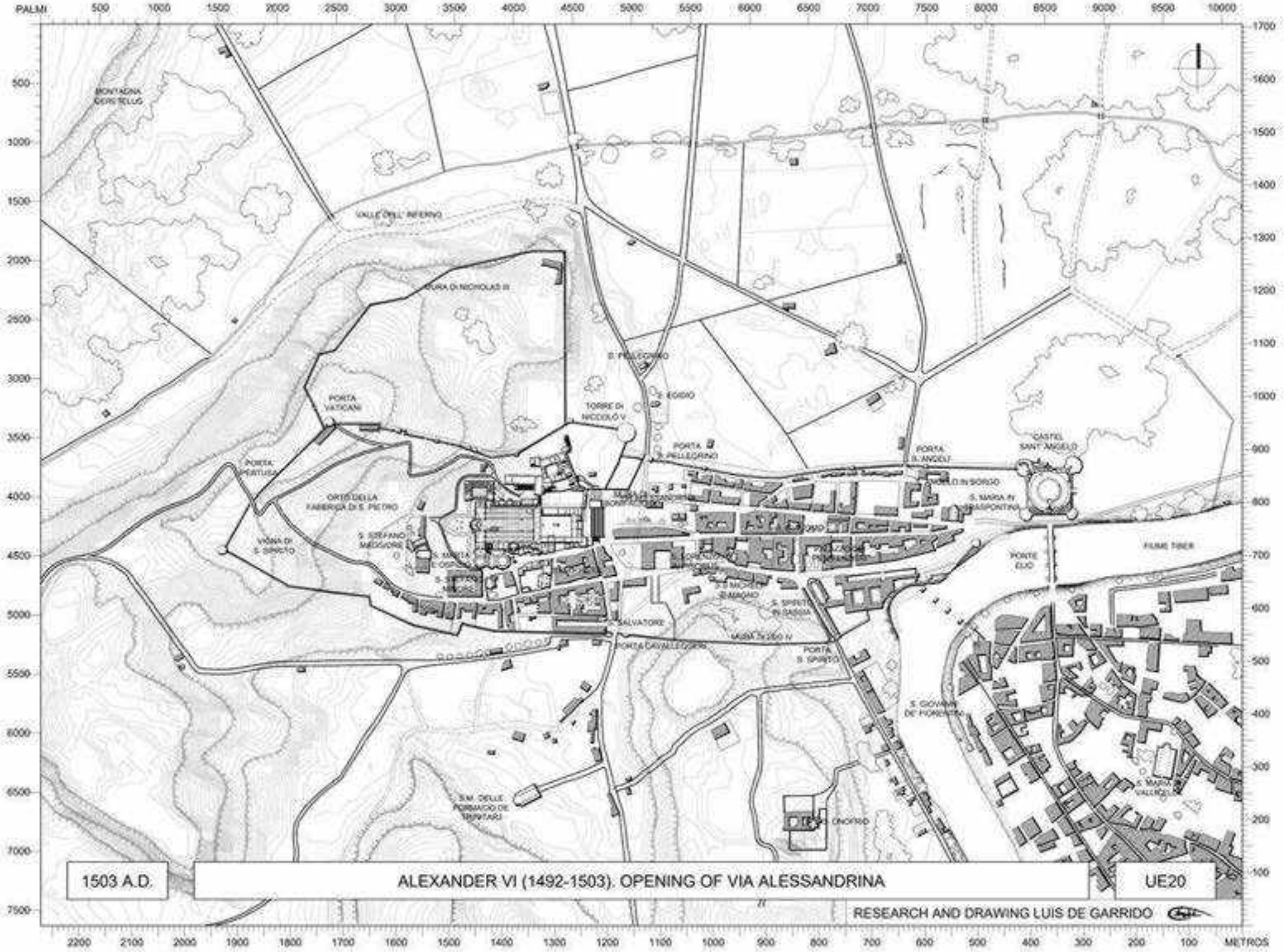
S. MARIA DI VALLICELLA
1464 A.D.
NICHOLAS V (1447-1455). REFORM PROJECT OLD BASILICA OF S. PETER
UE19
RESEARCH AND DRAWING LUIS DE GARRIDO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S. M. DELLE PORMACIO DE TRASTAVERE
S. ONOFRIO
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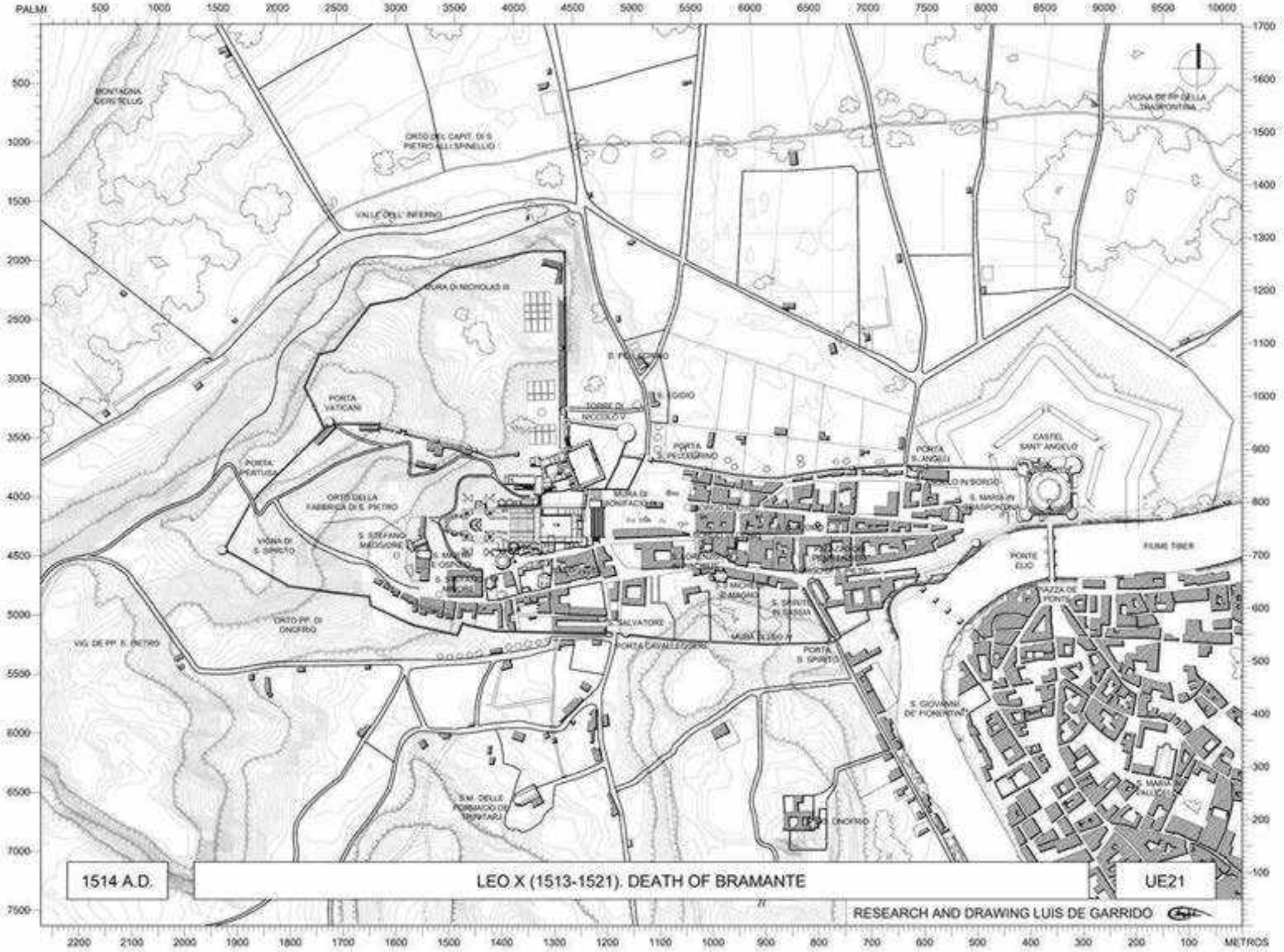
ALEXANDER VI (1492-1503). OPENING OF VIA ALESSANDRINA
UE20
RESEARCH AND DRAWING LUIS DE GARRIDO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S. MARIA ALLA LONGARA
S. ONOFRIO
PORTA CAVALLEGGERI
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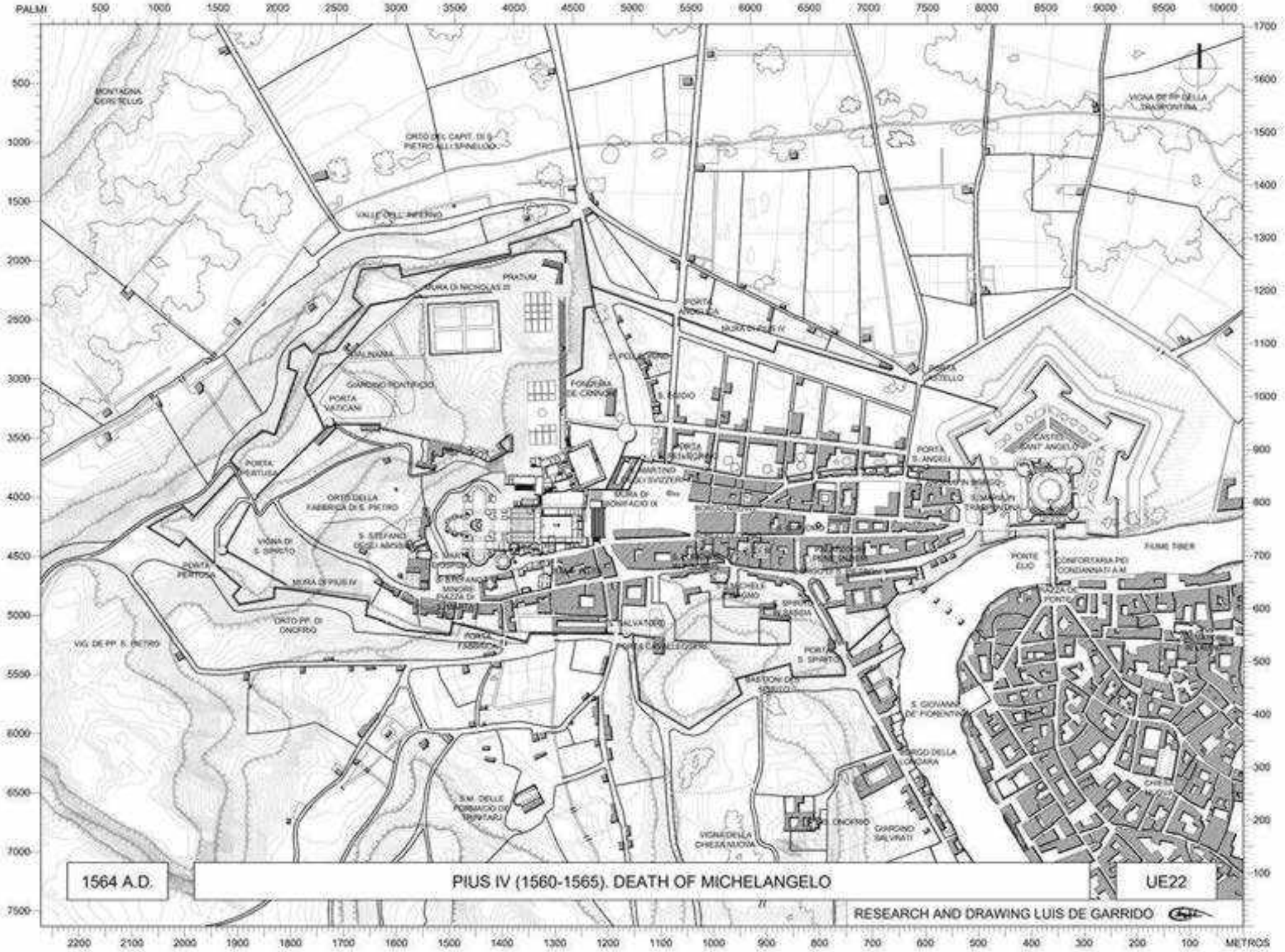
1514 A.D.
LEO X (1513-1521). DEATH OF BRAMANTE
UE21
RESEARCH AND DRAWING LUIS DE GARRIDO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S. STEFANO DEGLI ABYSSINI
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ORTO PP. DI ONOFRIO
VIG. DE PP. S. PIETRO
PORTA FABBRICA
MURA DI BONIFACIO IX
PORTA ANGELICA
MURA DI NICHOLAS IV
PORTA CASTELLO
PORTA S. ANGELI
CASTEL SANT'ANGELO
PORTA S. SPIRITO
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BORGO DELLA CIOCARA
PONTE ELIO
CONFORTARIA DEI CONDANNATI A M.
FIUME TIBER
PIAZZA DE PONTE
S.M. DELLE PORMACIO DI TRINITARJ
VIGNA DELLA CHIESA NUOVA
S. ONOFRIO
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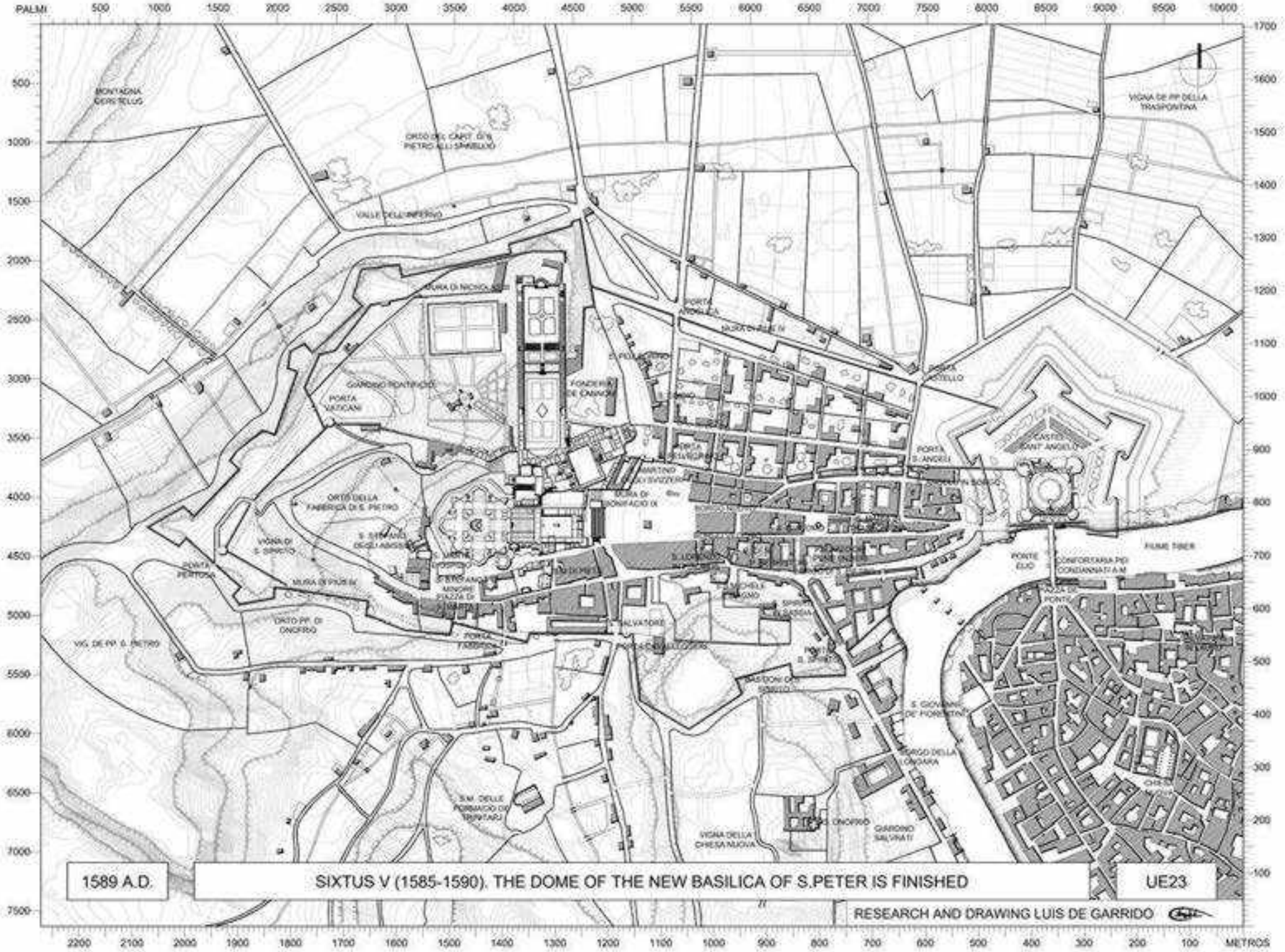
1564 A.D.
PIUS IV (1560-1565). DEATH OF MICHELANGELO
UE22
RESEARCH AND DRAWING LUIS DE GARRIDO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PONTE ELIO
CONFORTARIA PEI CONDANNATI A M.
FIUME TIBER
VIGNA DE PP DELLA TRASPONTINA
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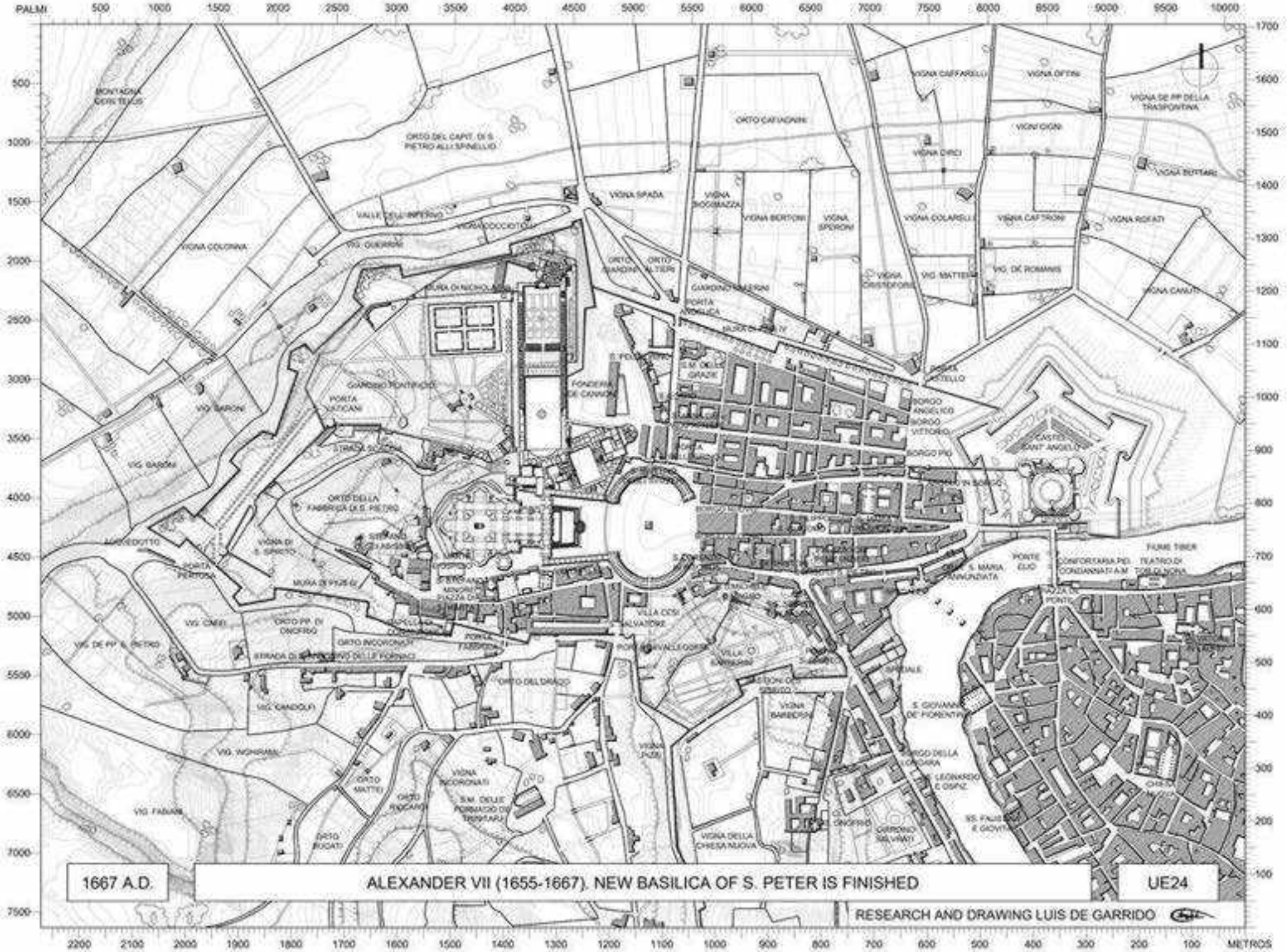
SIXTUS V (1585-1590). THE DOME OF THE NEW BASILICA OF S.PETER IS FINISHED
UE23
RESEARCH AND DRAWING LUIS DE GARRIDO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1667 A.D.
ALEXANDER VII (1655-1667). NEW BASILICA OF S. PETER IS FINISHED
UE24
RESEARCH AND DRAWING LUIS DE GARRIDO
MONTAGNA DOS TELLIS
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ORTO CATUCAINI
VIGNA CAFFARELLI
VIGNA OFFINI
VIGNA DE PP DELLA TRASPONTINA
VIGNI OIGNI
VIGNA CIRCI
VIGNA BUTTARI
VIGNA SPADA
VIGNA BICCHIAZZA
VIGNA BERTONI
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VIGNA COCCHETTI
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VIG. MATTEI
VIG. DE ROMANIS
VIGNA CANUTI
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VIG. GARONI
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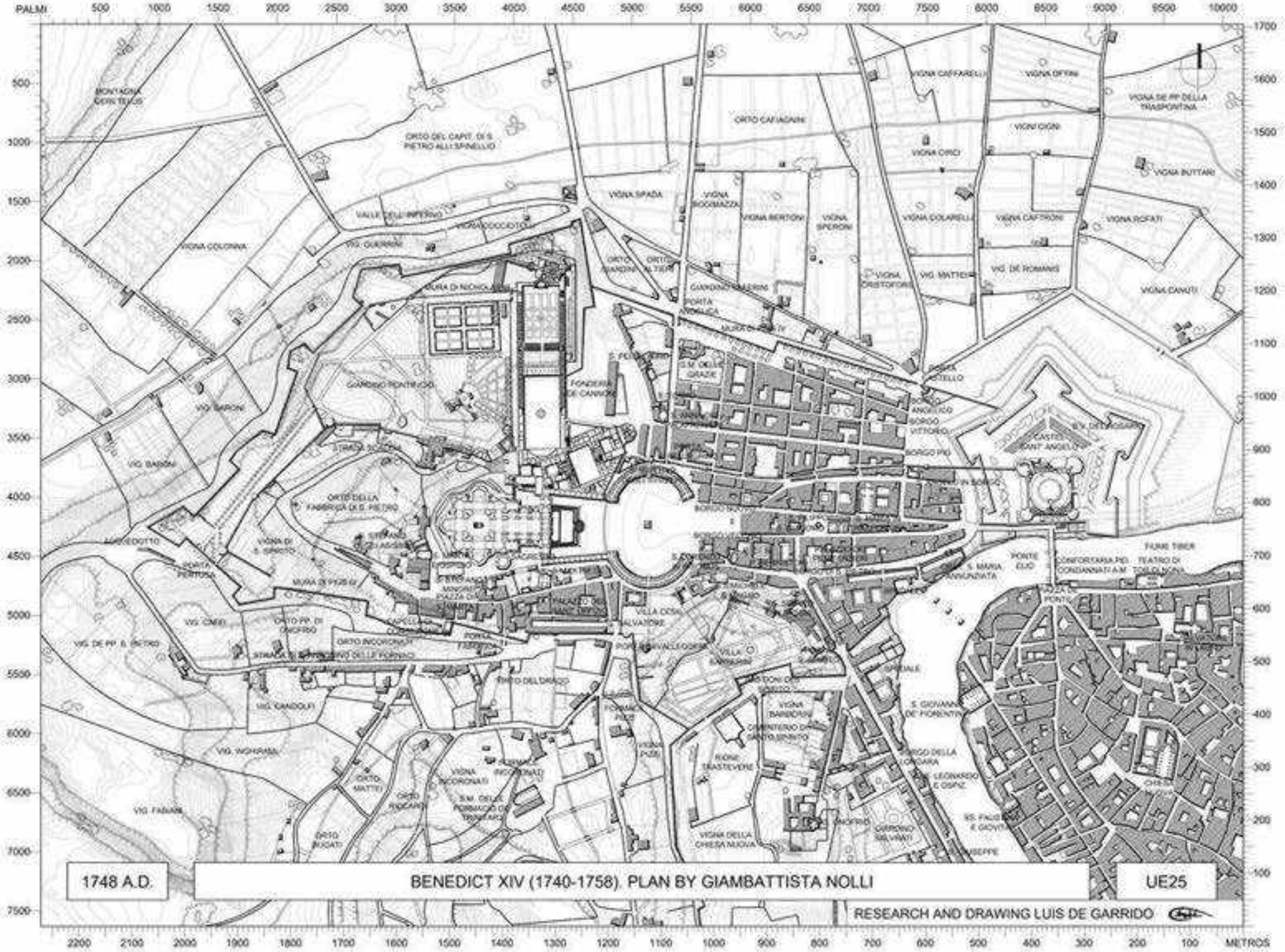
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TEATRO DI TOSCULONA
PIAZZA DI PONTI
CHIESA
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GIARDINO SALVIATI
VIGNA DI PP. DELLA TRASPONTINA
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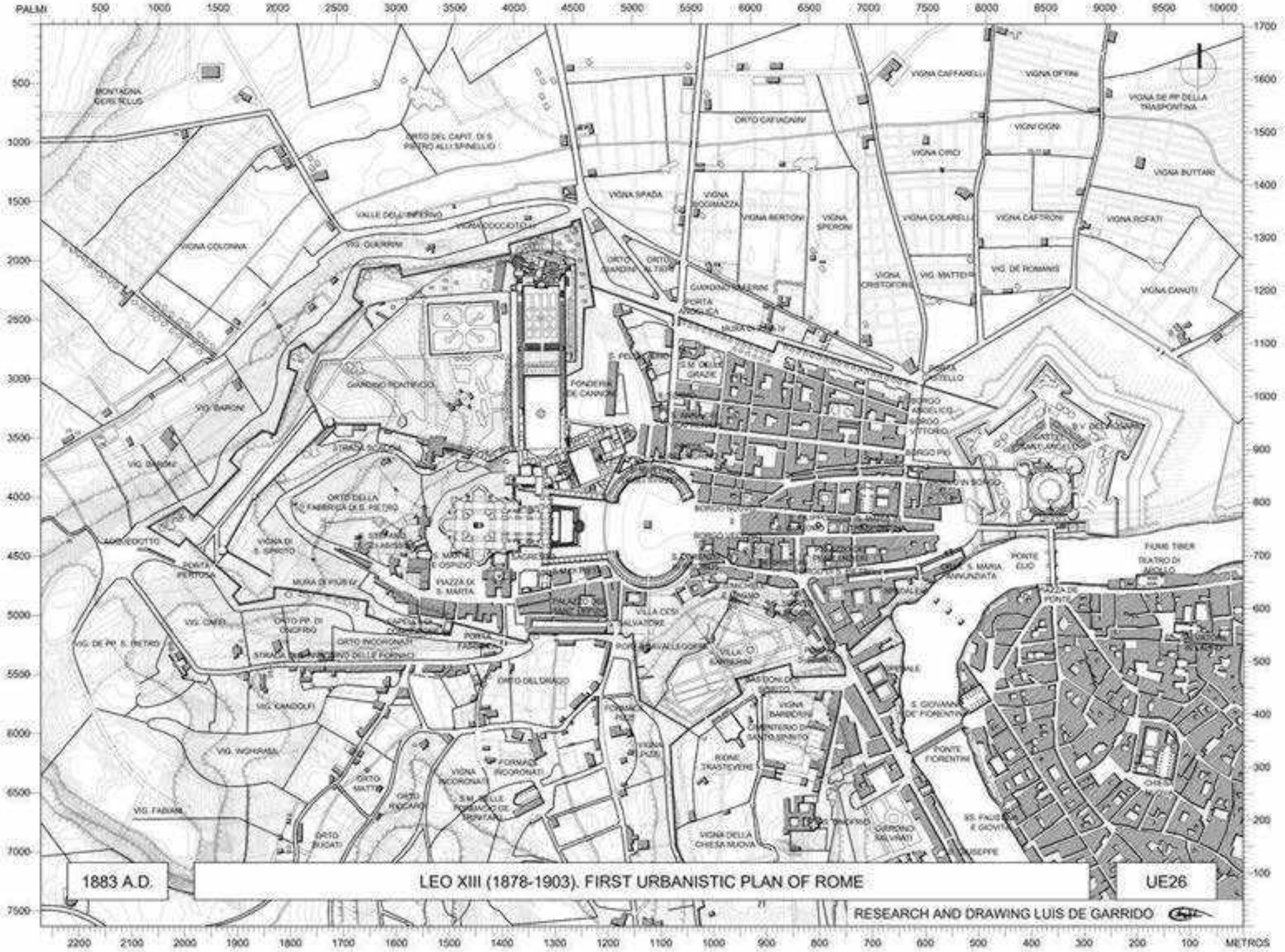
BENEDICT XIV (1740-1758). PLAN BY GIAMBATTISTA NOLLI
UE25
RESEARCH AND DRAWING LUIS DE GARRIDO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1883 A.D.
LEO XIII (1878-1903). FIRST URBANISTIC PLAN OF ROME
UE26
RESEARCH AND DRAWING LUIS DE GARRIDO
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VIGNA SPERONI
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VIGNA CANUTI
VIGNA BUTTARI
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VIG. BARONI
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PORTA PERTUSA
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CIMITERIO DI SANTO SPIRITO
RIONE TRASTEVERE
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PONTE ELIO
FIUME TIBER
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VIG. GIORGI
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VIGNA DI S. GIACOMO
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ORTO CAFFARARIV
ORTO DEL DRAGO
ORTO INCORONATI
ORTO MATTEI
ORTO RUCCARI
ORTO BUCATI
VIGNA INCORONATI
FORNACE INCORONATI
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S. MARIA ANNUNZIATA
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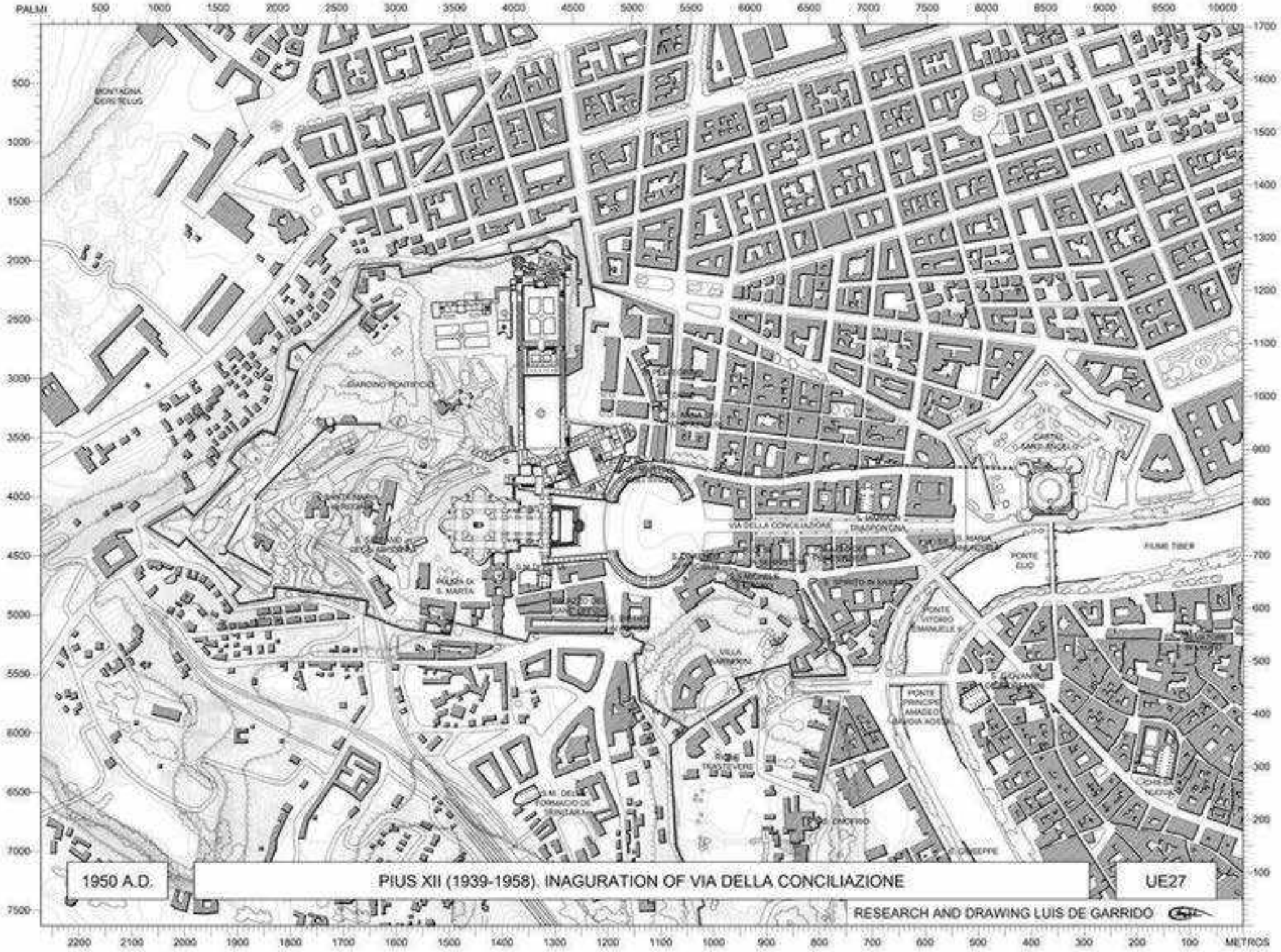
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FIUME TIBER
PONTE VITORIO EMANUELE II
PONTE PRINCIPE AMADEO DUCA D'AOSTA
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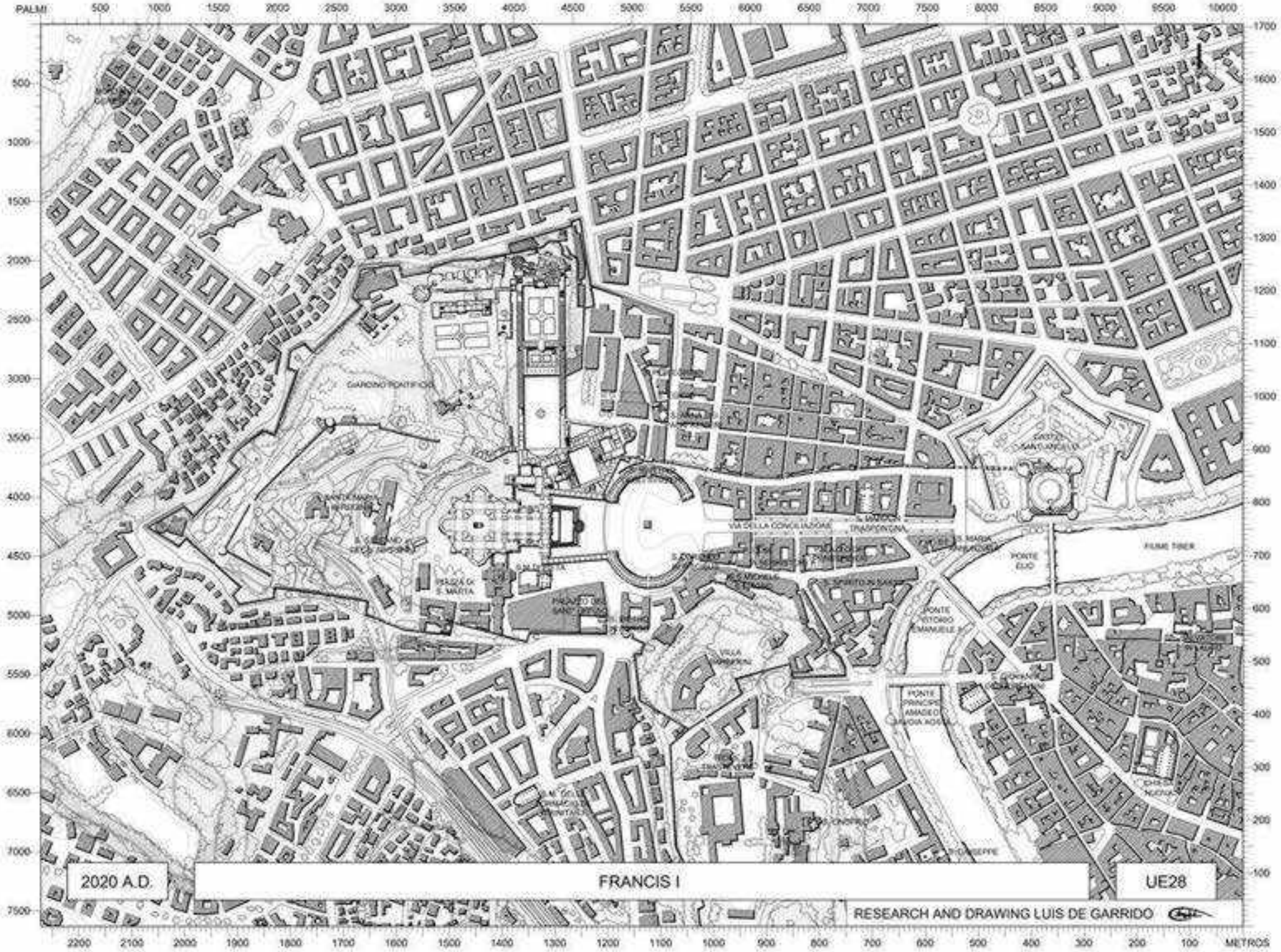
PIUS XII (1939-1958). INAGURATION OF VIA DELLA CONCILIAZIONE
UE27
RESEARCH AND DRAWING LUIS DE GARRIDO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PONTE VITTORIO EMANUELE II
PONTE PRINCIPE AMADEO DI SAVOIA AOSTA
FIUME TIBER
2020 A.D.
FRANCIS I
UE28
RESEARCH AND DRAWING LUIS DE GARRIDO
METROS

CHAPTER 3

"*Emperor Constantine, who raised Christianity to power, assassinating his wife Fausta, and his eldest son Crispus, the same year that he summoned the Council of Nicea to decide whether Jesus Christ was a man or the Son of God.*
... The council decided"

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Chapter 3. Historical analysis of the design and construction process of the old basilica of S. Peter

In this chapter an initial summary historical account of the construction process of the old basilica of St. Peter, as well as its evolution over time, has been created based on a large number of previously collected and classified historical references. This account is very important as it provides an initial script to reconstruct the design process and the construction process of the ancient basilica, as will be done in the next three chapters.

3.1. Main historical sources referring to the old basilica of S. Peter

At present there are two main documentary sources for the study of the old basilica of S. Peter.

1. Archaeological excavations

These excavations were carried out in the 40s of the 20th century, and allowed to have a more complete idea of the structure of the old basilica of S. Peter. The results of these excavations have been documented by various authors, especially Richard Krautheimer.

2. Historical documents

A set of historical documents that describe the old basilica between the 7th and 14th centuries has survived to this day.

The most important source of the early history of the old Constantinian basilica is the *Liber Pontificalis*, also called "Book of the Popes" which is a compilation of biographical reviews of the first popes, from St. Peter, to Stephen V (885-891) [1].

The initial drafting of the *Liber Pontificalis* was composed during the mandate of Pope Hormisdas (514-523) taking into account the existing documentation in the church of Rome. The first section of the *Liber Pontificalis* was completed in 535, and shows the history of the popes, from S. Peter, to Pope Silverius (536-537), as a biographical sequence [2].

The document has a distorted historical value since the biography of the first 36 popes took into account the *Catalogus Liberanus* appeared in 354, just when the construction of the main body of the basilica had been completed. The *Catalogus Liberanus* owes its name to the last para on the list, *Liberius* (352-366). In turn, this papal catalog took the

data for the first 18 popes, from the work *Cronica* by Hippolytus of Porto, which has practically no historical value, since it is based exclusively on the Christian tradition [3].

The information contained in the *Liber Pontificalis* between Pope Hormisdas (514-523) and Pope Boniface V (619-625) is more reliable from a historical point of view, although they continue to present errors, since the biographical compilation continued to be made with a significant time delay with respect to each pontificate reviewed.

The situation changes from the pontificate of Honorius I (625-638) since the entries to the *Liber Pontificalis* are made very shortly after the death of each pontiff, so the data are more exact, although they were not free of prejudices from the compilers. In any case, it should be noted initially that the book presents the Constantinian basilica as a place of pilgrimage [4].

Other more recent historical sources are the writings of the canons and clerics of the ancient basilica such as Petrus Mallius (11th century) [5], Maffeo Vegio (15th century) [6], Tiberio Alfarano (1525-1596) [7], and Giacomo Grimaldi (1568-1623) [8]. Therefore, there is hardly any information about the history of the basilica from the end of the *Liber Pontificalis* (year 891) until the 11th century. In the same way, there is hardly any information from the 11th to the 15th century.

The most important documentation that has come down to us are the texts and drawings made both by people who were able to visit the basilica, such as Martin van Heemskerck (1498-1574) [9]; Onofrio Panvinio (1530-1568) [10]; Giovanni Antonio Dosio (1533-1609) [11]; Domenico Tasselli da Lugo [12], etc., or people who lived in later times, and therefore could not visit the basilica, but who supposedly could have access to ancient documents and drawings of the basilica, such as Paul Letarouilly (1795-1855) [13], or Rodolfo Amedeo Lanciani (1847-1929) [14].

The greatest source of information about the building is the writings and drawings of Alfarano.

At the time of Alfarano, the transept and the western section of the naves had already been demolished, with the exception of the apse that the cleric could observe inside the Tegurium of Bramante. Therefore, Alfarano's plans have various conjectures, although not arbitrary, since he was able to observe the treads of the walls in the pavement among the ruins, and measure them directly. In addition, Alfarano was able to remember certain parts of the basilica still standing when he was a child. In fact, when the Arch of Constantine fell (1544-1545) Alfarano was 19 years old. In fact, some of the greatest historians and researchers of the old basilica of S. Peter, such as Ktautheimer and Frazer,

consider the plan layout and writings of Alfarano the most reliable source to get an idea of what this building was like [15].

Alfarano made several handwritten notes and at least three plans. The first of them, probably from 1571, shows the plan of the old basilica and on it pasted the plan of the new basilica by Michelangelo, made by Dupérac a few years earlier (1569). In fact, Alfarano, by scraping the ink, modified the position of the altar, which Dupérac drew in the geometric center of Michelangelo's project [16].

In 1589 Alfarano commissioned the engraver Natale Bonifacio to make a copper engraving of the plans of the old basilica based on the graphic documentation that he had previously prepared.

Alfarano made a second floor plan layout in 1576 of which there are only references of the title and its dedication to Cardinal Alesandro Farnese (archpriest of San Pietro from 1543 to 1589) [17].

There are also some anonymous graphics, or of uncertain authorship, most of which are of poor quality or are mere copies of some of the drawings mentioned. These documents do not provide information on the proportions and measurements of the old basilica, however, once the project strategy followed in its design has been identified, these documents allow the project to be properly completed.

However, and among all the graphic documentation that has survived to this day, there are some documents that do provide more exact information on the specific dimensions of the old basilica. These documents were made by Bramante (1443? -1514) (*GDSU 20 A*); and Baldasarre Peruzzi (1481-1536), (*GDSU 11 Ar "Pianta dell'Atrio e della Navata di S. Pietro"*, made in the year 1518, although some historians date it between the years 1520-1521).

3. Contemporary studies

Finally, it should be noted that there have been multiple proposals from various contemporary historians, based on the analysis of previous documents, and also taking into account the excavations carried out in the 1940s. These researchers include the following: Alberto Carpiceci, Ann Van Dijk, Christoph Jobst, Filippo Bonanni, Hugo Brandenburg, Jocelyn Mary Catherine Toynbee, John Osborne, Lex Bosman, Paolo Liverani, Richard Gem, Richard Krautheimer, Rosamond McKitterick, William Tronzo, among others.

3.2. Chronological summary of the construction of the old basilica of S. Peter

Based on the analysis of all available historical information, and on the basis of the latest research by authoritative historians on the subject, it is possible to determine a tentative sequence of the most important stages of the construction of the old basilica of S. Peter [18].

Initially, this sequence of construction stages can be classified into four large consecutive periods:

3.2.1. Built environment

It is the period from the beginning of the construction of the Circus of Nero and surrounding constructions, until the beginning of the construction of the great platform needed to build the basilica on it.

3.2.2. Period 1 (324-351). Sylvester (314-335) - Julius I (337-352)

It is the period from the beginning of the great horizontal platform to the completion of the construction of the main body, comprising the transept, the two exedras, the apse and the five naves.

3.2.3. Period 2 (352-514). Liberius (352-366) - Symmachus (498-514)

It is the period between the completion of the main body until the completion of the anterior body, comprising the narthex, the lateral wings, and the anterior rooms.

3.2.4. Period 3 (515-1503). Hormisdas (514-523) - Juluis II (1503-1513)

It is the period between the completion of the basilica until it began to fall to give way to the construction of the new basilica.

In chapter 5, all the consecutive construction stages of these four periods are reconstructed, and for this purpose, all the actions related to the construction of the old basilica must be previously collected, classified and analyzed. For this reason, it is convenient to know the motivations that prompted its construction, the vicissitudes in the construction process, and also the evolution of the basilica throughout the Middle Ages. The reconstruction of the pilgrimage ritual allows a broad overview of the state of the old basilica, as well as the most important buildings in its surroundings.

3.3. Brief historical reconstruction of the construction process of the old basilica of S. Peter

When Constantine entered Rome in the year 312 (Fig. 3.1), the annual commemoration of the *depositio* [19] of S. Peter and S. Paul had been celebrated since the middle of the third century on June 29 in the cemetery ad Catacombs of the *Via Appia*. The authority was interested in helping Christians in their liturgical activities and especially in this type of public, visible and influential events, so the construction of a basilica was a priority [20]. Emperor Constantine, who was a pagan until the time of his death allowed freedom of worship and even offered Christians buildings and grounds for their meetings and the celebration of their liturgical activity, and for this he proclaimed the edict of Milan (313 AD).

The construction of the basilica was part of a general plan to help the Christian community in Rome to build functional meeting places, together with the Lateran Cathedral [21], and other buildings. The construction of the basilica on the Vatican hill posed many difficulties since the terrain had great unevenness, and it also had to be built over a necropolis, just off the north face of Nero's circus (Figs. 3.2 and 3.3). Inside this necropolis was located what was believed to be the tomb of Peter, surrounded by the tombs of influential families. However, as Eusebius relates, in 325 there was already a huge number of pilgrims who crowded the access roads to the Vatican, especially the only access bridge over the Tiber River, and who collapsed the surroundings of the tomb, so urgent action was needed [22]. These events may have coincided with Constantine and Helen's new imperial policy of honoring Christian holy sites with imperial splendor.

Just after the Battle of Chrysopolis in September 324, and perhaps in commemoration of it, Constantine gave orders for the construction of a basilica in the Vatican, with non-state funds, personally donating marbles to beautify the tomb monument, and gold to adorn its roof [23]. The decisions to establish this basilica were made in parallel with the establishment of other sacred buildings, such as the complex of the Basilica of the Martyrdom in Jerusalem, on the site of Christ's tomb.

Constantine wanted these constructions to be in keeping with an imperial munificence, since from his perspective, an isolated and huge basilica, decorated with marbles and gold, could be the establishment of an imperial generosity of a traditional architectural type, in a traditionally minded city. And this could mark in the city the reunification of the empire under a Christian emperor.

Pope Sylvester I (314-335) would undoubtedly demand certain functional elements from the basilica, and especially on how it could incorporate the tomb of Peter. As there were no precedents, it was decided to adopt the same configuration, in the transept of the new basilica, as that existing in the original tomb, within the cemetery courtyard.

The place chosen for the construction of the basilica dedicated to S. Peter was just above what was considered his tomb, in the Vatican necropolis, and this created several construction and legal problems [24]. The land had a slight slope and welcomed a necropolis that was in use at the time. Roman law guaranteed the inviolability of the graves, but the emperor managed to impose his will and authorized the works, since he had a great interest in building just above the tomb of the Apostle Peter, the father of the church [25]. Constantine ensured, however, that the tombs were not damaged, and so a huge flat horizontal platform was built on which the building would later be built [26]. The platform, in its highest part, had an approximate height of 26.25 *roman feet* (1 *roman foot* = 29.7866 cm.), judging by the number of steps of the main access ladder to the platform (35 risers of approximately 0.75 *roman feet* each riser and 1.5 *roman feet* each tread).

The construction of the basilica was carried out in several stages [27]. The platform was built in 324, in the time of Pope Sylvester), and the triumphal arch of Constantine in 325 [28]. In fact the name of Constantine appears on the triumphal arch [29], and furthermore, in the year 325, Eusebius, and other writers, reported the large number of pilgrims who crossed the river to visit the most important sanctuary in Rome [30].

In July and August 326 Constantine was in Rome with his mother Helen for the celebration of their anniversary, and perhaps it was on this occasion that he presented the golden cross or, at the latest, in 329. It is also possible that it was in these years, at the end of the 320s, when the dedicatory inscription was made on the triumphal arch, which is proof that it was already built at this time. However, many researchers think that the construction of the foundation platform was the responsibility of his son Constans, and therefore the arch was also built by his order, although it was dedicated to his father [31]. Other historians do not think so, and they think that both, the platform, the arch and the apse, were the work of Constantine [32].

Be that as it may, since the imperial visit in 326, work continued regularly, although some researchers think that some changes were made to the design of the basilica's transept before its construction was completed. The apse was completed in the year 326 in the time of Sylvester I (314-335), according to the inscriptions found on some of its bricks.

A few years after the start of the works, the apse was modified, probably around the year 337, on the occasion of the ascent to the wheel of Constans, the son of Constantine, whose seal was probably used in the construction. The mosaic in the apse could have been completed in 340 as a *piaculum* on the occasion of the war waged against Constans by his brother Constantine II [33].

The transept was completed in 327. During the construction of the transept, several alternative proposals would undoubtedly be formulated on how to integrate the tomb of Apostle Peter with the central area of the transept (in the transept with the central nave), and the way of access to the same, in the same way that later did the popes Mark (336-336) and Julius I (337-352). At the beginning, the complex combined two practical functions: as a *martyrium* of the apostle, and as a covered cemetery, but with the passage of time other liturgical uses were required. The transept of the basilica was in practice very poor compared to the later basilica of S. Peter (in the design of the new basilica the narrow transept was rejected in favor of another the same width as the main nave, creating a wider transept and with the apostolic tomb located just behind the Triumphal Arch. This arrangement provides more space for liturgical activities and for pilgrims to access the Apostle's tomb).

The lateral exedras to the transept would be completed around the year 330. The main body (containing the transept, exedras, apse and five naves) would be built during the Liberius papacy (352-366). The elongated typology of naves was made in order to sequentially house an enormous amount of treasures associated with the Christian liturgy, and those that were allegedly desired to be accumulated and exhibited. So in reality a certain polytheism was maintained from the beginning (with the passage of time, a huge number of saints would be named, some of whom would have a reserved place in the basilica (ssauland in all Christian buildings). In this sense, the initial polytheism was consolidated, creating a special form of monotheistic syncretism -polytheistic, necessary to replace the old polytheistic traditions).

There is no evidence of the act of formal dedication of the basilica by the emperor (a mandatory requirement as it is an imperial construction, however it is known that the basilica was in use in 352 and 354, when Pope Liberius celebrated Christmas there [34]. The year 353 can be considered as the “official completion of the building”, since that same year the *Catalogus Liberanus* appears, promoted by Liberius, which although it does not have much historical value, constitutes an attempt to value the biography of the different consecutive popes, from S. Peter to Liberius, placing it inside the building.This

information was the starting point of the *Liber Pontificalis*, which was intended to compile the biographies of all successive popes, as an attempt to provide greater value to the Christian church.

The narthex and the perimeter wall of the anterior body were built in the time of Pope Siricius (384 - 399), the lateral wings to the atrium, and the gate house (which was initially equipped with lateral columns) was completed in the time of Simplicius (468-483). Pope Leo I (440-461) gave sermons in the almost finished basilica, developing the ideology of Peter and Paul replacing Romulus and Remus as guardians of the city of Rome [35] (Fig. 3.4). Thereby exalting Christianity, and bringing it to the level of classical Roman times. Leo I established the first monastery of the place, and the need for a papal residence.

Lastly, in the time of Symmachus (498-514) the side rooms of the gate house were completed, including the Episcopal Palace and the papal residential building (called *Episcopia*), "*nello stesso luogo a destra ea sinistra*" of the main entrance. It can therefore be said that the basilica was already completely finished in the year 514 (although it would have continuous extensions and reforms, for a thousand years until it began to be demolished in the 16th century).

Once completed, the basilica of Constantine had five longitudinal naves and a single transept. On the main facade, a staircase led to a large access platform to the hall of the complex.

The facade had three front doors, but it was not particularly attractive. However, when crossing the gate house, you entered the portico of the atrium, so beautiful that in the Middle Ages it used to be known as "*il paradiso*". The heart of the church was a small temple where it was believed that the remains of S. Peter lay. The emperor locked him in a funeral monument of precious marble and red porphyry. The monument was crowned by a baldachin with four solomonic columns from the 2nd century.

3.4. Brief historical reconstruction of the evolution of the old basilica of S. Peter

To correctly understand the architectural evolution of the ancient Constantinian basilica, it is necessary to know that it had always been considered a place of pilgrimage, and therefore was part of a ritual journey. Therefore, the knowledge of this pilgrimage ritual around the basilica can help to know the evolution of the architectural structure both of the interior spaces of the basilica and of the annex buildings located in its surroundings.

The basilica was built on the tomb of the Apostle, which was the goal of a large number of pilgrims since the second century, so from the beginning of its construction it would become the new place of pilgrimage.

Initially the pilgrims climbed the great east staircase and accessed the founding platform. According to Brandenburg, the transept was consecrated immediately after its construction, and immediately destined for worship [36]. Therefore (and according to constructive logic), in these years the pilgrims had to cross the foundational platform from east to west until they reached the transept where the Apostle's tomb was located.

Years later, when the anterior body of the basilica was finished, the pilgrims climbed the main staircase until they reached the entrance platform and entered the complex through one of the three main doors. Then they accessed the atrium through the gate house, and crossed it walking one of the two wings, until they reached the naves through one of the side doors. They went through the aisles and finally reached one of the sides of the transept where the Constantinian canopy was to venerate the tomb of the apostle under the auspices of the bishop with songs and collective prayers [37]. Before entering the naves of the basilica, the pilgrims wandered through the atrium where, since the 4th century, there was a great fountain, the *cantharus*, which quenched their thirst and served for their ablutions. Paulinus of Nola, who visited the basilica at the end of the 4th century, describes it in its essential parts

Years later, in the Middle Ages, the surroundings of the ancient Constantinian basilica were surrounded by a large number of other buildings and monuments, including churches, monasteries, xenodochia, and hospitals. Some of these buildings were part of the legacy of the ancient city, predating the construction of the Constantinian basilica in the early 4th century, although most were built later, in the Middle Ages, to serve crowds of pilgrims [38].

In the middle of the 9th century, after the impact of the Saracen sacking of the basilica in 846, Pope Leo IV (847-855) built a wall surrounding the entire area of the "*borgo*", as it was known, and thus creating the "*civitas Leoniana*" [39] (Figs. 3.5 and 3.6).

In these times, the pilgrimage route had already changed substantially (probably the change took place at the end of the 7th century, or the beginning of the 8th century, at the same time that the church of Sant'Andrea was united with the church of Santa Petronilla), and the pilgrims who wanted to venerate the relics of Peter had to cross the surroundings of the basilica following a new ritual route, which in those times had a relevant meaning. The layout of this route was not accidental, and it was undoubtedly the logical

consequence of the desire to intertwine the threads of the ancient and Christian history of Rome, initiated by Leo I (440-461). In this sense, it is worth mentioning that Pope Sergius I (687-701) dedicated a large part of his life to restoring and redecorating the basilica. Among the activities of Sergius I, indicated in the *Liber Pontificalis*, is the intentional relocation of the remains of Pope Leo I (440/10-461) in a prominent new tomb on the south transept [40].

The concept of "ritual tour" through the built space is ancient, and has its origins in pre-Christian religious traditions and processions [41] (Fig. 3.7). Long before the year 600 there are references to public Christian rituals that were performed in the urban landscape of the city of Rome, incorporating churches and other landmarks. In fact, this was the activity that led to the growth of the national liturgy, in which the pope moved daily through the spaces of the city, spaces increasingly endowed with symbolic meaning [42].

One of the first records of this type is that of the penitential procession led by Pope Gregory I (590-604) in the year 590, who sought divine intervention to end a certain devastating plague [43]. In this regard, it should be remembered the well-known story of the vision of Gregory I of the Archangel Michael, in which he appeared at a certain moment at the highest point of the Mausoleum of Hadrian, in the act of sheathing his sword, and thanks to this vision the mausoleum It was later known as the Castel Sant'Angelo (Fig. 3.8) [44].

This was certainly a good papal strategy, as it has an important meaning, which is sometimes overlooked. The result of Gregory I's vision was to appropriate a imposing monument, previously associated with Rome's imperial past, incorporating it into the city's Christian present narrative, while at the same time reinforcing the role of the popes in ensuring the health and safety of its citizens. In fact, and obviously more deliberately, the same thing happened two decades later with the conversion of another grand and significant pagan building such as the Pantheon, which became a church dedicated to Mary and all the martyrs, an act of Pope Boniface IV (608-615) in the year 609 [45].

These types of actions aimed to reinvent the symbolism of ancient buildings for the benefit of Christianity. Rome was replete with relics of earlier times in the form of buildings, statues and other public monuments that stood the test of time, constituting a mute testimony to the beliefs and achievements of an earlier age, and which were gradually appropriated by Christianity (Fig. 3.9).

Much of this situation was clearly deliberate, as revealed by the sermons of Pope Leo I (440-461) in the mid-fifth century, and not only as a simple appropriation, but rather as a

conscious construction of a Christian Rome, as the fulfillment of the intended destiny of the city. Pagan Rome was seen as a shadow of Christian Rome, in the same way that the Old Testament was seen as a shadow of the coming of Christ [46].

All pilgrims who went to Rome to visit the Constantinian basilica of S. Peter had to cross the Ponte Sant'Angelo, the ancient Pons Aelius [47], since it was the only bridge that crossed the Tiber in the Middle Ages on the stretch between the Ponte Milvio and the Isola Tiberina. The nearby Pons Neronianis appears not to have been used by Late Antiquity, as it is not mentioned in any source and there was no corresponding gate in the Aurelian wall.

Therefore, this single bridge became a nerve center for access to the city, and its inability to accommodate the volume of traffic often led to congestion of crowds attempting to cross it, sometimes with tragic results. In *Inferno* (XVIII, 28-33), Dante records the decision in the first papal jubilee, in the year 1300, to divide those who cross the bridge into two large groups, one in each direction, something that Dante would probably have witnessed first hand, since he made a pilgrimage to Rome that year.

When crossing the Tiber River, just to the right of the bridge head, the pilgrims could see the imposing Mausoleum of Hadrian. Its strategic location had prompted its early conversion into a fortress, and over the centuries it often played a role in defending the city, and specially the pope, from the 6th century "gothic wars" to the famous *Sacco di Roma*, by the troops of Carlos V in 1527 [48] (Fig. 10).

Despite the name and function changes, it was never forgotten that the original purpose of the building was an imperial tomb, which is recorded, for example, in the medieval description in the most influential treatise on the city and its buildings, the *Mirabilia. Urbis Romae*, from the 12th century, who was perhaps most responsible for creating a new perception of the ancient monuments of Rome [49] (the monument was still known as *Adrianium* in the time of Pope Hadrian I).

After crossing the bridge to go to the Constantinian basilica, you had to turn left -heading west- and walk through a covered portico, designed to offer visitors some protection against the sun and rain, and in parallel others that led from the doors of the Aurelian walls to the suburban sanctuaries of Saints Paul and Lawrence, located near the north transept. This portico may have been a project of Pope Simplicius (468-483) [50], but it is documented for the first time in Procopius's testimony of assault on Rome by Ostrogoths, in 537, when it was used to hide, in order to attack the adjacent fortress.

Along this arcaded path, between Castel Sant'Angelo and San Pietro, the medieval visitor could see two very prominent ancient monuments, which were also considered to be the tombs of ancient powerful Romans. The first was a large stone pyramid (resembling that of Senator Gaius Cestius Epulo that still survives at *Porta San Paolo* on the south side of the city) and which probably also dates from the time of Augustus [51].

There is no doubt that it was built to be a tomb, and while the name of the original occupant is not known today, in the Middle Ages the pyramid was known as the tomb of Romulus, one of the legendary founding twins of the city, and as a result it was known as *Meta Romuli* [52] (Figs. 2.6b and 2.8b). Similarly, in the southern part of Rome, at the Porta San Paolo, a twin pyramid has survived to this day, and was once known as the tomb of *Remus*. These two structures served to reinforce the concept of "Christian succession" expressed in the sermon of Pope Leo I (440-461) in the fifth century, and which also gave the convenient coincidence that a pyramid marked the way to the sanctuary of Saint Peter, and the other pyramid the way to the sanctuary of Saint Paul.

The *Meta Romuli* was largely demolished by Pope Alexander VI (1492-1503) in 1499, to widen the access roads to San Pietro, in anticipation of the large Jubilee crowds expected for the following year. However, the *Mirabilia* points out that at a much older date, at the beginning of the 8th century, the marble cladding had been removed and used to pave the atrium of the Constantinian basilica. Its base was rediscovered in the excavations carried out in 1948-1949 at the beginning of the modern Via della Conciliazione [53].

Finally, already at the end of the road and in the southern part of the basilica, the pilgrim could see another supposed pre-Christian tomb, a large Egyptian obelisk, made of red granite, and it was popularly believed that the bronze orb on its top contained the remains of Julius Caesar (Fig. 3.11) [54].

The obelisk, generally known in the Middle Ages as *agulia* (spire) was moved by Pope Sixtus V (1585-1590) in 1586 (Fig. 3.12), to the center of the square, aligned with the axis of the old basilica, and in charge of the works was Domenico Fontana [55]. Of the many Egyptian obelisks that had been brought to Rome in ancient times, the Vatican obelisk was the only one that remained standing throughout the course of the Middle Ages. Its original location in Egypt is not recorded and, unusually, there are no surviving inscriptions in the hieroglyphs. However, it is believed that this obelisk was moved to Alexandria shortly after the Roman conquest of Egypt by Augustus (27 BC-14), where it was established in the *Forum Julium* by the prefect Cornelius Gallus [56].

An inscription in Latin, still preserved and easily visible, was added in the time of the Emperor Tiberius (14-37), or that of his adopted son and successor, Caligula (37-41), and refers to both Tiberius and Augustus [57]. In AD 37, at the beginning of his mandate, Emperor Caligula transported the obelisk from Alexandria to Rome, as described Pliny the Elder in his *Naturalis Historia* (16.76.201), and later settled in the spina of the circus, where he would remain until 1586 [58] (Figs. 3.2 and 3.3).

Medieval city guides of Rome also refer to the obelisk as the *"agulia"* of S. Peter, no doubt based on its proximity to the basilica, along with the belief that Peter had suffered his martyrdom in the Vatican circus, already either in this place or near it. But there was also a second popular understanding regarding this object: not simply that it had been erected to honor Julius Caesar, but perhaps more significantly that it functioned as his tomb. The precise origins of this identification are unknown, but can be found in a variety of medieval texts.

At *Mirabilia*, the obelisk is known as the *memoria Caesaris, id est agulia*, and the passage goes on to report that its charred remains were contained in the large bronze sphere placed on top: "where his ashes rests splendidly in his sarcophagus" [59]. The etymology and meaning of *agulia*, a term that is also repeated in other sources, is far from true, but it is possibly a corruption of "*acus Iulia*" (that is, Julius's needle).

This association with Julius Caesar persisted until the 16th century, and some authors, for example Andrea Palladio, in his *Antichità di Roma* (1554), argue that the bronze sphere contained the ashes of Caesar [60]. Similarly, when describing the removal of the bronze palla before moving the obelisk, Fontana also notes the same common belief [61]. Just before the obelisk was moved to its current location in 1586, the palla was knocked down and taken to a room in the Belvedere so that a rudimentary form of forensic examination could be performed. The results were published that same year by Filippo Pigafetta, a Venetian diplomat living in the papal court, who reports that the orb was not found to contain human remains, but only rust fragments, and some earth, which he considers to belong to the original formwork process [62]. This association with Julius Caesar seems to have given the obelisk a special meaning, and from the time of Nicholas V (1447-1455) onwards it figured prominently in schemes to rebuild and reconfigure the old basilica of S. Peter and its surroundings [63]. According to Egidio da Viterbo [64], in 1505, Bramante suggested to Pope Julius II (whose choice of the papal name may indicate a possible predilection for the idea) that the new basilica of St. Peter be rotated 90 degrees, so that

the tomb of his imperial namesake can be at the entrance of the basilica [65]. But in the end it was easier to move the obelisk than to rotate the basilica.

The medieval pilgrims (and also the papal processions) followed the path marked by the "*agulia*", but before reaching San Pietro they were forced to pass two other ancient imperial monuments, now Christianized: The church of Sant'Andrea and the church of Santa Petronilla.

The church of Sant'Andrea was the medieval name given to the first of two ancient circular mausoleums, the Mausoleum of the Severan dynasty, located adjacent to the church on the south side, and linked to an entrance in the south transept (Figs. 3.11 and 3.13) [66].

Although this building was long thought to have been from the early 400s, archaeological excavations have revealed brick seals dating mostly to the reign of Caracalla (212-217), and this suggests that the circus had already fallen into disuse at the end of the 2nd century [67]. The mausoleum was converted into the church of Sant'Andrea by Pope Symmachus (498 - 514), who also built a set of stairs to provide access [68], somewhere west of the obelisk [69]. Thus, in the same neighborhood, "*iuxta ecclesiam beati Petri en Acoli",* Pope Leo III (795-816) built a *Triclinium* decorated with marble and mosaics, to which Gregory IV (827-844) would add a small hospice "*iuxta Accolam*", in which the pope could rest after mass [70]. If these references really derive from the term *cagulia*, and if this term is a corruption of *acus Iulia*, then the association of the obelisk with Julius Caesar may perhaps be delayed at least to the eighth century. In what could be said to be a clearer reference to the obelisk, it is also recorded that Leo III has reconstructed a reception room and a bathroom "*iuxta columnam maiorem*" [71].

The church of Santa Petronilla is the last monument that pilgrims could see, just before entering the basilica of S. Peter. Santa Petronilla is the name that Pope Stephen II (752-757) gave to the Mausoleum of Honorus, a dynastic mausoleum built by Honorius (384-423), son of Theodosius I, around the year 400 [72]. This mausoleum was aligned to the axis of the transept of S. Peter, and was attached to both the basilica and the first mausoleum of the Severan dynasty.

Having passed through these two buildings, full of altars and reliquaries, the medieval visitor then entered the south transept of the basilica, perhaps significantly a space filled with tombs of popes who had paid special attention to Saint Peter, before descending the staircase leading to the ring crypt of Gregory I (590-604). Finally, the pilgrims traveled eastward through the naves located to the north of the basilica, and went out into the

atrium. They walked through the atrium through the north arm, and finally left the basilica, through the gate house, and down the great stairs until they reached the square [73].

With the design of this pilgrimage route, the association of the most important buildings of ancient Rome with a new Christian reality was desired. On the other hand, it was intended that a personal mimesis of the pilgrims be generated with the new divine history of the city. Third, it was desired to create a new sacred story, associated with a new sacred geography.

Following these goals, the pilgrimage to Saint Peter evolved and medieval Romans tried to identify and explain the permanent remains of the ancient world, under a christian convenience, and a critical stage in this process was reached in the 7th century.

The beginning of that century witnessed the restructuring the apse by Gregory I (590-604) and the consequent establishment of a definitive path for pilgrims within the church. Years later, Pope Sergius I (687-701) reformed and redecorated a good part of the basilica, and among many other things he transferred the remains of Pope Leo I (440-461) to a tomb located in the south transept [74]. This fact has a great significance when considered in terms of the sequence of important Roman tombs found by medieval visitors. The choice of the place of the tomb in the south transept was very convenient, since of all successors of Apostle Peter, it was probably Leo I who put the most effort in intertwining the history of ancient Rome with the Christian history of Rome, and thereby legitimize the power of the Church, and the power of the pope as *pontifex maximus*.

The old basilica remained standing throughout the Middle Ages and hardly had any significant changes in its architectural structure, although multiple repairs and touch-ups were carried out. In addition, over time the basilica was acquiring greater functionalities and had to be expanded by means of a series of buildings attached to its south side. In the same way, and supported by these constructions and on the south wall of the atrium, a great conglomeration of constructions and houses were attached, in a chaotic and piled-up way, and along the path that led to the interior of the two ancient imperial mausoleums.

3.5. The architectural project of the old basilica of S. Peter

Undoubtedly there must have been a single initial executive project [75], which defined all the details of the design of the ancient basilica. The existence and need for a huge platform (about 686 *roman feet* long, and about 227 *roman feet* wide) to build a huge basilica on

top of it is more than enough proof that the old basilica of S. Peter was designed in one go, and that therefore an initial project necessarily had to exist.
However, and based on the previously shown chronology, it can be deduced that the building could have been built in two stages.

Stage I: 324 - 352
In the first stage, the transept, the apse, the two lateral exedras and the set of five naves were built, and it lasted approximately 28 years. In this first stage, changes were even made to the apse and consequently to its foundations.

Stage II: 352 - 514
In a second, longer stage, the narthex, the atrium, the lateral arms and the gate house were built, and it lasted about 162 years.

Given the speed of the first stage, and given that what was built is the main body of the building, it can be deduced that it was built following a single perfectly defined project. However, after the year 352, the works that remained to be done were not so urgent (the atrium, the lateral arms and the gate house), there was no emperor interested in accelerating the works, and there was less money available, so the construction was carried out in a slower way. Also, it is very possible that small changes were made from the original project.
The general design of the building was very simple, and as will be seen in the next chapter, it was generated based on an equilateral triangle of 82 *roman feet* in base and 71 *roman feet* in height [76]. What generated a transept of 224 *roman feet* (82 + 71 + 71) that together with the lateral exedras would reach a dimension of 306 *feet* long (224 + 41 + 41). This same dimension of 306 *roman feet* was chosen for the length of the naves and also of the anterior body (both with the same width of the transept, that is, 224 *feet*).
The simplicity of the design strategy used makes it possible that, once the main body has been built, a later architect can deduce the most suitable harmonic proportions so that the anterior body is perfectly integrated with the main body already built. The initial project, once the proportions and dimensions of the most important architectural elements have been established, leaves little room for freedom for the design of the remaining architectural elements. That is, once the platform, the main body, and the perimeter wall of the anterior body have been built, its internal design has few valid compositional

alternatives. That is, there are few compositional alternatives to integrate with the main body the design of the nartex, the atrium, the lateral arms and the gate house.

On the other hand, and no less important, it should be taken into account that the initial project should not have been carried out in too much detail, due to the enormous magnitude of the building, the speed with which it had to be built and especially (and as a result of these two factors) to the use of elements previously used, half-manufactured, of varied origin, and with different sizes, shapes and materials (*spolia*).

As a consequence, the initial project must have been very simple, and some of its architectural elements (columns, architraves, bases, ...) should not have been very defined, since they were not going to be made to order according to exact specifications, but were to be use those that are most readily available, coming from municipal quarries, from other more distant quarries, from other buildings in poor condition or even from building ruins.

The project had to indicate the approximate dimensions of the different architectural elements (which were defined on the fly) and their exact location in the complex. It should also indicate the architectural strategies necessary to integrate architectural elements with varied dimensions, varied materials, varied textures, from different places, and with completely different levels of finishes. For example, it would indicate that the capitals of the columns should have similar dimensions (since it was easy to build capitals intended exclusively for the basilica), and because the shafts of the columns could vary in thickness and length, the bases should have a variety of dimensions, so that the capital+shaft+base set always had the same dimension indicated in the project, and deduced geometrically from the plan (so that the elevation would be perfectly integrated with the floor plan).

It should also be noted that in the two stages of the construction process changes were made to the original project.

In the first stage, and based on the analysis of the excavations carried out in the foundations of the walls of the transept, exedras and apse, it can be deduced that at the time of construction certain changes were made in the original project. It is very likely that the apse would have been designed with a light covering, probably based on concentric wooden beams, and that finally it was decided to build an apse with a solid vaulted ceiling, much more robust and elegant, but heavier [77]. These changes on the fly to improve the initial project had a necessary impact on the design of the foundations, since they had to be improved shortly after being started.

It should also be noted that the apse was built directly on the ground, that is, outside the horizontal platform previously built. For this reason, it was necessary to make several different types of foundations, and at the same time an integration system of the different types of foundations had to be designed [78].

Other small changes of this first stage were, for example, relative to the thickness of the east wall of the main body (adjacent to the nartex) that was built with a dimension of 6 1/3 *palmi* (as Peruzzi indicates in *GDSU 11 Ar* drawing), instead of the 5 *feet* (6.66 *palmi*) initially projected. This change was perhaps made to lower costs, although it left the building with less transversal resistance. In fact, shortly after the dividing wall was made by Antonio da Sangallo, this transversal wall had to be reinforced by means of two huge curved scrolls, as can be seen in Heemskerck's drawings.

In the second stage, small changes were also made with respect to the original project, but these new changes were not made as a consequence of changes in ideas, but in order to adapt the building to changing needs over time. The building was designed in a generic and simple way, with the purpose that the Christian rites were coupled to a previously defined general architectural structure. However, the Christian rites were evolving and also the needs of the clergy who had to live continuously in the building. This generated that in the second stage of the construction of the basilica small adjustments were made to the original project. These adjustments referred, for example, to the thickness of the enclosure perimeter walls (which were designed and built 5 feet thick, instead of 6 feet thick). The changes were also related to the design of the main facade and the dimensions of the atrium gate house, and the rest of the rooms of the access body.

3.6. Typological background of the old basilica of S. Peter

In order to reconstruct the design process of the old basilica of St. Peter, it is important to know that for its design a typical typology was chosen in the great civil buildings of Rome.

The term “basilica” comes from the Latin *Basilica* which in turn derives from the Greek *Basilikè*, which means "royal or regal", and the complete expression "*Basiliké Oikía*" is actually an ellipsis, which therefore means "royal house". The basilica was an important public civil building with a diverse functionality (the most important use in Greece and

Rome was as a court of law), and with great importance for the community and the urban structure of the city (in Roman cities it occupied a preferred place in the Forum).

After the Edict of Milan of 313 promulgated by Constantine (313–337) the Roman Empire allowed the cult of the Christian religion. From then on, the Christians took advantage of several existing Roman basilicas to use them as religious premises for the celebration of their liturgy, and in addition they used their typology to build new buildings of worship. After the Roman Empire became officially Christian, the term basilica was also used to refer to churches, generally large or important, which had been granted special rites, or privileges in matters of worship. In this sense, the denomination is used today, both from an architectural and religious point of view.

The Roman basilica had multiple uses: market, place of financial transactions, worship, and especially as an administration of justice. It was also used as a meeting place for citizens to discuss common issues.

Regarding its architectural conception, it was a large rectangular room composed of one or more naves (always in an odd number). When it had more than one nave, the central one was wider and taller and was supported by columns. The difference in heights was used to open lighting holes in the upper part of the walls. At one end of the main nave there was an exedra or apse, where the presidency was installed, while the entrance was made from the opposite end through a portico.

Some examples of basilicas built with it in the Roman Forum are the following:

- Basilica Porcia, built in 184 BC, by Marco Porcio Catón.
- Basilica Emilia, built in 179 BC, by the censor Marco Emilio Lépido.
- Basilica Opimia, built in 169 BC, by the consul Opimio.
- Basilica Sempronia, built in 169 BC, by Tiberio Sempronio Graco.
- Basilica Julia, started in 54 BC, by Augustus, on the remains of the ancient Sempronia basilica.
- Basilica of Maxentius, started by the Emperor Maxentius between 307 and 310, and finished by Constantine after 313.

The adoption of the basilical typology by Christians undoubtedly had two compelling reasons.

In the first place, something common in Christianity, due to a desire to reuse everything that already exists and take it as one's own. A way of legitimizing the new doctrine and incidentally providing it with historical roots that it did not have. Renaming important

dates and existing rites, and reusing existing buildings, stretched a recently invented and adopted ideology to the end of time. The best way to control citizens and encourage them to adopt new beliefs is to let them continue with their customs, rites and beliefs, but convince them that in reality those customs, rites and beliefs in which they believe are just a part of something bigger, and therefore they will assume them with ease.

Therefore, in the Roman Empire it was not difficult to use the basilicas for the new Christian cult. The new cult was easily adapted to the spaces of a basilica (which had been designed for another purpose) and the spaces of the basilicas were renamed to embody the new Christian rites. By renaming the spaces the cult was legitimized and it was given greater antiquity and ancestry.

Second, reusing existing buildings, hardly modifying them, is the best option to immediately promote the new cult, make it universal in a short period of time, and at the lowest possible cost.

Therefore, if Christians begin to use the existing basilica buildings for their own worship, the most effective future strategy is to continue with the same structure when constructing new buildings. The typology should not have major changes, and the same structure should be repeated over and over again, which would hardly change very slowly, adapting to variations in beliefs, and to the social, political and economic conditions of each place and country. And that's what they did.

In this sense, a Christian basilica proper in the architectural sense is understood to be any rectangular plant with one or more apses in the front and with aisles along the length separated by columns (or pilasters), on which their corresponding roman arches or architraves rest. The referred naves (three usually) end in the apse. In the apse the altar is placed and the officiants are arranged around it. In front, in the presbytery, are the priests, while the faithful occupy the rest of the nave or naves.

The basic basilica typology consists of longitudinal naves without a transept. But many basilicas have a transept. Frequently the transept hardly highlights the sides of the nave. The early Christian basilicas did not have a pointed transept. Although initially the Christian temples followed the construction guidelines of the basilicas, they soon gave way to other forms, such as the Latin cross plan or the Greek cross plan, which became generalized, without the basilical typology disappearing.

The naves' roof usually consists of an artistically decorated wooden frame that is visible from the inside or hidden by a coffered ceiling: sometimes they have a vault in the lateral naves and the apse always ends in a quarter-sphere vault.

The illumination of the basilicas is obtained by open windows in the upper part (clerestory) of the central nave which is higher than the lateral ones and by other windows that are located in the apse and on the front of the building. All the windows used to be closed with perforated or openwork marble sheets to let in the light and prevent the action of destructive elements. But transparent sheets of unperforated alabaster and even stained glass windows were also used in sumptuous basilicas as inferred from some texts by Saint John Chrysostom and Prudentius. The interior decoration is achieved by the same architectural lines of the building with its classic moldings and by different ornaments of paintings and mosaics, especially on the upper wall of the triumphal arch and in the always magnificently decorated apses.

The basilicas are usually oriented with the main axis of the nave so that the apse is oriented towards the west. But from the 6th century, the Byzantine churches, giving an example, were oriented in the opposite direction since the priest (who when offering the sacrifice looked to the east) no longer celebrated facing the people as before.

The Basilica of Constantine was designed taking into account this basilica typology, although major construction challenges had to be solved due to its enormous dimensions, and also due to the fact that it should be built on sloping land, on top of an existing necropolis, while respecting the maximum its architectural structure.

3.7. General strategy to identify the design process of the old basilica of S. Peter

As mentioned in the previous section, and without a doubt, there must have been an initial project [79]. It is not conceivable to design and build such a large and important building on the fly, also bearing in mind that a huge initial horizontal platform had to be built. An initial project had to exist in which at least the dimensions of the most important architectural elements of the building and their geometric relationship with the others were defined.

The original project of the old basilica was based on a civil basilica typology since it was the most suitable for a building that could gather a large number of people and that had colossal dimensions, just as Constantine wanted.

A simple basilica typology was designed since the initial Christian liturgical activities could be accommodated in any large meeting building. With the passage of time the needs changed, and the building had to be gradually reformed (some of the reforms carried out became references to create new types of Christian buildings), until finally it had to be

demolished (at the beginning of the century XVI), since the Christian ritual had evolved over time, and its spatial structure was not adequate.

Following the wishes of Constantine, the building should have large dimensions, and its design should be solemn and impressive, and it should have great symbolic value. These requirements undoubtedly must have had a huge impact on the final design of the ancient basilica in several respects.

In the first place, the fact that the building should have large dimensions and with a basilical typology made it necessary to build a huge horizontal platform since the land had a slight upward slope in a west direction, and it also had to be built on the old necropolis.

Secondly, due to its great importance and its great symbolic value, the building had to be designed with great care and its dimensions could not be arbitrary in any way. It is obvious that if you wanted to build a monumental and symbolic building (which would also be the first building in Christendom) its dimensions should be perfectly studied, and its architectural elements should be perfectly integrated with each other, through unique and harmonic proportions.

Third, the design of the building should be very simple, since despite its large dimensions, it should be built in the shortest possible time. Constantine wanted the building to be built quickly for his own glory, and for the glory of his children. Therefore, this alleged speed of construction did not give rise to assessing the details, since it was more important to finish the building as soon as possible than to complete all the details of its gigantic internal and external spaces.

Fourth, repetitive architectural elements should be used with few variations, that is, the same approximate size should be indicated for the columns, for the windows, for the niches, for the walls, etc.

Fifthly, and as a consequence of all the above, and following a common technique for the construction of large buildings of the time, the building should be built (as it was built) using the technique that would later be named as *spolia*. The *spolia* was a rational and common sense constructive practice based on the reuse in a building of architectural elements previously used in other buildings, or elements destined for other buildings. In these times, with so many changes and so much construction activity, it was common in Rome to use sculptures, reliefs, parts of architraves, columns, pieces of columns, capitals ... from certain buildings in poor condition, to build new buildings. This technique was used repeatedly throughout the Middle Ages and the Renaissance [80].

Likewise, and due to the enormous scale of the building, and the speed with which it had to be built, half-built architectural elements should be used, and from different sites and quarries, and therefore they would have a huge variety of sizes, shapes, materials, textures and colors. In many cases, half-built architectural elements were obtained (usually from the imperial quarries) and they had just been finished in the building, sometimes even once it was in place.

The anonymous author of the project was undoubtedly well aware of all these circumstances and had to decide that the design of the building should be simple, and not fully detailed, since he could not know in advance all the architectural elements that would end up being used. In this sense, for example, in the design of the building, columns with standard sizes had to be specified, and that also could have variations between them, being able to be valid any shaft with diameters of approximately 3.75 *feet*, and 2.25 *feet*. Therefore, it was more important to define in the project the position of the axes of the columns and the separation between them than the exact dimensions of their diameter.

Taking these considerations into account, and thoroughly analyzing Alfarano's drawings, as well as all the historical references that have come down to us, it has been possible to identify the design process of the old basilica of S. Peter, as it will be seen in the next chapter.

3.8. General strategy to identify the construction process of the old basilica of S. Peter

Although the building was initially projected as a whole, it had to be built in parts since there are historical references indicating that independent parts of the building were used as it was being built.

As seen in the previous sections, and as will be seen in chapter 6, initially the entire foundation platform had to be built with the large access staircase. Immediately afterwards the Arch of Constantine had to be built. The transept was then finished and used. Later the main body was completed in its entirety, including the transept, the exedras, the apse and the five naves, and it also began to be used as a whole. Finally the building was completed as we know it from Alfarano's drawings.

In the next chapter, the stages of the design process of the old basilica will be reconstructed, and as a consequence its exact dimensions will be reconstructed with precision, both in plan and elevation.

Based on these plans, and taking into account all available historical references, in another later chapter all the stages of the construction process of the old basilica will be graphically reconstructed.

Notes 3

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[2] See Herman Geertman, 'La genesi del Liber Pontificalis romano. Un proceso di organizzazione della memoria', in F. Bougard and M. Sot (eds.), *Liber, Gesta, historie. Écrire d'histoire des evêques et des papes, de l'antiquité aun XXIe siècle* (Turnhout, 2009), 37-107, esp. p. 37

[3] Herman Geertman, 'La genesi del Liber Pontificalis romano. Un proceso di organizzazione della memoria', pp. 40-53

[4] Rosamond McKitterick, 'The representation of Old Saint Peter's basilica in the Liber Pontificalis', in McKitterick, Rosamond; Osborne, John; Richardson, Carol M.; Story, Joanna (eds.). *Old Saint Peter's, Rome* (Cambridge: Cambridge University, 2013), pp. 95-118

[5] Petrus Mallius, 'Petri Mallii Descriptio Basilicae Vaticanae Aucta atque Emendata a Romano Presbitero', in R. Valentini and G. Zucchetti (eds.), *Codice topografico della città di Roma*, 4 vols. (Rome, 1940-53), III, pp. 382-442

[6] Maphei Vegii Laudensis, *De Rebus antiquis memorabilibus basilicae S. Petri Romae*, in Acta Sanctorum Iunii (…), illustrate a Conrado Janningo, Tomus VII seu pars II, Antverpiae, apud Ioannem Paulum Robyns, (1717), pp. 61-85; Maffeo Vegio, *De Rebus*

Antiques Memorabilibus Basilicae Sancti Petri Romae. Cod. Vat. Lat. 3750; Maffeo Vegio, 'De Rebus antiquis Memorabilibus Basilicae S. Petri Romanae', in R. Valentini and G. Zucchetti (eds.), *Codice topografico della città di Roma,* 4 vols. (Rome, 1940-53), IV, pp. 375-398

[7] Tiberio Alfarano, m. 1596, and Michele Cerrati, *Tiberii Alpharanii.De Basilicae Vaticanae Antiquissima et Nova Structura,* (Roma: Tipografia Poliglotta Vaticana, 1914)

[8] Giacomo Grimaldi, 'Grimaldi, G., Instrumenta Autentica Translationum Sanctorum…', R. Niggl (ed.), *Descrizione della basilica antica di S. Pietro in Vaticano, (Codice Barberini latino 2733*) (Codices e Vaticanis Selecti 32) (Vatican City: Biblioteca Apostólica Vaticana, 1972); Giacomo Grimaldi, *La Descrizione della basilica antica di S. Pietro in Vaticano, Codice Barberini latino 2733*, Grimaldi, Giacomo and edited by R. Niggl, Reto, (Vatican City: Biblioteca Apostólica Vaticana, 1972)

[9] Christian Huelsen, and Hermann Egger, *Marten van Heemskerk, Album per schizzi,* in Die Römischen Skizzenbücher von Marten van Heemskerck, 2 voll. (Berlin, 1913-1916), rist. Soest, 1975. Contains the Album per Schizzi, by Marten van Heemskerck, Berlin, Königlichen Kupferstichkabinett

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[11] Carolyn Valone, 'Giovanni Antonio Dosio: The Roman Years', *The Art Bulletin* 58, no. 4 (1976), pp. 528-541

[12] *Monumentorun veteris basilicae vaticanae delineations et exempla picta vel adumbrate a Domenico Tassellio de Lugo et etiam ab aliss cum didascaliis lacobi Grimaldi Sec. XVI-XVII*, Arch. Cap. S. Pietro. A. 64. Ter. Biblioteca Apostolica Romana

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[16] Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', in *San Pietro. Storia di un Monumento* (Milano: Jaca Book, 2015), p. 38

[17] Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', p. 38

[18] Hugo Brandenburg, 'L'antica basilica constantiniana di S. Pietro', in *San Pietro. Storia di un Monumento* (Milano: Jaca Book, 2015), pp. 9-34 (p. 14). Hugo Brandenburg is of the logical opinion that the existence of a huge horizontal platform, to build the old basilica of St. Peter, is the best proof that the building had to be initially designed in its entirety, regardless of whether with the passage of the time small changes were made. This fact is indisputable. It is unthinkable to carry out the platform in stages in Roman times. Making a platform of such a size in stages would generate innumerable constructive defects, it would be very expensive and would not ensure its own stability and uniform behavior, and of course it would not ensure the stability of the basilica that would be built on it. Therefore, it must be visualized in a first stage with only the *Tropaion* protruding from the platform and in the *arch of Constantine*. To access these monuments, you should climb the great stairs and walk from east to west along the great platform. The same would occur as the apse, the transept, the exedras, the naves, the nartex, the atrium, the atrium gate house and the entrance rooms to the complex were built sequentially, in different historical stages.

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FIGURES 3

Figure 3.1

Virgin Mary Amid the Emperors Justinian and Constantine. Detail southwestern entrance mosaic

Byzantine mosaicist, ca. 1000

Basilica Hagia Sophia of Constantinople (Istanbul, Turkey)

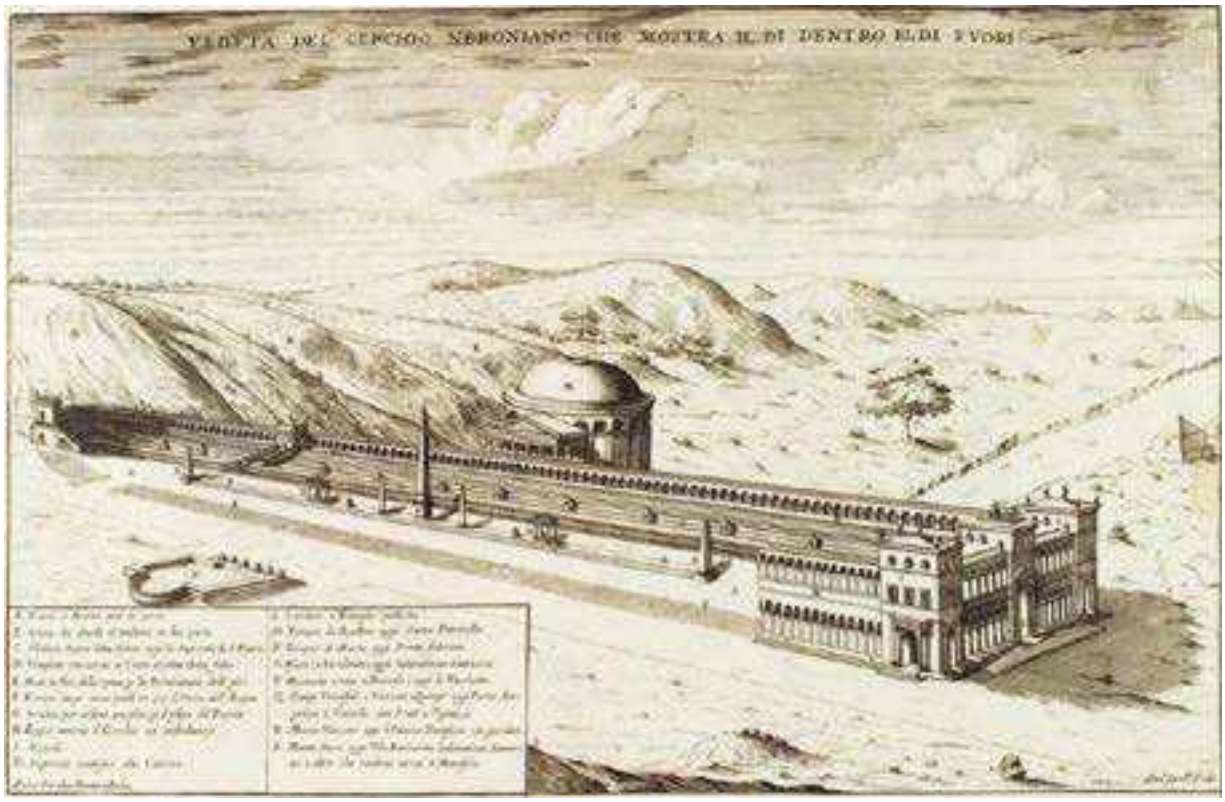

Figure 3.2

Veduta del cerchio Neronian oche mostra il di dentro el di fuori

Carlo Fontana

Carlo Fontana. *Il tempio Vaticano e sua origine. Con gli edifice piú cospicui antichi e moderni fatti dentro e fuori di esso.* Rome (1694), p. 29

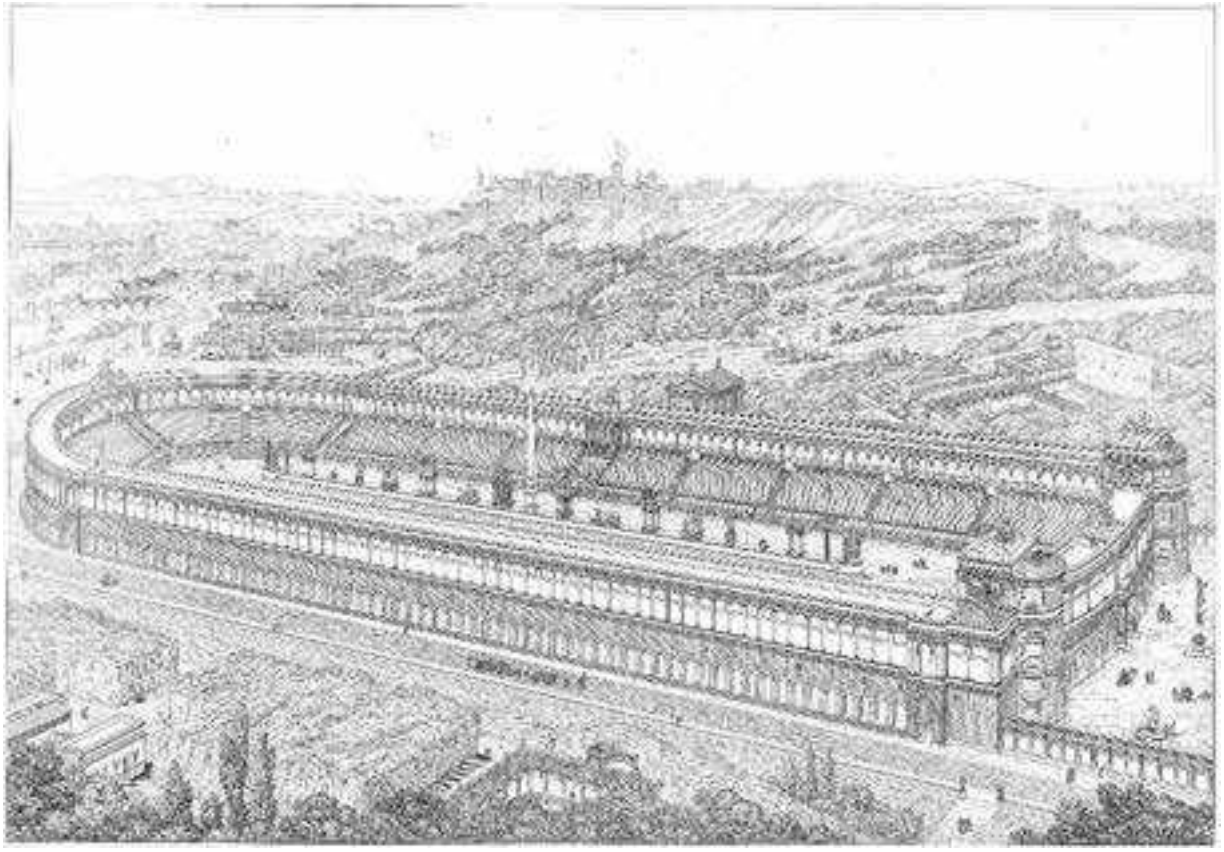

Figure 3.3

Neron Circus, between I – IV century

Paul Marie Letarouilly, 1882

Paul Marie Letarouilly. *Le Vatican et la basilique de Saint-Pierre de Rome*, vol.1. Paris (1882). Cap. Cirque de Caíus Caligula et Neron, PL4

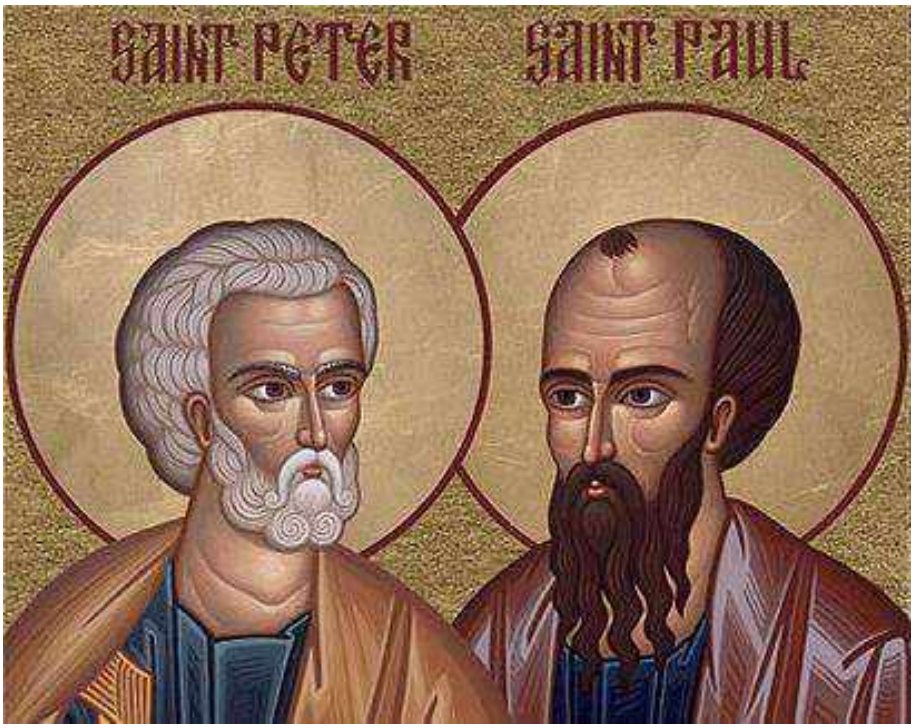

Figure 3.4

Lupa Capitolina. *Lupa con Romolo e Remo.* Bronze sculpture from the 5th c. or middle age

Sala della Lupa, Palazzo dei Conservatori; accession number MC 1181

Saint Peter and Saint Paul

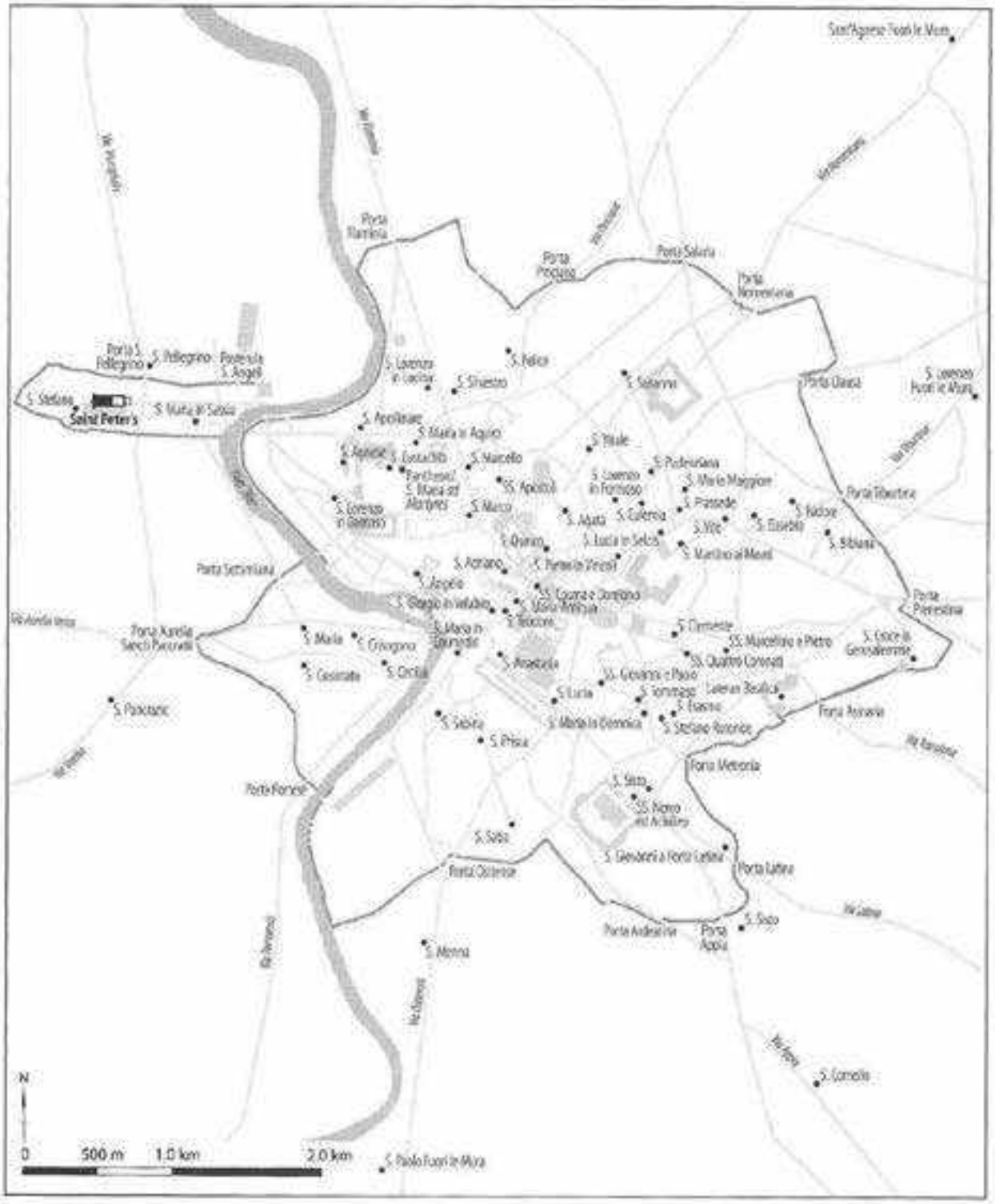

Figure 3.5

Saint Peter's and the city of Rome

Rosamond McKitterick

Rosamond McKitterick. *Old Saint Peter´s Rome.* Rome (2013), p. 22

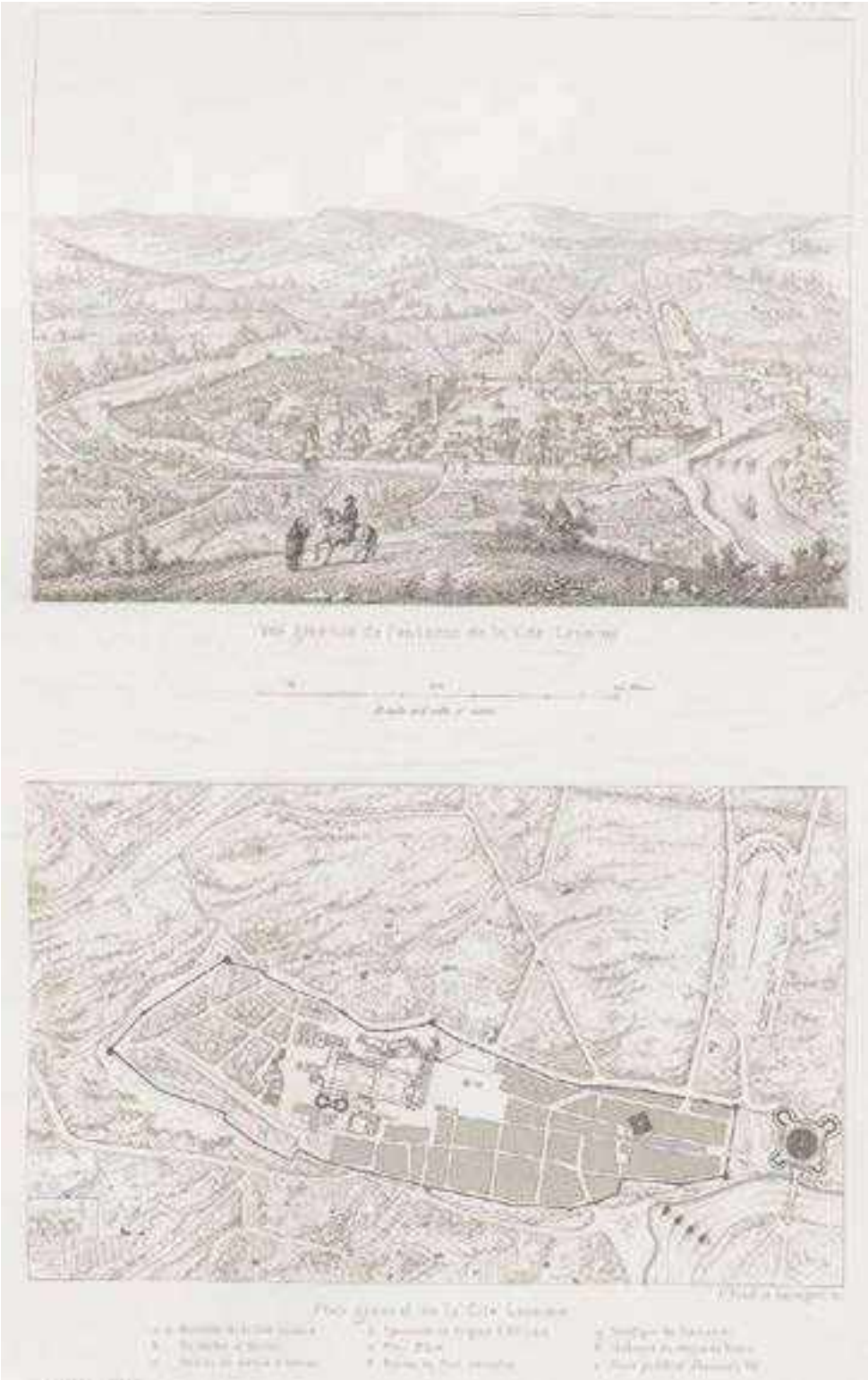

Figure 3.6

Ancient Basilica of S. Peter in Rome, IV – XVI century

Paul Marie Letarouilly, 1882

Letarouilly, Paul Marie. *Le Vatican et la basilique de Saint-Pierre de Rome*, vol.1, Paris (1882). Cap. Ancienne Basilique de Saint-Pierre, PL1

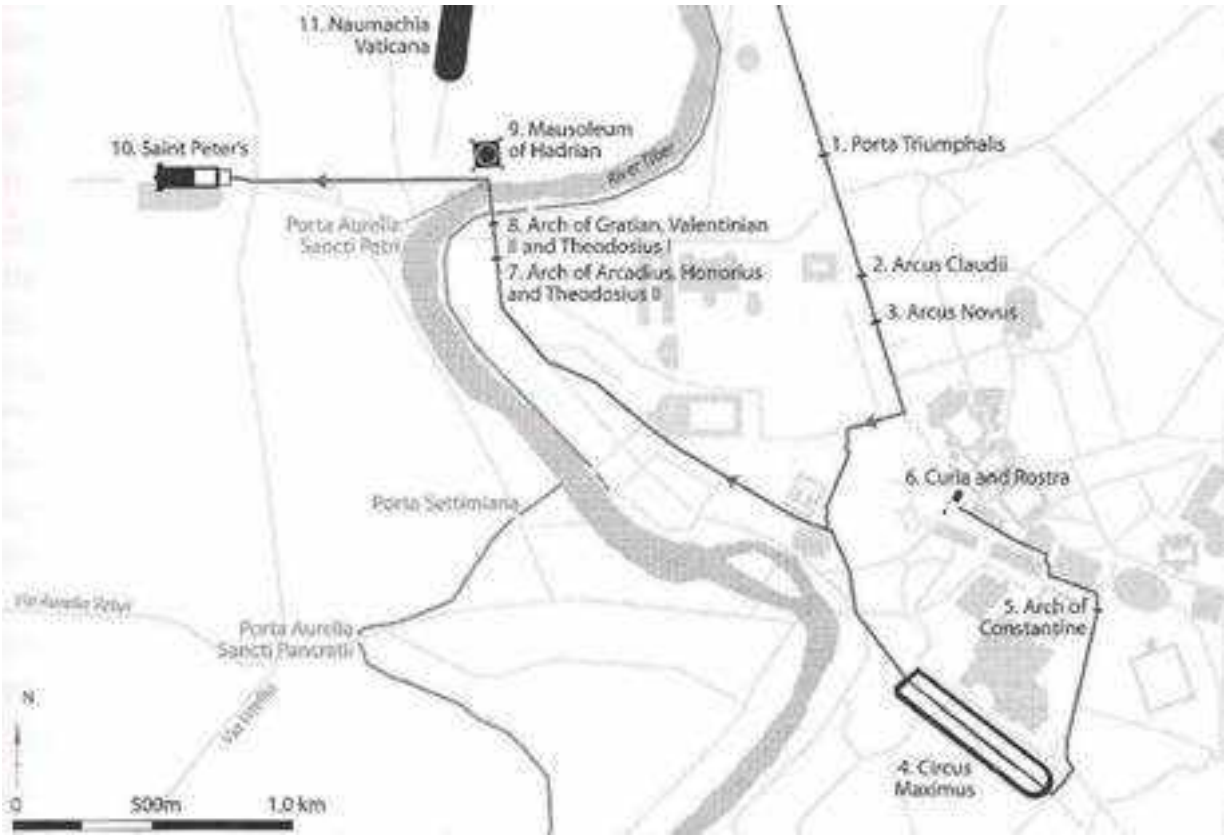

Figure 3.7

The imperial processions of the late antique adventus and of the visit to Saint Peter's

Rosamond McKitterick

Rosamond McKitterick. *Old Saint Peter´s Rome*. Rome (2013), p. 29

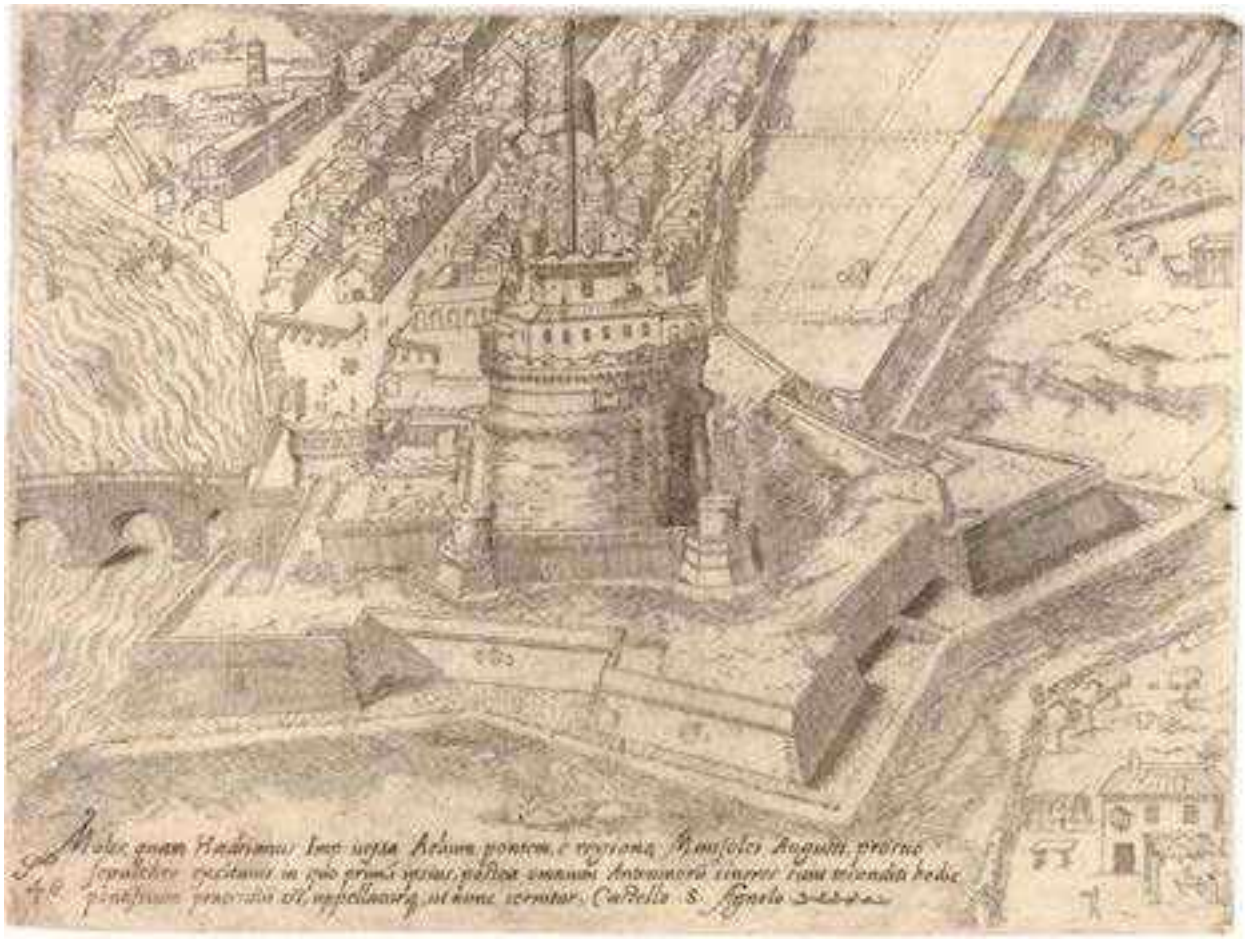

Figure 3.8

Moles quam Hadrianus Imp. Iuxta Aelium pontem

Giovanni Antonio Dosio, 1569

Giovanni Battista Cavalieri and Giovanni Antonio Dosio. *Urbis Romae aedificiorum ilustrium quae supersunt reliquiae.* Rome, 1569. Plate 48

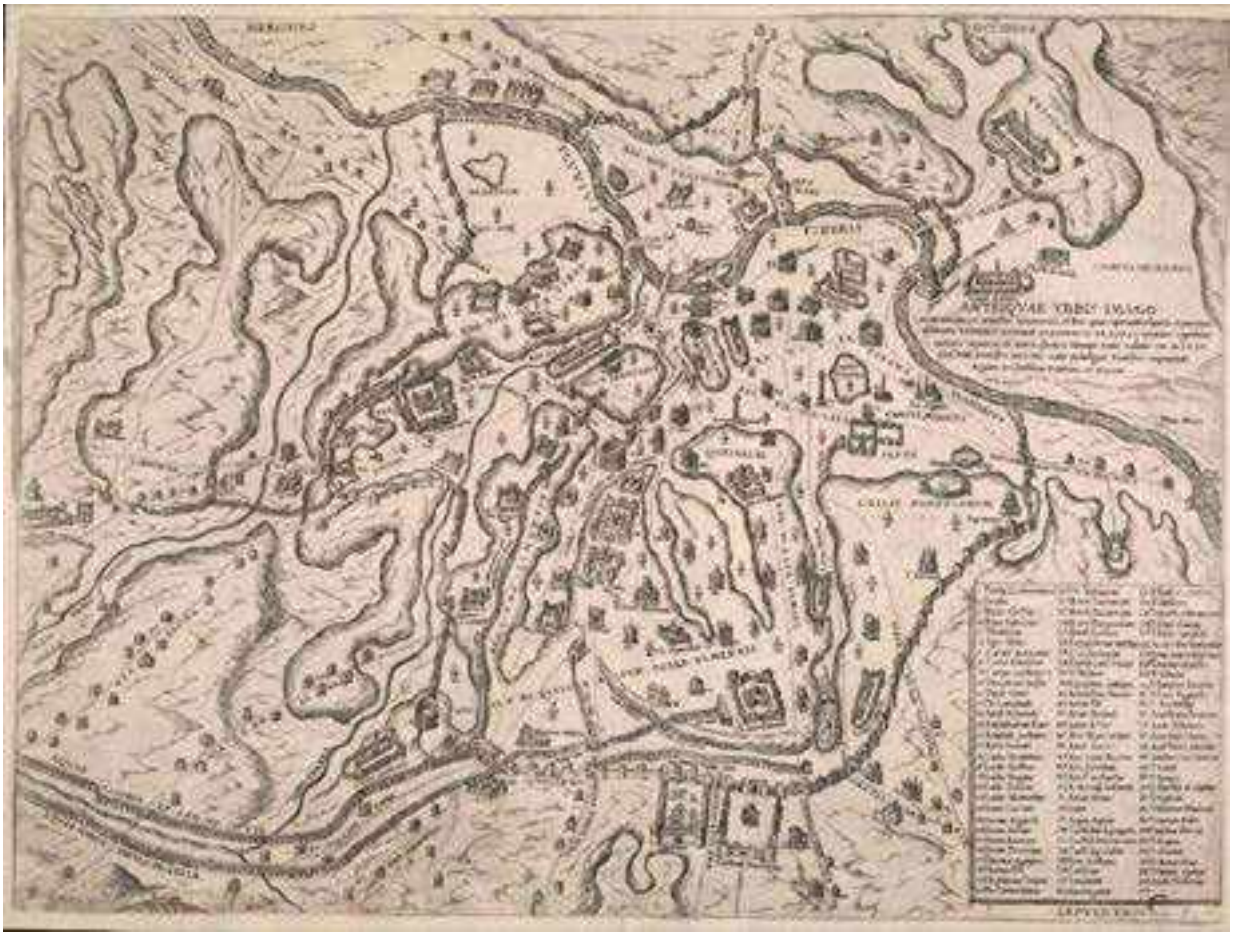

Figure 3.9

Bird's-eye view of ancient Rome. In that earlier view the imprint (which appears following title at center right) had Rome as place and Pius IV as pope

Onofrio Panvinio, 1565

Onofrio Panvinio. *De Ludis Circensibus, libri II*. Venice: Giovanni Baptista C. (1681), p. 7

Figure 10

The victories of Emperor Charles V. The death of Charles, Duke of Bourbon, and the capture of Rome; the Duke falls backwards from a ladder against a tower to the alarm of a soldier; in the distance Rome is in flames, including the Castel Sant' Angelo

Dirk Volkertsz Coornhert, after Maarten van Heemskerck, published by Hieronymus Cock, 1565

The British Museum, cod. 1868,0208.59

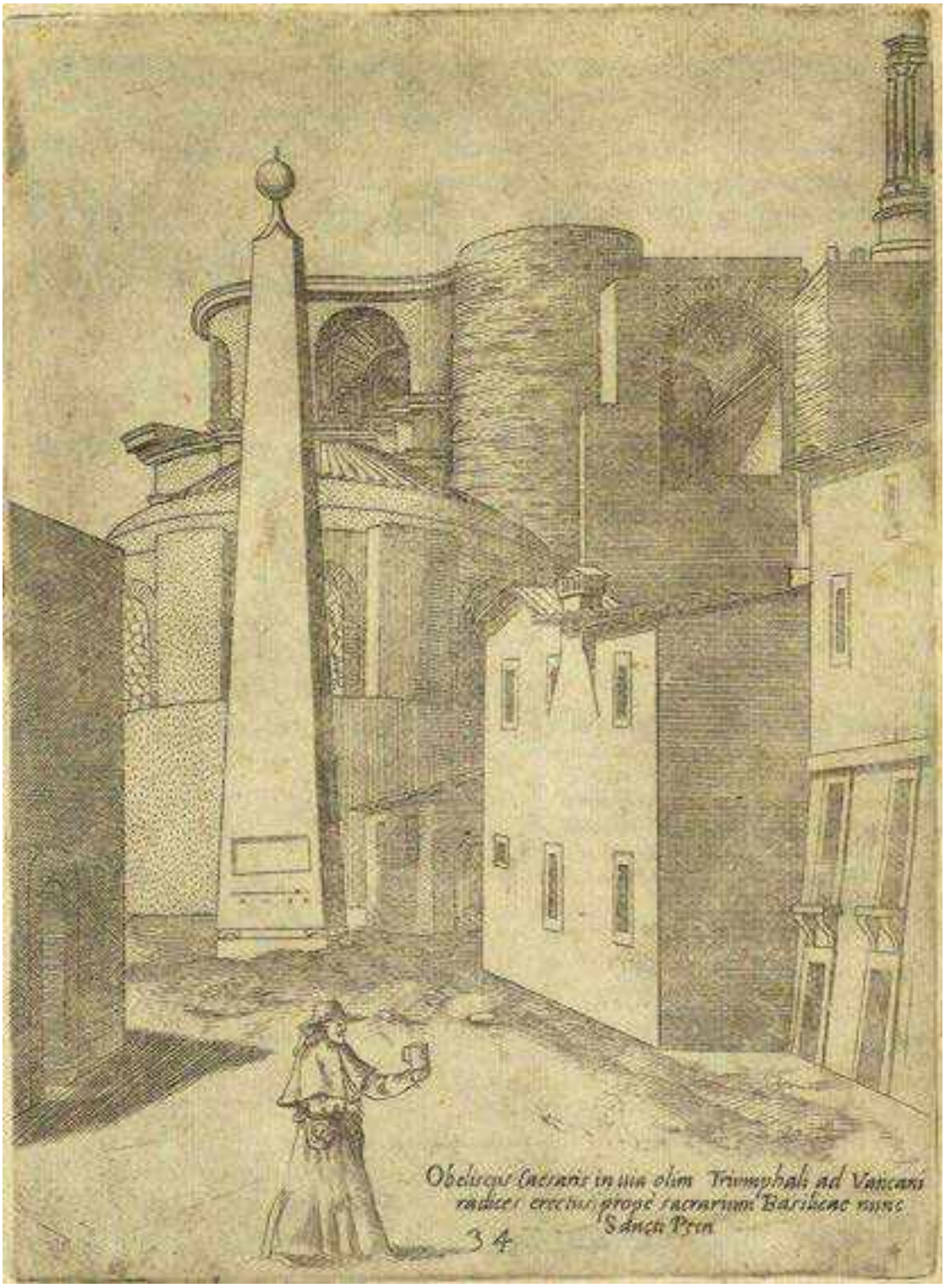

Figure 3.11

The Obelisk of Cesare in S. Peter's square in Rome with surrounding buildings

Giovanni Antonio Dosio, 1569

Giovanni Antonio Dosio; Giovanni B. de Cavalieri. *Cosmo Medici DVCI Florentinor. Et Senens. Urbis Romae Aedificiorum Illustriumquae Supersunt Reliquiae.* Rome (1569), p. 34

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Figure 3.12

State of the Vatican Basilica after the transport of the obelisk, Fresco

Giovanni Guerra, 1587-88

Sixtine Chapel, Vatican Library

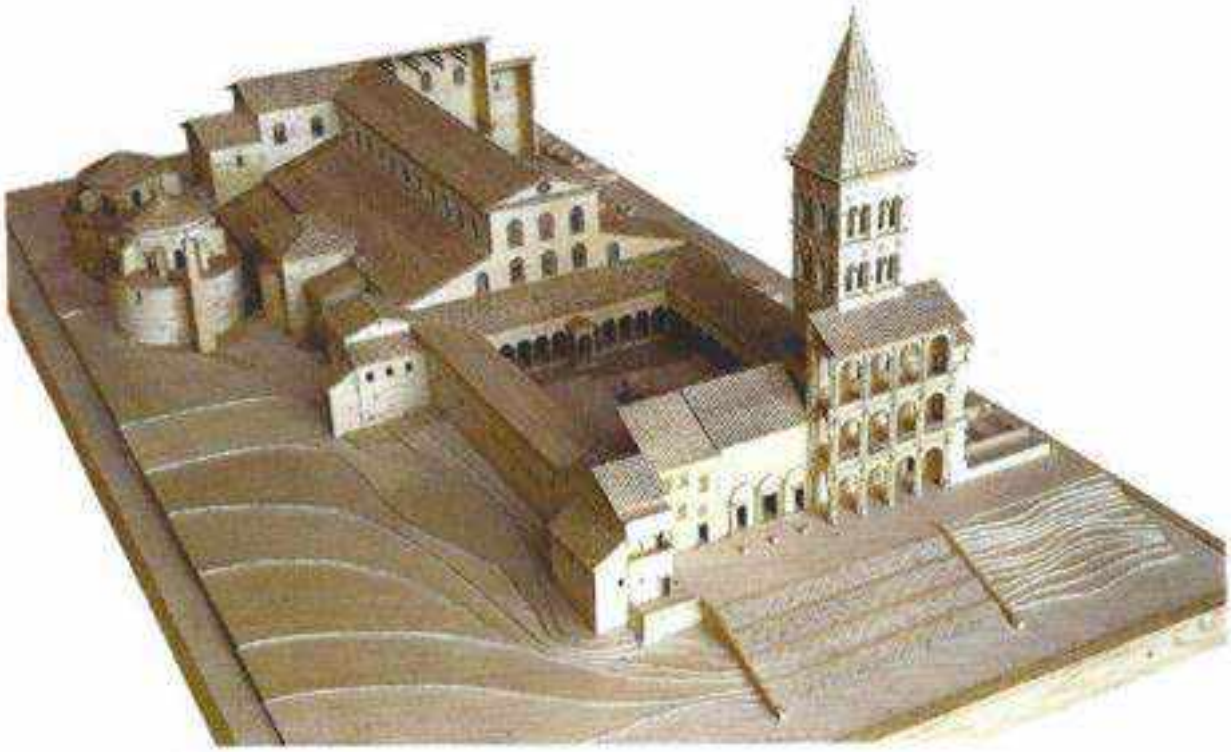


Figure 3.13

Model of the Old Basilica of St. Peter

Alberto and Mauro Carpiceci

CHAPTER 4

"*Haec autem ita fieri debent, ut habeatur ratio firmitatis, utilitatis, venustatis. Firmitatis erit habita ratio, cum fuerit fundamentorum ad solidum depressio, quaque e materia, copiarum sine avaritia diligens electio; utilitatis autem, cum fuerit emendata et sine inpeditione usus locorum dispositio et ad regiones sui cuiusque generis apta et commoda distributio; venustatis vero, cum fuerit operis species grata et elegans membrorumque commensus iustas habeat symmetriarum ratiocinationes*"

Marco Vitruvio Pollione

Chapter 4. Reconstruction in stages of the design process of the *old basilica of S. Peter* Objective

4.1. Objectives

In this chapter it is desired to reconstruct the complete project of the old basilica of S. Peter as initially conceived. In the same way it is desired to identify the consecutive stages of the design process from the first decision until the project was finished.

In ancient Rome, very few plans were made to project a building for very different reasons (modularity of the process, existence of architectural orders, scarcity of paper or papyrus, etc.). The most important thing was the realization of a floor plan, which was complemented with one or more sections, or even some elevations, perfectly integrated with the floor plan.

Initially, the floor plan layout was designed, with a certain geometric structure such that all its elements were geometrically related to each other. When the floor plan was almost finished, the sections were drawn based on the geometric structure of the floor plan. The definition of the building was completed with indications on the order that should be used and the proportions of the columns and other modular elements. Finally, the new architectural elements defined in section were moved to the floor plan, creating a certain transformation in its structure. In this way, the floor plan influences on the section, and the section pan in turn on the floor plan, generating a perfect integration between all the elements of the building.

Therefore, for the reconstruction of the design process of the old basilica, first the design process in floor plan will be reconstructed, and based on the resulting floor plan layout, the design process in section will be also reconstructed. Once the floor plan and the main section layouts have been defined, the facades can be reconstructed, taking into account the historical information available, and therefore the appearance that the old basilica could have in different historical periods. This complete reconstruction of the appearance of the building, and at different stages of its history, will be done in Chapter 6.

Therefore, it is not desired to draw the old basilica once it was built, since in its construction, as in the construction of any building, small errors and deviations were made regarding the original project.

No doubt there was an initial project, possibly carried out in 324, during the time of Sylvester and Constantine. This original project was followed - quite accurately - during

the construction of the main body of the basilica, including the apse, the transept, the two side exedras and the five naves, since its construction took less than 30 years. There are two huge proof of the existence of this project. On the one hand the fact that a foundational platform was built that included all the spaces of the basilica although they were built many years later [1]. On the other hand, and as shown in this chapter, all the architectural spaces of the building are geometrically related, which shows that they were designed together and at the same time.

However, once the main body was finished it is possible that a new project based on the already built basilica had been carried out, and perhaps this new project had light deviations from the original project. This second project, if there was one, could have been carried out at the time of Liberius (352-366), and would regulate the construction of the anterior body (including the nartex, the atrium, the lateral wings, the gate house and its adjacent rooms), which would end completely in the time of Symmachus (498-514) [2]. However, this second project (if there was one) would greatly resemble the initial project, since in reality, once defined the main body, there are few alternatives to correctly project the narthex, the lateral wings of the atrium and the rooms adjacent to gate house.

Therefore, there was a project or two, the present work aims to reconstruct all the consecutive stages of the global design process, from the first decision, until the project was perfectly defined.

4.2. Units of measurements in *Ancient Rome* and in the *Renaissance*

For the identification of the design process and the deduction of all the dimensions of the old basilica of S. Peter there is an important problem to solve. The units of measurement existing in Rome in the fourth century were not the same as the units of measurement that existed in Rome in the Middle Ages, and in the Renaissance.

In ancient Rome, the most common units of measurement in building construction were *cubitus*, *pes*, and *palmus*.

1 *cubitus*:	6 *palmus*	1 *cubitus*:	44.68 cm.
1 *pes* (feet):	4 palmus	1 *pes*:	29.7866 cm. (Vatican)
1 *palmus*:	4 *digitus* (1 *digitus* = 1 finger)	1 *palmus*:	7.4466 cm.

In the Renaissance, in Rome, the most common units of measurement were:

1 *palmo 'di architetti'*: 12 *once*	1 *palmo 'di architetti'*: 22.34 cm.
1 *palmo 'di architetti'*: 3 *palmas*	1 *palma*: 7.446 cm.
1 *palma*: 4 *once* (1 *once* = 1 finger)	1 *once*: 1.8616 cm.
1 elbow: 2 *palmi 'di architetti'*	1 elbow: 44.68 cm.

In the Renaissance, in Florence, the most common units of measurement were:

1 *braccia fiorentine* (1 bf = 2.61 *palmi* = 0.5836 m.)

As expected, the units of measurement had some dispersion over time and across different regions. However, the old Roman *palmus* and the Renaissance *palma* were equivalent, so it can be said that the old Roman *pes* (*roman foot*), the most common unit of measurement, was quite exactly equivalent to 4/3 of the Renaissance *palmo di architetti* [3].

Measurements made in the old basilica in the Renaissance were made mostly in *palmi*, as were most of the projects for the new basilica. Bramante, Giuliano da Sangallo, Fra Gicondo, Antonio da Sangallo, Peruzzi, Michelangelo, and several other Renaissance architects took measurements of the ancient basilica in *palmi*. And based on these measurements and these units of measurement they carried out their projects.

However, the project of the old basilica was made based on *pes* (from now on it will be called *roman feet*, or simplifying, *feet*) as a unit of measurement. And this fact is important, since a dimension that corresponds whole number (and perhaps has a certain symbolic character) made with a certain unit of measurement, corresponds to a decimal number, without any type of symbolic character, in another unit of measurement.

This means that the reconstruction of the dimensions of the old basilica of S. Peter, as well as the identification of the stages of its design process must be carried out on *pes* (*roman feet*). The internal coherence and the geometric relationships between the different architectural elements must be realized and understood in *feet*. Furthermore, these measurements must resemble the measurements made in the Renaissance (made in *palmi*), which were probably rounded.

Leonardo da Vinci also provides a graphic scale in his drawing "The Vitruvian man", and in the text a set of units of measurement with which he describes the dimensions of the human body:

"Vetruvio, architetto, mette nella sua opera d'architectura, chelle misure dell'omo sono dalla natura disstribuite in quessto modo cioè che 4 diti fa 1 palmo, et 4 palmi fa 1 pie, 6 palmi fa un chubito, 4 cubiti fa 1 homo, he 4 chubiti fa 1 passo, he 24 palmi fa 1 homo ecqueste misure son ne' sua edifiti…".

4.3. Identification of the stages of the design process of the floor plan of the old basilica of S. Peter

4.3.1. Objectives

In this section the design process of the floor plan of the old Basilica of S. Peter is reconstructed in a similar way to how it should have been originally carried out in the realization of the executive project.

As mentioned, the floor plan layout was the fundamental part of the design of a building in ancient Rome, and the elevation design was done next, although undoubtedly certain decisions made in the section design could have an impact on the floor plan design.

When the floor plan of a certain building is projected, a sequential set of decisions are taken that allow the project to evolve, stage by stage, from the first decision to the end of the project. The decisions that are made at a certain stage make the project evolve until it reaches a new stage, so that the realization of a project becomes a sequence of clearly defined stages.

In this way, this section identifies the stages of the design process that were originally carried out in the elaboration of the project for the old basilica of S. Peter. It is not intended to emulate the same design process that was carried out initially, since, as in any design process, decisions were not made only sequentially, since they were also made in parallel. In addition, at each stage of the design process, there were several suitable alternatives, so several of them had to be explored, until their validity was verified, continually returning to previous stages of the process, in order to explore new paths in the decision-making tree. In general, it can be said that the design process of any building is a complex process, full of uncertainties, and its reconstruction equally complex.

However, an architect who has previously designed a building could easily recompose the sequential stages that he carried out in his project, sequentially and without uncertainties, since he can remember the successful decisions that were made, when going from one stage to another, until it was completely finished.

Taking into account these clarifications, in this section the sequential set of stages of the project of the old basilica of S. Peter is reconstructed, based on the final successful decisions.

The procedure to identify these stages is the same as an expert chess player would do when seeing the position of the pieces on the board at a certain stage of the game. The chess player could reconstruct the sequential stages of the game, including the position of all the pieces in each stage. That is, he could reconstruct the sequence of stages from the beginning of the game, to the stage in which the pieces occupied certain positions.

Taking these considerations into account, the reconstruction of the design process of the plan of the old basilica has a special importance since it allows reconstructing with precision the shape and dimensions that the original building could have had.

4.3.2. Archaeological excavations and measurements of the old basilica of S. Peter

In the 40s of the 20th century, excavations were carried out under the new basilica of S. Peter in order to analyze vestiges and make measurements of the old basilica of S. Peter and the Necropolis [4] (Fig. 4.1). Of course these measurements have been taken into account in this work, although with certain reservations.

It must be considered that it is very difficult to stake out exactly a foundation in an irregular terrain, and instead the walls (and colonnades) can be set out more accurately drawing them on the foundation surface. Therefore, there are always differences and eccentricities between the paths of the foundation walls and the upper walls (or colonnades).

In addition, in the particular case of the old basilica of S. Peter, heterogeneous bases and columns were used, with different sizes and shapes, and often half finished (*spolia*) [5]. Therefore, the measurement from a specific base, or from a specific column, is not significant, since the same measurement made from a base or an adjacent column could vary up to half a *palmi*, or perhaps more.

Therefore, simple and limited measurements, although they are binding, do not have definitive validity to reconstruct exactly the original project of the old basilica of S. Peter. Therefore, it is very important to know precise measurements made in situ by architects.

4.3.3. Historical graphics and measurements of the floor plan of the old basilica of S. Peter

There are three main historical sources (texts and graphics) containing measurements of the old basilica of S. Peter. The historical references available that contain measurements of the old basilica are from the 15th century, so measurements are made in *palmi* (1 *palmo* = 22.34 cm.), and eventually in *braccia fiorentine* (1 bf = 2.61 *palmi* = 0.5836 m.).

Two sources are very reliable because they were made by talented architects such as Donato Bramante (1443?-1514) and Baldasarre Peruzzi (1481-1536), who were also involved in the design and construction of the new basilica. The third source is not so reliable, since the measurements were made by a cleric, Tiberio Alfarano (1525-1596), not well versed in architecture, and also, at the time of making the measurements, a considerable part of the old basilica had already been torn down, on the occasion of the construction of the new one, so in many cases he could not make direct measurements on the building, and had to be guided by vestiges on the ground, and by his imagination.

There are also historical documents with comparative tables of measurements supposedly made by Alfarano, Fontana, Oldoino, Ferrabosco and Severano, compiled by Filippo Buonanni in his work *Numismata Summorum Pontificum Templi Vaticani Fabricam Indicatia* [6].

In addition, texts and graphic documents are preserved, without measurements, made by people who visited the basilica, such as Maarten van Heemskerck (1498-1574) [7], Onofrio Panvinio (1530-1568) [8], Giovanni Antonio Dosio (1533-1609) or Giacomo Grimaldi (1568-1623) [9], or people who lived in later times, and therefore could not visit the basilica, but who were supposed to have access to documents and ancient drawings of the basilica, such as Paul Letarouilly (1795-1855) [10], or Rodolfo Amedeo Lanciani (1847-1929) [11]. There are also some anonymous graphics, of difficult authorship, which mostly have poor quality, or are only copies of some of the mentioned drawings

These documents do not provide information on measurements of the old basilica, however, once the project has been reconstructed, these documents allow it to be properly completed.

Finally, in recent years, a set of works and considerations of several contemporary researchers have been accumulating, which have been able to take into account both the previous documents and the excavations carried out in the 40s [12].

Of course, all these works have been taken into account to carry out this research, however, most of them do not go beyond conjecture or interpretation, so the three most important sources for the study of the old basilica of S. Peter are the work of Bramante, Peruzzi and Alfarano.

1. Donato Bramante

Currently, several drawings made by *Bramante* for the design of the new basilica of S. Peter are preserved: *GDSU 3 A, JSM Codex Corner f.18, GDSU 1 A, GDSU 7945 Av, GDSU 7945 Ar, and GDSU 20 A*. But only one shows dimensions and proportions of the old basilica, the *GDSU 20 A* drawing.

When analyzing the *GDSU 20 A* drawing, (Fig. 4.2) can be observed a set of marks made by Bramante in order to make a scale drawing of the old basilica, and the project of Nicholas V; and also to capture his architectural ideas on a scale, integrated into the built environment. Some types of marks are usually called as "compositional marks", and are necessary to compose adequately the different architectural elements of a given project. And other types of marks are “scale marks”, necessary to measure directly on the floor plan and to draw to scale throughout the design process.

Scale marks are more or less straight lines that are found throughout the drawing, and are spaced a distance of 5 *palmi*. On the other hand, the compositional marks are very short, are separated by a distance of 10 *palmi*, and are only drawn in certain specific parts of the drawing. There are also drawn shorter compositional marks separated by a half distance, that is, a distance of 5 *palmi*.

The dimensions of these marks are deduced from the analysis of Alfarano's drawings, where there is drawn a graded scale. If measured on the layout of Alfarano it can be seen that the size of the transept of the old basilica is about 408 *palmi*, and the width of the central nave is approximately 110 *palmi*. By carefully analyzing *Bramante*'s *GDSU 20 A* drawing, there is evidence of 11 marks drawn across the central nave, and a total of 41 marks along the transept.

If the Alfarano drawing is superimposed with the Bramante *GDSU 20 A* drawing, it is clear that they do not match exactly, and the Alfarano drawing does not have the exact proportions, and even it does not exactly match the dimensions written by Alfarano in some cases. So some exact measurements of some architectural elements that can serve as a reference are needed. For this reason, other complementary strategies must be used

to deduce the exact dimensions of the old Basilica of S. Peter in Vatican. Fortunately, there is a drawing, made by Peruzzi, which provides certain exact measurements.

2. Peruzzi

The most reliable measurements of the old basilica of S. Peter are the texts and the *GDSU 11 Ar* drawing (*Pianta dell'Atrio e della Navata di S. Pietro*) made by Peruzzi (Fig. 4.3), perhaps about the year 1518 (according to my own research), although many researchers think that made between 1520 and 1521 [13].

This drawing is of vital importance since it was made by Peruzzi in order to measure the already built part of Bramante's project for the new basilica, and its relationship with the still standing part of the old basilica. Therefore, the measures had to be done with great diligence and precision.

In *GDSU 11 Ar* several measures are perfectly appreciated. The length of the atrium is 26 *canne*, that is, 260 *palmi*. The depth of the gate house is 92 1/6 *palmi* (5 1/2 + 81 2/3 + 5 = 92 1/6), indicating that the outer wall is 5 *palmi* and the wall adjacent to the patio of 5 1/2 *palmi*. The width of the basis of the atrium colonnade is 5 *palmi*. The size of the narthex counting the wall is 57 *palmi*, and the adjoining wall of 6 1/3 *palmi*. The distance from the axis of the basilica to the wall of the main body (inside the narthex) is 143 *palmi*. The separation between columns of the internal lateral naves is 39.5 *palmi*. The drawing shows a dimension of the stairway access platform of 77 2/3 *palmi*.

Peruzzi also indicates, in a pencil drawing, that the interior width of the main body of the naves is 284 *palmi* [14].

3. Alfarano

Tiberio Alfarano (1525-1596) in his work *De basilicae Vaticanae antiquissima et nova structura* of 1582 [15] describes the *old basilica* before being demolished. This work (published in 1914) was accompanied by three precise drawings, dated respectively 1571 (Fig. 4.4), 1576 (lost) and 1582, the last of which, engraved in copper by Natale Bonifacio and published in 1590 (Fig. 4.5), is a precise graphic description of the basilica and the annexed buildings. These drawings, together with written descriptions and measurements (Fig. 4.6), represent one of the best sources for general knowledge of the ancient basilica, according to Krautheimer and Frazer [16]. Although, Alfarano's references are not a reliable source of "accurate" measurements of the architectural elements of the old basilica of S. Peter.

Alfarano was not a construction professional so he would not have rigor or thoroughness when taking measurements. In fact, the measurements indicated in his writings show an ambiguity that an architect would not have. For example, when talking about the distance between columns, Alfarano does not specify whether the measurements have been made from the widest part of the respective shafts, or from the lower part, or from the bases.

Finally, mention should be made of the drawing made by Francesco Cancellieri (Fig. 4.7). This drawing was made by almost literally copying Alfarano's drawings, however Carcellieri improved the position and design of the buildings adjacent to the old basilica, and this has been a great help in chapter 2 and chapter 5, to rebuild the state of the urban structure in the vicinity of the old basilica.

4.3.4. Methodology followed to reconstruct the design process of the floor plan of the old basilica of S. Peter

Once that all the historical references have been compiled, an exhaustive analysis of it has been carried out in order to tentatively identify any type of dimensional relationships of the architectural elements that could apparently be contained in the design of the building. Based on it, what could be the first action in the design process of the old basilica of S. Peter must be identified, as well as a causality relation with the rest of actions, from those carried out with greater promptness, to those that were clearly carried out later.

Among all the tentative design strategies that are being proposed, there comes a time when one of them is capable of providing results with partial coincidences with the dimensions and historical information collected. This strategy is gradually polishing, until finally one is reached that has almost total coincidences with the information collected [17].

The compositional strength of this strategy is such that it can even reject certain commonly accepted measurements. It must be remembered that the architectural design process has its own harmonic rules, so that all architectural elements must be geometrically related to each other, so if a given dimension is dissonant with respect to the others, it is most likely that this dimension, although historically accepted, could be false.

The deduced compositional strategy also allows us to identify the consecutive design stages that the architect made from his first stroke, until the project was complete. Next,

the different identified stages are specified and explained, testing with different compositional strategies, until identifying one whose final result coincides with the historical evidence, and also has an enormous internal coherence, a great simplicity and great compositional strength.

4.3.5. Stages of the design process of the floor plan layout of the old basilica of S. Peter

The big problem in the genesis of any project is what should be the first action to be taken to start the design process. This first geometric action is always generated based on the initial idea of the architect.

In the case of the old basilica of S. Peter it is evident that a simple basilica typology was desired. They did not want to innovate, on the one hand the concrete needs of the Christian liturgy were unknown, and on the other they were in a hurry.

The most appropriate thing was to build a large building with a basilical typology, which was capable of housing a multitude of people. For this reason, it was decided to build a huge basilica, composed of two main parts: an anterior body that should contain the gate house, the atrium and the narthex, and a main body that should contain the five naves (a central nave of great width, and four equal side aisles with a smaller width). The main body should articulate with a transept with exedras, and a circular apse. In other words, it was thought of a building with a simple and conventional structure, but of enormous dimensions.

A first decision that was made is that both the main architectural body and the anterior architectural body have the same dimensions; but these dimensions should be chosen appropriately.

The second decision to be made was to identify the geometric relationship between the transept and the main body. Therefore, a geometric strategy should be thought of that would relate the dimensions of the body of the naves with the dimensions of the transept with the exedras, in such a way that if the dimension of one is modified, the dimension of the other is proportionally modified, with the purpose that they were harmoniously united.

The best way to integrate the transept with the set of naves is that both have the same dimension, in such a way that from the set of naves only the exedras stood out. Therefore, it only remained to relate the depth of the transept with the naves.

The most important element of the main body is the central nave (which should also be closely linked to the transept), so a simple formula should be chosen to geometrically relate the depth of the transept to the width of the central nave. A rectangle should be chosen in such a way that the ratio of its long side to its shortest side, is the ratio of the width of the central nave to the depth of the transept. This rectangle would not correspond to any architectural element of the basilica, but it would constitute its generating core. Therefore, and simply for the purpose of explaining the design process, this rectangular generating space will be referred to as the "transept core".

Stage 1 (Layout OSP-F1)

Without doubt, the first architectural element that was defined was the "transept core", since it represents the connection between the main nave and the transept, the two main architectural spaces of a basilica. In addition, the "transept core" would be the first space that was desired to build since in its east side it would include the Arch of Constantine, and in its west side it would integrate the apse.

Given its special importance for Christian worship, the building should have a special symbolism and therefore the shape of the "transept core" should be studied with great care. Therefore, the architect author of the project chose an equilateral triangle as the generator of the "transept core", because the equilateral triangle perfectly symbolized the concept *Trinitas*, initially formulated by *Tertullian* in the year 215 (*Adversus Praxeam II*) to refer to a God that exists as three different people: father, son and holy spirit: "… *the three are one, due to the fact that all three come from one, per unit of substance*" [18].

This concept was slowly and gradually taking shape by Christians in the third century and it was at the *council of Nicea*, in 325, when it was formally raised by the Christian church. The concept was questioned by a generation of debates, until the faith of *Nicea* was definitively reaffirmed in Constantinople in 381 [19].

It is more than likely that the architect author of the project of the old basilica of S. Peter had knowledge of the recent *Trinitarian dogma*, as well as its representation by means of a triangle, and decided to use this concept, and its symbolism, as the generating essence of the project. Nothing better than an equilateral triangle, representing the Christian Trinity, as a source of inspiration and generating geometric figure of the architectural structure of the basilica.

However, this equilateral triangle must be very well chosen since it will be the generator of the central rectangular space of the basilica, that is, the "transept core".

It is clear that the architect was commissioned by Constantine to make a large building in the shape of a basilica, so the main nave should have a significant width. Surely the architect will try several especial dimensions, such as 75 *feet*, 80 *feet*, 85 *feet*, 90 *feet*, etc., that is, all round numbers. However, and to ensure the compositional success of his project (*concinnitas*) he decided that the lateral spaces of the transept had the same dimension as its depth. Therefore, the total length of the transept would be the width of the central nave plus twice its depth.

The height of an equilateral triangle is calculated by multiplying its base by the sine of 60º ($\sqrt{3}/2$). Therefore, the height corresponding to the successive tentative triangles would be: 64.9519 *feet* (base 75 *feet*); 69.2820 *feet* (base 80 *feet*); 73.6121 *feet* (base 85 *feet*); etc. All these dimensions have decimals and are inexact, and therefore not very suitable to constitute the genesis of an important and symbolic project. In addition, the resulting length of the transept (the sum of the base of the central triangle plus two heights), would generate unattractive numbers, and also decimals.

The author of the project had to look for suitable numbers, so that they had a certain beauty, and also generated functional spaces. In addition, many resulting transepts were too small, and others were too large. And the same would happen with the length of the naves, whose length should be equivalent to the length of the transept plus that of the lateral exedra.

After doing several tests, one number stood out above the rest: 82 *feet*.

If an equilateral triangle is drawn with 82 *feet* of base, its height is a nearly whole number, 71 *feet*. Also, the resulting length of the transept is now 224 *feet* (71 + 82 + 71), which is an attractive number (7 * 2 * 2 * 2 * 2 * 2) and loaded with symbolism.

The author of the project therefore determined that the equilateral triangle generating the "transept core" had dimensions of 82 *feet* base, and 71 feet high. The equivalence of these dimensions in *palmi* is 109.33 *palmi* base, and 94.66 *palmi* high, which are almost equivalent to the rounded measurements that were made on the monument in the Renaissance, and which were rounded to 110 *palmi* and 95 *palmi* (although others would round to 109 *palmi* and 94 *palmi*, generating confusion to current historians).

Stage 2 (Layout OSP-F2)

Once the "transept core" was determined, the transept was projected by adding two

squares to each side of the "transept core". The squares would have their sides with the dimension of the depth of the transept, that is, 71 *feet* * 71 *feet*. The resulting transept would therefore have a length of 224 *feet* (82 + 71 + 71), that is, 298.66 *palmi*.

The dimension of the sides of the lateral squares must coincide with the dimension of the two lateral naves of the main body, and 71 *feet* is an adequate dimension.

Stage 3 (Layout OSP-F3)

Once the transept was determined, the lateral exedras were projected. To create a harmonic ensemble, it was decided that the best option was that the exedras had a width half of the main nave, that is, 41 *feet*. In this way the transept-exedra set would have a compositional rhythm of 41 - 71 - 41 - 41 - 71 – 71 (all prime numbers), and therefore would have a total length of 306 *feet* (408 *palmi*).

Stage 4 (Layout OSP-F4)

The length of the main body (naves) is determined by coinciding with the length of the transept plus the two exedras, that is, 306 *feet* (408 *palmi*). The main body is collateral to the transept, and therefore has its same dimension, that is 224 *feet* (298.66 *palmi*).

Stage 5 (Layout OSP-F5)

The length of the anterior body (which includes narthex, lateral wings, atrium, gate house and adjacent rooms) is determined by coinciding with the length of the main body, that is, 306 *feet* (408 *palmi*). The width of the anterior body is also 224 *feet* (298.66 *palmi*).

Stage 6 (Layout OSP-F6)

The central nave is determined. At the beginning of the design process the dimensions of the "transept core" had already been determined so that its width coincided with that of the central nave. Therefore, the central nave is determined by lengthening the compositional lines of the "transept core", splitting the main body into three parts. The lateral spaces are reserved for the four lateral naves and the central space is the central nave. The central nave therefore has a width of 82 *feet* (109.33 *palmi*) and an initial length of 306 *feet* (408 *palmi*), regardless of the thickness of the walls (to be determined later).

Stage 7 (Layout OSP-F7)

In stage 2 a dimension of 71 *feet* (94.66 *palmi*) was reserved for the space that includes the two lateral naves. This space must include the main colonnade, the inner lateral nave, the lateral colonnade, the outer lateral nave and the outer wall.

The architect divided this space into two equal spaces, therefore each part with a width of 35.5 *feet* (71/2 = 35.5). The interior space is used to locate the main colonnade 3.75 *feet* (5 *palmi*), the inner lateral nave and the lateral colonnade 2.25 *feet* (3 *palmi*). The outer space is used to locate the outer lateral nave and the perimeter wall 6 *feet* (8 *palmi*). In order to achieve a harmonious design, it is logical that the dimension of the side wall is the sum of the dimensions of the columns (6 = 3.75 + 2.25) creating a coherent compositional rhythm. As a result, the interior width of the main body of the basilica is 212 *feet* (224 - (6 + 6) = 212), that is, 282.66 *palmi*, a dimension very close to the dimension of 284 *palmi* indicated by Peruzzi [20].

In this way the two naves are with the same width de 29.5 *feet* (35.5 - 6), that is, 39.33 *palmi*, which is a dimension almost identical to the 39.5 *palmi* indicated by *Peruzzi* in *GDSU 11 Ar*. The inner lateral nave has a width of 29.5 *feet* (39.33 *palmi*) from column to column (35.5 - (3.75 + 2.25) = 29.5); and the outer lateral nave has a width of 29.5 *feet*, from column to wall (35.5 - 6 = 29.5).

It should be noted that the basilica was built based on the "*spolia*" of materials, very common at the time and especially in large buildings with repetitive elements [21]. Therefore, the dimensions of the bases and columns are merely indicative, and the initial dimensioning would simply serve to circumscribe in its interior the columns and bases that could be obtained, both from municipal quarries, as well as from other buildings. Many of these architectural elements would be placed in the building even without being completely finished, in a somewhat precarious way. In this sense, the measurements made by Antonio da Sangallo the Younger are explained, since in his *GDSU 119 Ar* drawing, it indicates that the separation between the columns of the central nave is 108 *palmi*, and that the separation between the columns of the lateral naves is 40 *palmi*. This measurement error is undoubtedly due to three reasons. On the one hand, what is indicated regarding the *spolia*, on the other hand it is possible that the columns near the main door were narrower, and lastly, it is possible that *Antonio da Sangallo* was less rigorous with the measurements, since his objective was not it was to mediate the central nave, but only part of the narthex and the staircase of connection with the papal palace.

In this stage the axes of the colonnades are therefore defined. The separation between axes of the colonnades of the central nave is 85.75 *feet* (82 + (3.75/2) + (3.75/2) = 85.75), that is 114.33 *palmi*. The separation between the axes of the colonnades of the central nave and the lateral colonnades is 43.5 *feet* (29.5 + (3.75/2) + (2.25/2) = 32.5), that is, 43.33 *palmi*. The separation between the axes of the lateral colonnades and the perimeter wall is 30.625 *feet* (29.5 + (2.25/2) = 30.625), that is, 40.83 *palmi*.

The columns of the main nave had variable diameter (*spolia*) although all of them close to 3.75 *feet* (5 *palmi*), as shown in the drawings (*GDSU 108 Ar, GDSU 108 Av, GDSU 120 Ar*) by Peruzzi, and in the drawings (*GDSU 1079 Ar* and *GDSU 1079 Av*) by Giovan Battista da Sangallo il Gobbo. Likewise, the bases of the columns of the central colonnades have an approximate width of 6 *feet* (8 *palmi*), that is, 1.125 *feet* (1.5 *palmi*) protrude on each side of the columns (although due to the *spolia*, some bases had a variable dimension between approximately 5.5 and 6 *feet*). The columns of the lateral naves had a variable diameter, but close to 2.25 *feet* (3 *palmi*), and their bases had a dimension of about 3.75 (5 *palmi*), that is, 0.75 *feet* (1 *palmo*) protruding on each side of the columns.

Thus the distance between bases of the main nave is 79.75 *feet* (82 - (1.125 + 1.125)), that is, 106.33 *palmi*. The distance between bases of the central colonnade and the lateral colonnade is 27.625 *palmi* (29.5 - (1.125 + 0.75), that is, 36.83 *palmi*. The distance between the base of the lateral colonnades and the perimeter walls is 28.75 *palmi* (29.5 – 0.75), that is 38.33 *palmi*.

The 106.33 *palmi* (79.75 *feet*) dimension for the width of the old basilica (from base to base) was rounded to 107 *palmi* by the architects involved in the design of the new basilica of S. Peter (Bramante, Giuliano da Sangallo, Peruzzi, Antonio da Sangallo,...) [22], not only because it is the distance between the bases of the columns of the central nave, but also because this dimension, 107 *palmi*, was the ideal side of an octagon to design the big central dome pillars with the compositional sequence 12 - 15 - 12 (39 *palmi*). In fact, Bramante respected this rounded dimension, and when designing the "central nucleus" of the new basilica he separated the great central dome piers (crossing piers) from each other a distance of 107 *palmi*, as they are preserved in the present.

Finally, the width of the perimeter wall was projected to be 6 *feet* thick (8 *palmi*), to create a symmetrical compositional rhythm (3.75 - 29.5 – 2.25 / 29.5 - 6), and therefore create two lateral naves with the same width of 29.5 *feet* (39.33 *palmi*). The perimeter wall should have this high thickness (6 *feet* = 8 *palmi* = 1.78 m.), not only to support its

own weight and that of the roofs, but especially the lateral thrust of the wind. A typology of roman basilica usually had only 3 transverse walls (2 in the transept and 1 in the narthex) so that its resistance to the lateral resistant moments caused by the wind is small. That is why the side walls were primarily responsible for enduring wind blows, and therefore they should be very thick.

Stage 8 (Layout OSP-F8)

At this stage the dimensions of the perimeter walls and columns are determined. The transept was the first architectural element to be built (integrating the previously constructed apse and Constantine arch), and liturgical activities were carried out inside it for quite some time, when the naves were not built yet.

Based on the constructive experience in basilicas of similar dimensions, a thickness of 6 *feet* (8 *palmi*) for the perimeter walls was determined, and built by *opus listatum* (using tuffs and brick bands), and in some places, *opus caementicium* [23]. Due to architectural recurrence with the main nave, the existing columns between the transept and the lateral exedras are sized with 3.75 *feet* (5 *palmi*), and their respective bases with 6 *feet* (8 *palmi*). As a result, the transept (including exedras) is with internal dimensions of 212 *feet* long (224 - (6 + 6)), by 59 *feet* wide (71 - (6 + 6)) (that is, 282.66 *palmi* long, by 78.66 *palmi* wide).

The transverse wall of the main body (where the 5 access doors were located) was designed with a thickness of 5 *feet* (that is 6.66 *palmi*), that is, one foot less than the thickness of the north and south perimeter walls. *Peruzzi* confirms in his *GDSU 11Ar* drawing that the thickness of this wall was 6 1/3 *palmi*, which is a dimension equivalent to 5 *feet*. Therefore, the internal length of the naves was 306 - 5 = 301 *feet* (401.33 *palmi*).

Stage 9 (Layout OSP-F9)

Apse dimensions are determined. The inner diameter results from discounting the width of the main nave (82 *feet*), on each side of the width of the main body, that is, 60 *feet* (224 - (82 + 82)), that is, 80 *palmi*. It can be also deducted when discounting three times the dimension of the exedra, by means of two compass spins. That is, at a distance of 123 *feet* (41 * 3 = 123) from the outside of the exedras on both sides. The resulting dimension is 60 *feet* (306 - (2 * (3 * 41))). Therefore, with a center on the axis of the perimeter wall, a semicircle of 30 *feet* inner radius (40 *palmi*), and 36 *feet* outer radius

(48 *palmi*) is drawn, and the apse is determined. Therefore, the apse protrudes from the east wall of the transept a dimension of 33 *feet* (36-3), that is, 44 *palmi*.

It is therefore clear that the apse can only be determined once the transept and lateral exedras have been designed and once the thickness of the perimeter walls has been calculated. However, the apse had to be built first, at the beginning of the architectural process, as reflected in the inscriptions on the bricks discovered in recent excavations [24].

Once the horizontal platform was built, the next constructive problem was the construction of the apse and the lateral exedras, located outside the platform. Therefore, several technical problems had to be solved, such as changes in construction techniques in the lower foundation base, and the need for a superior unifying longitudinal foundation [25].

In this stage the general dimensions of the building have been determined, which basically coincides with the *GDSU 20 A* drawing of Bramante.

Stage 10 (Layout OSP-F10)

The narthex of access to the main body of naves is determined. With the purpose of integrating properly the anterior body with the main body (*concinnitas*), it is determined that the narthex has an external dimension equivalent to half the wheelbase of the colonnades of the central nave. The separation between axes of the colonnades of the central nave is 85.75 *feet* (82 + (3.75/2) + (3.75/2) = 85.75), that is 114.33 *palmi*.

Therefore, the width of the narthex (including the bases of columns) is 42.875 *feet* (85.75 / 2), that is, 57.16 *palmi*, a dimension very similar to that indicated by Peruzzi in the *GDSU 11 Ar* drawing (57 *palmi*). According to the measurements made by Peruzzi and the identified design strategy, the atrium was initially designed by means of the interior alignment of the column bases. To determine the interior free width of the narthex (from base to wall), the dimension of the column bases must be discounted, obtaining 39.125 *feet* (42.875 - 3.75), that is, 52.16 *palmi*. Therefore, the interior width of the narthex, from column to wall, was 39.875 *feet* (39.125 + 0.75), that is, 53.16 *palmi*.

Stage 11 (Layout OSP-F11)

In this stage the dimensions of the entrance building (including gate house and adjacent rooms) are determined. As a compositional resonance with the main nave and the narthex, the best option is that the total width of the entrance building has the same

dimension as the distance between the axis of the central colonnades and the outer wall, that is, 69.125 *feet* (224 – 85.75)/2), equivalent to 92.16 *palmi*, and that exactly matches what *Peruzzi* specifies in his *GDSU 11Ar* drawing (*Peruzzi* specifies an internal wall thickness of the lobby of 5 1/2 *palmi*, an external wall thickness of 5 *palmi*, and an internal dimension of the lobby of 81 2/3 *palmi*, which in total amounts to exactly 92.19 *palmi*).

In this way the main nave becomes the generating space for both the atrium and the lobby.

As a result of determining the size of the narthex and the entrance rooms, the length of the atrium is also determined. The length of the atrium (base to base of columns) results from deducting the length of the main body, the dimensions of the narthex and the dimensions of the lobby, resulting in a dimension of 194 *feet* (306 – (42.875 *feet* + 69.125 *feet*)), that is, 258.66 *palmi*. However, the distance from the central wall of the lobby to the columns of the narthex is somewhat higher, since it must be added the dimension that the bases of the narthex protrude from the columns (0.75 *feet*), so the resulting dimension is 194.75 *feet*, that is 259.66 *palmi*. This dimension is equivalent to the one specified by *Peruzzi* in the *GDSU 11 Ar* drawing of 26 *canne* (260 *palmi*), which shows that the design process followed up to here is correct.

It should be noted that on the sides of the internal rooms adjacent to the gate house (and adjacent to the atrium) there were columns of 2.25 *feet*, with bases of 3.75 *feet*, so that the length of the atrium from column to column was 195.5 *feet* (194.75 + 0.75), that is, 260.66 *palmi*.

Stage 12 (Layout OSP-F12)

The width of the atrium (from column to column) and the north and south covered wings are determined. To properly integrate the anterior body with the main body (*concinnitas*) these spaces are formed simply by lengthening the compositional lines of the lateral colonnades and their bases. As a result, the northern and southern colonnades of the atrium have 3.75 *feet* bases (5 *palmi*), and 2.25 *feet* columns (3 *palmi*).

The perimeter walls could have been designed the same thickness as the main body (6 *feet*), but the architect determined that 5 *feet* (6.66 *palmi*) would be enough, since the walls were subjected to less gravitational loads and less horizontal wind loads. In this way, the lateral walls of the anterior body have the same thickness as the access wall. Thus the interior width of the anterior body of the basilica is 214 *feet* (224 - (5 + 5)),

that is 285.33 *palmi*. Therefore, the distance between the axis of the basilica and the inner face of the perimeter walls is 142.66 *palmi* (285.33 / 2), which coincides basically with the dimension of 143 *palmi*, indicated by *Peruzzi* in the *GDSU 11 Ar* drawing (Peruzzi specifically notes 14 *canne* 3 *palmi*).

The width of the lateral wings to the atrium is 37.75 *feet* (2.25 + 35.5), including the column and the perimeter wall, therefore the width of the lateral wings including the bases is 38.5 *feet* (0.75 + 37.75), that is, 51.33 *palmi*. In the same way, its internal width was 30.5 *feet* (37.75 - (5 + 2.25)) from column to wall, that is, 40.66 *palmi*. That is, a dimension of 29.75 *feet* (30.5 - 0.75) from base to wall, that is 39.66 *palmi*. Therefore, the width of the atrium was 148.5 *feet* (224 - (37.75 * 2)), from column to column, that is 198 *palmi*, and 147 *feet* (148.5 - (0.75 * 2)), from base to base, that is say, 196 *palmi*.

The colonnade between the narthex and the atrium should have the same dimensions than northern and southern colonnades, that is, 2.25 *feet* (3 *palmi*) columns on 3.75 *feet* (5 *palmi*) bases. To determine the interior free width of the narthex (from base to wall), the dimension of the column bases must be discounted, obtaining 39.125 *feet* (42.875 - 3.75), that is, 52.16 *palmi*.

As a result, the atrium dimensions are, from base to base, 194 *feet* (258.66 *palmi*) long * 147 *feet* (196 *palmi*) wide. And, from column to column, 195.5 *feet* (260.66 *palmi*) long * 148.5 *feet* (198 *palmi*) wide.

Stage 13 (Layout OSP-F13)

At this stage the dimensions of the large staircase to the building are determined. In the drafting of the original project, it was necessary to foresee that the entrance staircase had a large horizontal platform, as a prelude to the entrance of the gate house, in order to house a large number of pilgrims, and to give the building magnificence. Therefore, this horizontal platform had to be correctly dimensioned, at the same time that the set of flights of steps and stair landings was dimensioned (which should bridge the gap between the ground and platform on the east side).

The unevenness between the ground and the foundational platform was about 26.25 *feet* (35 *palmi*) in the east, so about 35 risers were needed, with 3/4 *foot* (1 *palmo*) each riser. To make the staircase as comfortable as possible, 5 flights with 6 steps each one (that is, 7 risers per flight) were projected, as indicated by Alfarano [26].

Making a rough estimate for the dimension of the access platform and for the set of flights and landings, it was estimated that the depth of the staircase was twice the depth

of the reception block (69.125 *feet*), that is 138.25 *feet* (69.125 * 2) (184.33 *palmi*). For the horizontal access platform, a dimension equivalent to a quarter of the total width of the anterior body of the basilica was chosen, that is, 56 *feet* (74.66 *palmi*) (224/4). In this way a dimension of 82.25 *feet* (109.66 *palmi*) for the set of stairs and stairwells is obtained (138.25 - 56 = 109.66). This dimension is equivalent to the width of the central nave of the basilica, which is a compositional wink of the total set, and is the best possible compositional option (*concinnitas*).

Peruzzi noted in the *GDSU 11 Ar* drawing (probably made in 1518) the dimension of 77 2/3 *palmi* for the entrance platform. This dimension is 3 *palmi* higher than estimated in this design process (74.66 *palmi*). However, it should be remembered that pope *Pius II* (1458-1464) extended the front of the stairs and made it more comfortable, prior to the measurements of Peruzzi [27]. The reform undoubtedly meant building on the existing platform and steps, so when adding new stones carved on the steps, the distance of the first step from the wall of the main facade had to be extended considerably.

It only remained to determine the width of the staircase. For this, the compositional lines of the lateral columns of the lateral naves of the main body were simply lengthened, as was done in the atrium. In this way the columns of the lateral naves of the main body were aligned with the columns of the atrium and with the parapets of the staircase. Thus the width of the staircase is 147 feet (196 *palmi*), and each parapet has a width of 2.25 feet (3 *palmi*). Therefore the total width of the staircase including the two parapets is 151.5 feet (202 *palmi*).

In the times of Pius II, the stairs were extended northwards, up to the line formed by the outer face of the north perimeter wall of the old basilica. The stairway, which originally had a width of 147 feet, became 185.5 feet (147 38.5 feet) (38.5 feet is the distance between the interior face of the north parapet and the north face of the north perimeter wall). 185.5 feet equals 247.33 *palmi*.

These measurements deduced in the identification of the design process coincide with those provided by Maderno, who indicates that the width of the staircase was 248 *palmi* [28]. Based on these facts, it can be concluded that the project to reform the stairs of Pius II would suppose that the steps of the stairs had a total width coinciding with the width of the basilica, that is, 224 feet (298.66 *palmi*). The parapets would protrude on both sides of the basilica, so the total width of the staircase including the parapets is 228.5 feet (224 + 2.25 + 2.25), that is, 304.66 *palmi*.

In the documents of control of work and payments to the mason Manfredino da Como, of the year 1462, a length is indicated for the north parapet of the basilica of 12 "*passi*", that is, 120 *palmi*, and for the south parapet of 113 *palmi* [29]. *Maderno* points out in the drawing *GDSU 263 A* approximate dimension of 100 and 110 *palmi* respectively for these parapets [30]. These dimensions substantially coincide with the dimensions deduced geometrically here (82.25 *feet* = 109.66 *palmi*). Undoubtedly, the parapets would have been repaired on a regular basis throughout the middle age, so their length could have lengthened when they were measured in the Renaissance. But without a doubt the parapets had 109.66 *palmi* in the original project, since no other dimension has any compositional, geometric and projective sense.

In the same way, in the documents of mason Manfredino, the parapets of the stairs are 3 *palmi* wide, which considering the marble covering, reach the 4 *palmi* measured by *Maderno*. The reform of Pius II meant the coating of marble plates of the parapets, so its thickness became 4 *palmi*, as *Maderno* later pointed out [31]. This 3 *palmi* dimension coincides with the dimension deduced here.

To deduce the number of steps and their dimensions, as well as the dimensions of the staircase, certain clues are available. Alfarano indicates that the staircase had 5 flights of 7 steps each flight [32]. This information contrasts with the one provided by an English traveler, John Capgrave (after 1447) declared that 29 were the steps [33], and Nicolaus Muffel (in 1452) remembers 28 steps [34]. The only way to integrate this information so dispersed is that Alfarano was referring to the "risers" of the steps, while John Capgrave and Nicolaus Muffel were undoubtedly referring to the "treads" of the steps. Defining the number of steps of a staircase always generates this type of confusion, since for a staircase with several landings the number of treads and risers is not the same (they differ in the number of landings). It should also be taken into account that around the stairs there were several piles of land, for the part of this land could be covering the first or even the second of the steps, which justifies the discrepancies between Capgrave and Muffel with Alfarano.

On the other hand, the dimension of 82.25 *feet* (109.66 *palmi*) is perfect to house 5 flights of steps with 6 treads per flight (7 risers per flight) and four landings. Assuming treads of 1.5 *feet* (2 *palmi*) wide and risers of 0.75 foot (1 *palmo*) high -as was later recommended by Alberti, and as those that were made a little later in the Venezia Palace [35]- it is a width of 9 *feet* (12 *palmi*) for each flight of 6 treads (6 * 1.5 = 9), so the dimension occupied by the five flights is 45 *feet* (5 * 9 = 45).

This leaves 37.25 *feet* available (82.25 - 45) for the 4 landings. The logical decision to achieve a functional and harmonious result is to provide in this case also 9 *feet* each landing, that is to say 36 *feet* in total (9 * 4). Thus there is a perfect rhythm of 9 flights of 9 *feet* (12 *palmi*) each flight (5 flights for steps and 4 flights for landings). And the remaining dimension, 1.25 *feet* (1.66 *palmi*), would be the setback of the first flight of steps with respect to the lateral parapets.

The dimensions of the staircase indicate that the foundational horizontal platform would have an approximate height of 26.25 *feet* (35 *palmi*) above ground level on the east side, which gives an idea of the difference between the terrain of the west and east sides of the basilica. This unevenness, if continuous, implies that the slope of the ground of the imperial mausoleum located further east (*Severan Mausoleum*) is 8.25 *feet* (11 *palmi*) below the level of the foundational platform, and that the slope of the southern lateral staircase of access to the narthex from the outside (collateral to the *Secretarium*) is 15 *feet* (20 *palmi*). This gives an idea of the number of steps that had the access stair to the mausoleum and the south lateral stair to access the narthex.

The mason indicates a height of 33 *palmi* (presumably for the south side parapet) and 22 *palmi* (presumably for the north side parapet), and both parapets protruded a height that "exceeded the height of a man" on the steps [36], and that can be equivalent to approximately 8 *palmi* (3 *feet*), so from the lowest level of the terrain (beginning of the steps) the height of the south parapet would be 43 *palmi* (35 + 8), that is, 32.25 *feet*. However, the land piled up on the east side of the original foundational platform could have perfectly reduced the height of the south parapet by 10 *palmi* on the west side of the staircase, leaving a free height of 33 *palmi*, which is what the mason measured when making the marble coating. The north parapet would be much smaller due to the upward slope of the terrain towards the north side and also due to the piles of land that accumulated throughout the middle ages on the east side of the foundational platform. Therefore, it would reach the height of 22 *palmi*, measured by the mason in the west part of the staircase.

Stage 14 (Layout OSP-F14)

Entrance building, including gate house, is determined. The entrance building had five sections, and each section had two rooms. These rooms were the last to be built several years after the start of construction, but they were undoubtedly determined in the initial project, since they constitute access to the basilica, and its design had to be done

precisely. In addition, although it was built years later, and therefore the original project could have been lost, the design of the entrance rooms is so simple that the architects responsible for finishing the building did not have many compositional alternatives to integrate these rooms with the previously built part.

It is determined that the exterior rooms of the entrance building have a depth equivalent to the width of the outer side naves, with respect to the outer wall, that is 34.75 *feet* (46.33 *palmi*) counting the thickness of the walls. The thickness of the facade walls and the interior wall to the atrium was about 5 *palmi* (3.75 *feet*), as specified by Peruzzi in *GDSU 11 A* drawing. Therefore, the interior dimension of the exterior rooms of the entrance building is 27.25 *feet* (34.75 - (3.75 + 3.75), that is 36.33 *palmi*. In this way the interior rooms of the entrance building are 34.375 *feet* deep (69.125 – 34.75) including the wall. Therefore, its internal dimension is 30.625 *feet* (34.375 – 3.75), that is 40.83 *palmi*.

Finally, the width of the gate house (the central room of the entrance building) is designed with an internal dimension equivalent to a fifth of the width of the east facade, that is, 44.8 *feet* (224/5 = 44.8), that is 59.73 *palmi*. So the lateral rooms have a width of 47.35 *feet* (63.13 *palmi*) and 29.75 *feet* (39.66 *palmi*) respectively (5 + 29.75 + 3.75 + 47.35 + 3.75 + 44.8 + 3.75 + 47.35 + 3.75 + 29.75 + 7 = 224 *feet*).

Stage 15 (Layout OSP-F15)

In this stage the position of the 22 columns of the longitudinal naves is determined. The 5 naves have an exact internal length of 301 *feet*, from wall to wall (306 - 5), and in the four colonnades that separate the five naves 22 columns must be located. No doubt the number 22 was a requirement of the commission, although it is also a desirable decision by the architect, both for functional reasons, as well as tectonic, and also symbolic.

The number 22 was highly valued by the Christian community of those times. Initially because dividing 22 by the 7 days of creation there is a very exact approximation of the number pi (22/7 = 3.1428, number pi: 3.1416), so it was widely used by scholars and geometers of the time. In fact, achieving the “quadrature of the circle” was a challenge always present in the architecture workshops for at least two millennia.

In addition, there are several coincidences in the Bible with the number 22, although I will only cite a few: The Bible is composed of 3 sections (the first from *Genesis* to the *Songs of Solomon*, the second from *Isaiah* to *Acts* and the third from *Romans* to the

Apocalypse) of 22 books each. The *Apocalypse* ends in chapter 22. 22 are the letters of the Hebrew alphabet. And the chronology of men from *Adam* to *Jacob* is 22 names.

Perhaps today the recurrent use of this number might seem far-fetched, as well as its symbolic justification by Christians. However, in the early years of Christianity this type of symbols was of great importance to justify the designs and actions of greater importance for the community.

By arranging 22 columns between the two transverse walls 23 intercolumns are created. Therefore, since the length of the longitudinal naves is 301 *feet*, the distance between columns would be 301/23 = 13.087 *feet*, which is a non-exact number. This dimension is unacceptable for a Roman intercolumn, which should have a rounded dimension, since in the design of colonnades, simplicity, repetition and beauty were always sought on the basis of simple numbers and proportions. It is desirable that the separation between columns be an integer, or at least a round, middle decimal number. In addition, pilasters must be arranged at the junction of the intercolumn with the walls. However, this number 13.087 provides a valuable clue: the 23 intercolumns of the 22 columns should have a dimension of 12 3/4 *feet* (12.75 *feet* = 51 *palmus* = 17 renaissance *palmi*).

The architect arranged an intercolumn of 12.75 *feet* (with columns of approximately 3.75 *feet* (= 15 roman *palmus* = 5 renaissance *palmi*) in the colonnades of the main nave, and approximately 2.25 *feet* (9 *palmus* = 3 *palmi*) in the colonnades of the lateral naves), so that the total size of the colonnade (from axis to axis of the extremes) is 391 *palmi* (23 * 12.75 = 293.25 *feet*).

So, there are 7.75 *feet* (301 – 293.25) available for the 2 lateral pilasters, that is 3.875 *feet* from the last axis to the wall. As a result, the pilasters of the central colonnades have a dimension of 5.75 *feet* (3.875 + 1.875), that is, 7.66 *palmi* (since the average radius of the central columns is approximately 3.75 *feet*). The pilasters of the colonnades of the lateral naves have a dimension of 5 *feet* (3.875 + 1.125), that is, 6.66 *palmi* (since the average radius of the lateral naves columns is approximately 2.25 *feet*).

Stage 16 (Layout OSP-F16)

In this stage the position of the columns of the lateral naves of the atrium is determined. The total length of the atrium is 194 *feet* (258.66 *palmi*) from base to base, or what is the same, 195.5 *feet* (260.66 *palmi*) from column to column. It was also desirable that the separation of columns in these two lateral colonnades be similar to the separation of columns from the naves and at the same time that the number of columns has a certain

symbolic character. Therefore, initially it was tested with 13 columns (and therefore 14 intercolumns).

When dividing the dimension 194 *feet* by 14 (number of intercolumns), the result is 13.85 *feet*, which suggest that the separation between axes of the columns must be 13.5 *feet* (18 *palmi*). Thus the size of the colonnade (from external axis to external axis) is 189 *feet* (13.5 * 14), that is, 252 *palmi*. Therefore, there are 5 *feet* (194 - 189) available for the 2 lateral pilasters, that is 2.5 *feet* (3.33 *palmi*) from each external axis to the walls. As a result, the pilasters of the longitudinal colonnades of the atrium have a dimension of 3.625 *feet* (2.5 + 1.125) (since the average radius of the atrium columns is approximately 1.125 *feet*). This is the dimension that the pilasters protrude above the base line, but an additional 0.75 *feet* protrude above the column line, therefore the total dimension of the pilasters is 4.375 *feet* (3.625 + 0.75), that is, 5.83 *palmi*.

Stage 17 (Layout OSP-F17)

In this stage, the narthex columns are arranged. The available dimension is 147 *feet* (196 *palmi*) from base to base, or what is the same, 148.5 *feet* (198 *palmi*) from column to column. In this way, 10 columns can be arranged, and therefore 11 intercolumns. When dividing 147 by 11, a dimension of 13.36 is obtained, which suggests that the separation between axes should be 13.125 *feet* (17.5 *palmi*), in order to leave space available to dimension the lateral pilasters.

The 11 intercolumns have a dimension of 144.375 *palmi* (11 * 13.125) between extreme axes, that is, 192.5 *palmi*. Therefore, 2.625 *feet* (147 - 144.375 = 2.625) remain available for the 2 lateral pilasters, that is, 3.25 *palmi* from each external axis to the walls (2.625 / 2 = 1.312). As a result, the pilasters of the frontal colonnade of the narthex have a dimension of 2.43 *feet* (1.312 + 1.125 = 2.43) (since the average radius of the atrium columns is approximately 1.125 *palmi*). This is the dimension that the pilasters protrude above the base line, but an additional 0.75 *feet* protrude above the column line, therefore the total dimension of the pilasters is 3.18 *feet* (2.43 + 0.75), that is, 4.25 *palmi*.

Stage 18 (Layout OSP-F18)

The niches and columns of the transept and lateral exedras are determined. The access holes of the transept to the lateral aisles are sized with 22.5 *feet* (30 *palmi*), centered on each of the lateral naves, separated 3.5 *feet* (4.66 *palmi*) from the lateral columns ((29.5-

22.5) / 2), and therefore separated from each other 9.25 *feet* (3.5+2.25+3.5), that is 12.22 *palmi*. The axes of the two interior columns are 11.25 feet apart, that is, 15 *palmi*. These columns have a diameter of approximately 3.75 feet, or 5 *palmi*.

Constantine's arch has a dimension equal to the internal diameter of the apse, that is, 60 *feet* (80 *palmi*), so that the side walls of the arch have a total dimension of 18.25 feet (11 + 3.75 + 3.5), that is, 24.33 *palmi*; and protrude from the columns of central nave 11 feet, that is, 14.66 *palmi*.

The columns of the portico between the transept and the exedras have the same dimensions as those of the central nave, that is, bases of approximately 6 feet (8 *palmi*), and columns of approximately 3.75 feet (5 *palmi*). The interior width of the transept is 59 feet (71 – (6 + 6)), that is 78.66 *palmi*. So if pilasters of 4 feet (5.33 *palmi*) are arranged, as they are in the collateral wall between transept and lateral aisles) on each side, a dimension of 51 *feet* is left (59 - (4 + 4)), that is 68 *palmi*. Based on this dimension, the most appropriate is to locate the columns separated 14.25 *feet* (19 *palmi*) to the pilasters; and 15 feet (20 *palmi*) to each other (14.25 + 3.75 + 15 + 3.75 + 14.25 = 51 *feet*). Therefore, the distance between the central bases is 12.75 *feet* (15 - (1.125 + 1.125) = 17.5), and the distance from the column bases to the pilasters bases is 12 *feet* (14.25 - (1.125 + 1.125)). Therefore, the separations are equivalent, with a slightly wider width in the center.

The niches of the perimeter wall located in the east of the transept have a diameter of 7.5 *feet* (10 *palmi*) and are aligned to the access porches to the side aisles and to the axis of the colonnade between them.

The 5 windows of the apse are centered on radial axes every 30º, and are separated by a double dimension of their width. As the size of the outer semicircle of the apse is 113.09 *feet* (150.79 *palmi*), the outer width of each hole is 6.28 *feet* (150.79 / 18 parts), that is, 8.37 *palmi*; and the gap between gaps is 12.56 *feet* (6.28 * 2).

The windows of the north and south side walls of the main nave are centered on the even columns, counted from the transept, so a total of 11 windows were projected, as Alfarano indicated [37]. The architect wanted to create a compositional rhythm based on the proportion of 1:2 between its width and its separation, that is, the width of each window would have a half dimension to the separation between them. Therefore, since the distance between three columns is 25.5 *feet* (12.75 + 12.75), that is, 34 *palmi*, the width of the windows is 8.5 *feet* (25.5/3 = 11.33), that is 1.33 *palmi*, and the separation between windows is 17 *feet* (8.5 * 2).

Stage 19 (Layout OSP-F19)

In this stage the archs of the north and south perimeter walls of the anterior body of the basilica are determined. The architect wanted to create an arrangement of very narrow holes centered on each intercolumn of the lateral wings of the atrium. It was decided to give a width to the holes similar to the width of the perimeter walls, that is, 6 *feet* (8 *palmi*). In this way they were separated from each other a distance of 7.5 *feet* (10 *palmi*).

In this stage, the doors, windows and columns of the 9 lobby rooms are also delimited. The central space is framed laterally by very wide load-bearing walls and pilasters, and the lateral rooms adjacent to the atrium are the only ones that have columns, with the purpose of being integrated into the colonnades of the lateral arms to the atrium.

Stage 20 (Layout OSP-F20)

From the beginning the transept was designed in such a way that its western wall was located just above the wall in which the tomb of the apostle was [38]. In this way the special relationship between the tomb and the building was perfectly established [39]. The emerging protective podium that was built on the *Tropaion* was framed by the western apse, and some type of structure capable of articulating the spaces should be designed, allowing the visit of the pilgrims, and at the same time the front celebration of the liturgy.

Therefore, Constantine raised a canopy that would improve the tomb as an object of devotion included in the transept [40]. The Constantine Canopy was raised on marble slabs and was composed of four *Vitinee* columns whose axes are 22.5 *feet* (30 *palmi*) apart, and with an approximate diameter of 2.25 *feet* (3 *palmi*) in its widest part. On the columns rested an entablature based on two cross arches, and at its intersection hung a large lamp [41].

4.3.6. Reconstruction and measurements of the floor plan layout of the old basilica of S. Peter

In the last stage of the reconstructed design process, the project of the old basilica of S. Peter is perfectly defined, with all its architectural elements dimensioned and bounded in *palmi* (Layout OSP-F21)

It can be verified that the dimensions of the architectural elements deduced geometrically throughout the design process reconstructed here, basically coincide with the dimensions indicated in the available historical references, as well as with those indicated by specialist historians. Additionally, the rebuilt floor plan layout has been superimposed with Bramante's *GDSU 20 A* drawing and it is observed that they practically coincide (Layout OSP-F22).

Finally, on the floor plan, the ancient necropolis can be located with all precision, taking into account the work carried out by Krautheimer (Layout OSP-F23).

Once the floor plan layout of the old basilica has been rebuilt, it is ready to rebuild the design process carried out in the section project of the building. And with this it can be said that the project of the old basilica of S. Peter would have been rebuilt.

As has been said, the constructive practice of projecting a building by means of floor plan design, and possibly accompanied by a section or elevation, avoiding perspective drawings, was a common practice in ancient Rome and lasted until the Renaissance. This practice, as will be seen later, was also used in the design of the new basilica of S. Peter [42].

The original development of the project for the floor plan of the old basilica was carried out using a sequence of stages similar to those shown in this section. However, and in parallel, decisions were being made in the design of the sections and elevation, decisions that would also have an impact on the design of the floor plan layout (such as dimensions of windows, doors, niches, etc.). These decisions about the section drawing are shown in the next section of this chapter.

4.3.7. Conclusions

Although there is little historical information available, it has been possible to reconstruct the exact dimensions of the floor plan of the old basilica of S. Peter, as well as all the design stages from the first stroke to the final project.

This has been possible due to the knowledge of the compositional characteristics of the design process in architecture. To achieve a good architectural project a design strategy must be established in whose consecutive stages recurrent and coherent actions must be adopted, based on the same architectural rules, as well as the same set of geometric relationships between the different architectural elements. In this way, each architectural element has a specific geometric relationship with the rest of the architectural elements, so if the exact dimension of a given element is known, the dimension of other elements

can be deduced, and based on the information of the new stage the dimensions of other elements can be deduced, and so on.

Based on this, the dimensional information contained in the drawings of Bramante, Peruzzi, Antonio da Sangallo the Younger, Alfarano and Maderno have been sufficient to deduce all the dimensions of the different architectural elements, as well as the consecutive stages of old S. Peter design process.

In any case, the identification of the stages of the design process of the floor plan layout of the old basilica of S. Peter has a great value, in architecture and history of art, since it allows reconstructing with precision the dimensions of a monument that has not been able to survive the passage of time. It also allows knowing the motivations, ideals and compositional strategies of the design of the first Christian basilica, and reveals the secrets of its beauty and architectural quality.

4.4. Identification of the stages of the design process of the section plan of the old basilica of S. Peter

4.4.1. Objectives

In this chapter the complete project of the old basilica of S. Peter in Vatican, as originally conceived, is reconstructed. In the previous section, the floor plan layout design process was already reconstructed, and in this section it is desired to deduce the design process, step by step, in section in order to identify all the spaces of the old basilica.

The reconstruction of the design process of the section of the old basilica of S. Peter will be carried out with the same methodology used for the reconstruction of the floor plan layout. It should be taken into account that in the design of any building the decisions made in the design of the section plan have an impact on the design of the floor plan, and vice versa, so the floor plan and section plan design are not independent processes. Although the floor plan design is done first, there comes a time when the section plan must be completed to complete the floor plan layout.

These considerations have been taken into account in the reconstruction of the design process in floor plan, and in the same way are taken into account in the reconstruction of the design process in section plan.

Once the floor plan layout and the section plan layout of the old basilica have been obtained, it is ready to reconstruct all the elevations, and make three-dimensional views. This will be done in Chapter 6.

4.4.2. Historical graphics and measurements relating to the section of the old basilica of S. Peter

In order to be able to draw up the sections and elevations plans of the old basilica of S, Peter, there are also several historical drawings made by people who were able to visit the old S. Peter directly (although it was already partially demolished), such as the drawings by Maarten van Heemskerck (the most important drawings are: “View of S. Peter Square”, Vienna, Albertina, n. 31681 (Fig. 4.8); “View of the basilica from the southeast, showing the buried obelisk and the Church of S. Andrea (Santa Maria della Febbre)”, Staatliche Museen zu Berlin, Kupferstichkabinett, Heemskerck-Alben, n. 79, D.2a, fol. 22v (Fig. 4.9); “View of the interior towards the south transept”. Stockholm, Nationalmuseum (Fig. 4.10); “S. Peter's Square with the statue of Marco Aurelio (1532-1536)”, Staatliche Museen zu Berlin, n. 79, D.2a fol. 53r (Fig. 4.11); “View of the construction of the new basilica from the northwest, showing the remains of the old basilica”, Staatliche Museen zu Berlin, n.79, D.2a fol. 15v (Fig. 4.12); “Interior of the old basilica, showing the new building”, Staatliche Museen zu Berlin, n. 79, D.2a fol. 52r (Fig. 4.13)); Pieter Coecke van Aelst (“View of the basilica from the southwest”, Biblioteca Apostolica Vaticana, coll. Ashby 329 (Fig. 4.14)); Domenico Tasselli da Lugo (plate 10 (Fig. 4.15), plate 12 (Fig. 4.16), plate 17 (Fig. 4.17) and plate 18 (Fig. 4.18), Biblioteca Apostolica Vaticana, Arch. Cap. S. Pietro A. 64 ter.); Giovanni Antonio Dosio (“Construction of the dome of the new basilica of S. Peter, and view of the facade to the atrium of the old basilica, XVI-XVII century”, GDSU 2555 A (Fig. 4.19)); “View of the obelisk from the east”, GDSU 2536 A (Fig. 4.20)), and Giacomo Grimaldi (“The front of S. Maria in Turri and the access doors to the atrium of S. Peter”, Biblioteca Apostolica Vaticana, Arch. Cap. S. Pietro, H.2, f. 62r (Fig. 4.21); “Atrium of old S. Peter”, Barb. Lat. 2733, 133v and 134r, Biblioteca Apostolica Vaticana (Fig. 4.22); “Interior of S. Peter, showing the internal part of the dividing wall, with the access stairs to the new basilica with the raised floor”, Barb. Lat. 2733, 115v and 116r, Biblioteca Apostolica Vaticana (Fig. 4.23); “Interior of old basilica of S. Peter”, Barb. Lat. 2733, 104v and 105r, Biblioteca Apostolica Vaticana (Fig. 4.24)).

Finally, the engraving made by Natale Bonifacio da Sebenico and Giovanni Guerra, in 1586 ("The transport of the Vatican obelisk", The Bristish Museum, nº 1892,0714.41 (Fig. 4.25)) [43] that is especially important, because it shows the plan layout of the perimeter of the existing buildings in the southern area of the basilica, around the street that connected the square with the obelisk.

There are also some paintings available, such as the painting by the Scuola di Raffaello (Gianfrancesco Penni, or Gulio Romano), "The Donation of Costantino", Musei Vaticani. Sala di Costantino (Fig. 4.26)); the painting by A. Tempesta and M. Bril "The transfer of San Gregorio Nazianzeno", 1580 ca. Palazzo Apostolico Vaticano, III Loggia nord (Fig. 4.27)); or the fresco made by Giovanni Guerra, "The transport of the Vatican obelisk", 1586, Palazzo Apostolico Vaticano, Biblioteca Sistina, II sala (Fig. 4.28) [44].

These documents do not provide information on proportions and section measurements of the old basilica, but do provide information on the approximate proportions of the different architectural elements, elevation and section. However, as the floor plan layout has been previously identified with precision, these drawings constitute a very valuable tool to accurately identify the project's sections and elevation.

When identifying all the stages of the sectional and elevation design process, even the smallest detail of all these historical graphic references will be taken into account. Some drawings are more accurate in some respects, and less accurate in other respects, so all the drawings complement each other and provide a general idea of the building in all its aspects.

There is also graphic material made by people who lived in later times, and who therefore could not visit the basilica, although they were able to access documents and old drawings of the basilica, such as the drawings by Paul Letarouilly (1795-1855) [45].

Paul Letarouilly was not able to directly measure the old basilica, but perhaps he was able to have access to additional graphic material when drawing his drawings, and he made some scale drawings, with full precision in elevations and sections. Some drawings represent the supposed appearance of the old basilica immediately after it was built, "Le Vatican et la Basilique de Saint-Pierre de Rome", vol. 1, Cap. Ancienne Basilique de Saint Pierre, planche 3 (Fig. 4.29), planche 5 (Fig. 4.30), and planche 7 (Fig. 4.31), and other drawings show how, according to Letarouilly, the basilica looked like between the 4th and 16th centuries, "Le Vatican et la Basilique de Saint-Pierre de Rome", vol. 1, Cap. Ancienne Basilique de Saint Pierre, planche 6 (Fig. 4.32) and

planche 8 (Fig. 4.33). He also made perspective drawings of the supposed appearance of the basilica and its surroundings, between the 4th-16th centuries (planche 1) (Fig. 4.34) and another view with the supposed appearance of the basilica in the year 1558 (planche 9) (Fig. 4.35).

Based on the historical references available today, Letarouilly's drawings are known to be fanciful in many respects, especially in the least historically documented aspects, such as, for example, the definition of the facade to the square, the design of the bell tower, or the decorative elements of the basilica. For this reason, these drawings are usually undervalued from a historical point of view.

However, Letarouilly's drawings are very well projected and proportionate, and he was the only one that carried out a similar work (although much simpler, and without detailing stages) to the one that has been carried out in this section. Letarouilly made his drawings taking into account innumerable historical references, and applying rational and coherent compositional rules, just as any architect in old Rome would have done. In fact, once Letarouilly's drawings have been analyzed, it can be seen that he used the most logical, rational and appropriate geometric rules in each case on a recurring basis. Without a doubt, Letarouilly did a great job, re-composing and re-proportioning the available historical graphics, and that is why his drawings have been chosen as a “script” to recompose the different stages of the design process of the project of the old basilica of S. Peter.

However, it should also be noted that Letarouilly's drawings have quite a few errors, which must first be detected and corrected.

First, they have proportional errors with respect to the position and dimensioning of the main elements, such as the colonnades of the central nave, the colonnades of the perimeter naves and the perimeter walls. However, as the floor plan layout of the old basilica has been precisely reconstructed previously, Letarouilly's drawings can be adapted and rescaled to the correct floor plan dimensions, so that these main architectural elements are perfectly located. The drawing of the Letarouilly section of the old basilica has been superimposed on the scaled floor plan layout of the old basilica (reconstructed in previous section). In this way, as the different architectural elements present in the sectional drawing are reconstructed, they will be placed in their proper place, following the compositional lines of the reconstructed floor plan layout.

Second, Letarouilly's drawings have certain errors due to the form of graphic reproduction, as well as the inevitable photographic errors of the original drawings.

However, these errors can be easily corrected throughout the design process deduction process.

Third, the drawings have certain historical and architectural inconsistencies of all kinds, such as, for example, the presence of arches between the transept and the lateral naves (since these arches are incompatible with the existence of columns, as described by Alfarano, and as can be seen in the *GDSU 20 A* drawing by Bramante), the incorrect design of the bell tower, the incorrect design of the east facade, the presence of decorative elements for which no historical evidence is available, etc. All these errors will be corrected as the design process of the old basilica is rebuilt.

Therefore, and as has been said, the Letarouilly sectional drawing will be used as a "script" to reconstruct geometrically, and correctly, all the architectural elements visible in the collected historical documents.

Of course there will always be the doubt of being rebuilding the design process that was followed in the project of the old basilica, or instead, of being rebuilding the design process that Letarouilly followed.

For this reason, at each stage of the reconstruction of the design process, the different existing compositional alternatives are evaluated, and the most appropriate is chosen, regardless of the decisions that Letarouilly might make when he made his drawing.

The reality is that at every stage of the design process there are few valid alternatives, making it relatively easy to choose the most suitable one. Also, when in doubt, the appropriate alternatives hardly differ one or two *palmi* from each other. So in any case, the correct reconstruction of the design process will result in a section very similar to the one made by Letaouilly.

But of course at no time has it been attempted to reconstruct the Letarouilly section. Instead, based on Letarouilly's drawing (as a script), the rational design process of the section of a basilica whose floor plan layout is previously known in detail has been reconstructed.

4.4.3. Methodology followed to reconstruct the design process of section of *old S.* Peter

There are no vestiges of the old Basilica of S. Peter, just remains of the foundations and the bases of a few columns of the naves. On the other hand, there are hardly any historical documents that describe the building and that provide measurements of it. However, with the little documentation available, a general strategy can be devised to

reconstruct the original project. Similarly, it is possible to identify the stages of the design process carried out to carry out the architectural project.

The key to identify the stages of the design process, and therefore rebuild the original project, lies in the knowledge of the characteristics that a "good architectural project" must have, to achieve what Alberti called by the term "*concinnitas*". With this term Alberti described the beauty and quality of an architectural design, based on the compositional coherence carried out in the development of a good architectural project, and the harmonious relationship between the different architectural elements with each other, and with the whole, so that nothing is left over, and nothing is missing. To achieve this compositional coherence that every good architectural project must have, at the beginning of its design process certain architectural strategies, based on certain compositional rules and certain mathematical and geometric relationships, must be tentatively established. These rules and these proportions must be applied consistently and recurrently in each stage of the design process until reaching the final project. Once a certain compositional strategy has been established (which includes a certain set of compositional rules and a certain set of geometric proportions), it must be applied recurrently and without variations throughout the architectural process. As a consequence, a coherent, harmonious and beautiful result will be obtained at the end of the process [46].

Conversely, when analyzing a certain building, it is possible to identify both the compositional rules and the geometric and mathematical relationships between the different architectural elements. And as a result, the compositional strategy that has been used in the realization of the project can be identified. Therefore, the higher the quality of an architectural project, the easier it is to identify the strategy followed in its design, including the harmonic relationships between its elements and the compositional rules used. On the other hand, if the project has not been correctly and coherently projected, it would be very difficult to identify the design strategy, since recurring compositional patterns could not be detected.

The geometric and mathematical relationships used in a good architectural project accurately relate the different architectural elements to each other, and to the whole. Therefore, if the dimensions of some architectural elements are known, the dimensions of the other elements can be deduced.

Fortunately, when analyzing the available historical documents, it is easy to verify that the old basilica of S. Peter was well designed, that is, certain compositional rules and

certain relationships between each of the architectural elements had been applied correctly and recursively. And for this reason it is possible to identify each and every one of the decisions that the author of the project was able to make throughout the design process, and finally identify the architectural project quite accurately. In the same way it is also possible to identify the dimensions of all the architectural elements, as they are designed at each stage of the design process.

4.4.4. Stages of the design process of the section plan layout of the old basilica of S. Peter

For the reconstruction, step by step, of the design process in section of the *old basilica of S. Peter*, the previously deduced plan layout of the old S. Peter has been used (Layout OSP-F20), and a "work environment" has been generated, as a backdrop, on which the different stages of the design process will be drawn. This work environment (Layout OSP-S0) consists of the sectional drawing of Letarouilly "Le Vatican et la Basilique de Saint-Pierre de Rome", vol. 1, Cap. "Ancienne Basilique de Saint Pierre", planche 5) (Fig. 4.28) drawn, in a blurred and scaled way, on top of a small part of the floor plan layout of the old basilica. Only a small part of the naves and the transept have been drawn from the reconstructed floor plan of the old basilica, since only the compositional lines used in the floor plan are needed to rebuild the sections.

It should be noted that the old basilica of S. Peter was designed in *pes* (*roman feets*), although many later measurements have been made in *palmi*. For this reason, the conversion factor must be taken into account. In Rome, and in the Vatican, the exact conversion was 1 *pe* (*roman foot*): 0.2978 meters (D'Anville). The *palmi "di architetti"* used in the Renaissance in Rome, and in the Vatican, was equivalent to 22.34 cm. Therefore, 1 *pe* (*roman foot*) is equivalent to 4/3 *palmi*. And conversely, 1 *palmi* is equivalent to 3/4 *feet* [3].

On this work environment, the ground level line is initially drawn, and the most important compositional lines of the floor plan design are projected on the drawing in order to be used for the reconstruction of the different architectural elements.

Stage 1 (Layout OSP-S1)

The first action that was usually carried out in order to design the section of a basilica typology was to define the maximum height of the building. Usually the maximum height was determined based on the dimensions of the floor plan layout, and a

triangulation used to be carried out among its most representative architectural elements.

In the case of the old basilica of S. Peter, with 5 naves, the usual possibilities were to make a triangulation with the axes (or sides) of the internal colonnades, or the edges of the perimeter walls. Usually circles were also made with a center on the axis of the basilica and with radius the distance to the internal -or external- face of the perimeter walls, or to the axes of the colonnades.

By testing all these possibilities, some resulting dimensions (for the total height) are too large, and instead other dimensions are too small to correctly design a basilica. However, one possibility stands out above the others, and therefore seems the most appropriate, since the resulting proportions of the building (relationship between the height of the roof with the width) are assimilated to the dimensions that are perceived in the watercolors and historical drawings, and in the Letarouilly section.

To obtain the exterior height, two arcs of a circle are drawn with a center on the axis of the lateral colonnades, with a radius the distance between these axes (150.75 *feet*), and consequently, an exterior height of 130.55 *roman feet* (174.07 *palmi*) is obtained. In the same way, to obtain the interior height, two arcs of a circle are drawn, centered on the inner face of the bases of the columns of the central colonnades, with a radius the distance between these faces (147 *roman feet*), and consequently, an internal height of 127.30 *roman feet* (169.74 *palmi*) is obtained. The distance between the exterior height and the interior height (3.25 *feet*, 4.33 *palmi*) is perfect as the thickness of the roof, including the wooden cross beams, the longitudinal straps and the covering with tiles included.

Stage 2 (Layout OSP-S2)

The next habitual decision in the design of a basilica was the determination of its central nucleus, that is, the central nave. For this reason, and since the width of the central nave had already been previously determined in the floor plan layout design process, the first thing to do is determine the height of its walls, which also coincides with the top of the main beams of the roof structure.

A common practice in the design of a basilica typology was that the height of the walls of the central nave was similar to the distance between the axis of the basilica and the inner sides of the perimeter walls. This way of determining the height makes a lot of sense, and great functionality, since the observer who walks along the axis of the central

nave could perceive the same distance both vertically (to the beams ceiling) and horizontally (to the perimeter walls), and he would feel a completely balanced space around him.

Therefore, the architect of the old basilica drew a circle with center on the axis of the basilica and radius the distance from the axis to the inner face of the perimeter walls. Therefore, the height of the walls of the central nave is 106 *feet* (141.33 *palmi*). This dimension coincides with that usually referenced by the specialist historians in old basilica of S. Peter [47].

Stage 3 (Layout OSP-S3)

In this stage, the height of the north and south perimeter walls of the basilica is determined. This height should also be related to some of the most characteristic dimensions of the basilica floor plan layout, in order to integrate the elevations with the floor plan. Furthermore, since the perimeter walls are the architectural elements furthest from the nucleus of the basilica, they should be directly related to the central nucleus, and have an entire and characteristic dimension.

After testing various alternatives, the most suitable dimension for the height of the perimeter walls is half the width of the central nave, counted from the exterior face of the walls of the central nave (coincident with the exterior face of the columns of the central nave), that is to say 44.75 *feet* ((82 + 3.75 + 3.75) / 2) (59.66 *palmi*).

Stage 4 (Layout OSP-S4)

This stage does not constitute a design stage as such, since it is a verification that the design process followed in the first stages is adequate, and that the dimensions initially determined are correct. However, it has been included as a design stage, since in many cases, in order to verify the correct relationship between the whole and the parts, these types of checks are usually carried out, in order to make sure that it is going the way appropriate, within the decision-making tree.

It can be verified that the perceptual distance from the axis of the basilica to the top of the walls of the central nave is the same as the perceptual distance to the top of the perimeter walls. This geometric verification indicates that although they have been designed differently, the internal and external walls of the basilica are directly related geometrically. Therefore, the compositional process followed so far, as well as the dimensions obtained, can be considered as correct.

At this stage, the way in which complex systems are analyzed and designed is evidenced, as is the case of architectural design. Apparently the actions that are carried out to create a certain architectural project are simple, just a twist of compass, centered at a certain characteristic point, and with radius a certain characteristic dimension. In this way, the work environment is being filled with what are called “compositional lines”. These compositional lines involve simple design actions, but in reality regulate the different design alternatives in a complex way. In fact, to achieve a harmonious design, all the architectural elements must be related to each other through the same set of geometric relationships. Therefore, the compositional lines previously drawn to design a certain architectural element should be used to design new architectural elements. In this way the different architectural elements are closely linked to each other, which ensures the harmony and beauty of the final result (*concinnitas*). The total set of “compositional lines” creates what usually is called “compositional mesh”, which regulates the design of all the architectural elements of a given architectural object. These compositional meshes allow the control of a complex system such as architectural design.

Stage 5 (Layout OSP-S5)

At this stage, the roof of the lateral naves of old St. Peter's is determined. To determine the roof, the bottom point of the roof must first be identified (the roof overhang), and it is determined that it is separated from the perimeter walls by a dimension equivalent to its width (6 *feet*). Therefore, joining this point with the outer vertex of the walls of the central nave, the roof inclination is obtained, and therefore the dimension of the height of the roof of the perimeter naves.

In the compositional network created so far, it can be verified that the drawn line passes through the point of union between the lines that determine the maximum internal height and the internal width of the basilica. Therefore, the roof line can be determined in two different ways and is always the same result. This coincidence confirms that the decision made is correct, since it constitutes evidence that a harmonious relationship has been created between the different architectural elements designed so far (*concinnitas*).

Stage 6 (Layout OSP-S6)

At this stage the position of the lower beams of the deck of the main nave is determined. This dimension is important perceptually, and is closely related to the structural

dimensioning of the load beams. That is, as long as the beam section dimension is greater than a structural minimum, the dimension is geometrically adapted to meet the compositional and perceptual geometric requirements.

To determine the position of the beam bases, a circle is drawn with a center on the axis of the central nave, and with a radius the distance from the axis to the outer side of the perimeter wall (112 *feet*). Its encounter with the external part of the walls of the central nave determines the location of the beam seats, and its intersection with the internal part of the walls of the central nave determines the dimension of the section of the beams.

Stage 7 (Layout OSP-S7)

The height and position of the clerestory windows of the central nave and transept are geometrically determined. The upper part is determined by the intersection of the line that determined the height of the central nave (*Stage 1*) with the outer side of the walls of the central nave. The lower part of the windows is determined by drawing a circle with center on the axis and radius the distance to the internal sides of the lateral colonnades, that is, 74.25 *feet* (99 *palmi*). To adequately integrate the windows with the whole, they are positioned with respect to the walls of the central nave at a distance equivalent to the distance between the inner sides of the central and perimeter walls, that is, 65 *feet* (3.75 + 29.5 + 2.25 + 29.5) (86.66 *palmi*).

In this way, the windows are projected as a compositional reflection in the section of the lateral colonnades and of the perimeter walls in the floor plan layout. In other words, the windows are thus perfectly integrated in section with the floor plan layout of the side colonnades and the perimeter walls. This stage shows how the compositional mesh is becoming increasingly complex, in order to integrate the different architectural elements with each other, and therefore the floor plan layout with the section layout. In this way, this compositional mesh will be enriched step by step, and will determine the elevation design of all the architectural elements down to the last detail.

Stage 8 (Layout OSP-S8)

In this stage, the height of the columns of the central nave is determined (the lenght of the base+shaft+capital set). The dimension is equivalent to the distance between the internal side of the walls of the central nave and the axis of the lateral colonnades, that is, 34.375 *feet* (3.75 + 29.5 + 1.125) (45.83 *palmi*). In this way the central nave is integrated in height with the lateral naves since they share common dimensions.

According to measurements made by Baldassarre Peruzzi (*GDSU 108 Ar* (Fig. 4.36), *GDSU 108 Av* (Fig. 4.37), *GDSU 120 Ar* (Fig. 4.38)), and by Giovan Battista da Sangallo il Gobbo (*GDSU 1079 Ar* (Fig. 4.39) and *GDSU 1079 Av* (Fig. 4.40)) it is known that the shafts of the columns of the central nave had variable dimensions, but all measured a little more than 39 *palmi* (29.25 *feet*), and most had dimensions that ranged from 39.2 *palmi* (29.4 *feet*), and 39.4 *palmi* (29.55).

Therefore, a dimension of 34.375 *feet* (45.83 *palmi*) matches perfectly, because it provides a variable dimension between 4.825 *feet* (34.375-29.55) and 4.975 *feet* (34.375-29.4) to size the capital and the base. As the column shafts all had different dimensions, due to their indeterminate origin (*spolia*), and since the capitals should be made uniformly and with a dimension of approximately 4.2 *feet* (5.6 *palmi*) (1/7 the height of the column shaft), each base of the columns should have different dimensions (between 0.625 and 0.775 *feet* high), so that the base+shaft+capital set always had a dimension of 34.375 *feet* (45.83 *palmi*). These measurements of bases and capitals coincide with those outlined in the design drawing of two bases of the colonnades, a column with capital, and a fraction of the architrave of the old basilica of S. Peter, probably made by Alberto Alberti (Rome, Istituto Nazionale della Grafica, n. 2402 fol. 9r.) (Figs. 4.41 and 4.42). These deduced dimensions also coincide with the dimensions of the columns that are still preserved today (since they were reused in the construction of the new basilica), and with the dimensions of the bases discovered in the archaeological excavations of the 1940s (Figs. 4.43 and 4.44).

Stage 9 (Layout OSP-S9)

At this stage the height of the Arch of Constantine is determined, which coincides with the height of the lower part of the clerestory windows of the central nave (determined in stage 7). Therefore, to determine its height, a circle is drawn with the center on the axis of the central nave and with radius the distance from this center to the internal sides of the lateral colonnades, 74.25 *feet* (99 *palmi*) [48]. To determine the position of the arc starting line, a circle with a center on the axis of the central nave is drawn at the top of the arc and with radius the distance to the arc springs. Therefore, the height of the center of the arc circle is 44.25 *feet*, which is the same height of the arch stirrups (74.25 – 30 = 44.25 *feet*) (59 *palmi*).

At this stage the dimension and position of the upper part of the entablature of the central colonnade are also determined, and therefore the position of the perimeter

balcony of the central nave. For this, a circle is drawn with a center on the axis of the central nave and with radius its distance to the axis of the walls of the central nave. Therefore, its height is 42.875 *feet* (41 + (3.75/2)) (57.16 *palmi*), and its total dimension is 8.5 *feet* (42.875 – 34.375 = 8.5) (11.33 *palmi*). These dimensions of the entablature coincide with those indicated in the drawing by Alberto Alberti (Rome, Istituto Nazionale della Grafica, n. 2402 fol. 9r.) (Fig. 4.41), and with the approximate proportions that are evident in the drawings of Domenico Tasselli da Lugo (plate 13 (Fig. 4.44) and plate 15 (Fig. 4.45), Vatican Apostolic Library, Arch. Cap. S. Pietro A. 64 ter.). Once the dimensions of the entablature have been determined, the dimension of the architrave and all the desired moldings can be detailed, as well as the protruding dimension at the top of the entablature, in order to create a continuous balcony.

Stage 10 (Layout OSP-S10)

At this stage the roof of the central nave is determined. The interior face of the roof is obtained by joining the point that determines the maximum internal height (determined in stage 1) with the upper exterior point of the walls of the central nave. The exterior face of the roof of the central nave is obtained by drawing a parallel from the point of the maximum exterior height. The overhang of the roof extends to the intersection with the height line of the central walls.

In this stage it is evident how the compositional mesh is being completed, superimposing the compositional lines previously drawn in the previous stages.

Stage 11 (Layout OSP-S11)

At this stage the height of the transept is determined. The transept must be perfectly integrated with the central nave, so its elevation must be directly related to it, and must be generated based on some of its fundamental dimensions. And the best option is to design it based on the side walls of the central nave.

In this way, the maximum height of the transept roof is determined by drawing a circle with a center on the outside of the walls of the central nave, and with radius its distance from the internal side of the exedras 102.25 *feet* ((71-3.75) + (41-6)), that is, 136.33 *palmi*. In this way the central nave is integrated with the transept, and also with the exedras. Following this same process, the height of the transept's side walls is determined by drawing a circle with the same center and with radius its distance to the

inner side of the opposite wall of the central nave 85.75 *feet* (82 + 3.75), that is 114.33 *palmi* [49].

Stage 12 (Layout OSP-12)

At this stage the height of the exedras is determined. The exedras must be integrated with the transept, and also, with the central nave, so the best option to design it is to take the side walls of the central nave as a reference.

To determine the height of the cover of the exedras, a circle is drawn with a center on the outer side of the walls of the central nave, and radius its distance to the inner side of the perimeter walls, that is, 61.25 *feet* (71 – (3.75 + 6), that is, 81.66 *palmi*.

The height of the perimeter walls of the exedras coincides with the height of the perimeter walls of the lateral naves, 44.75 feet (59.66 *palmi*). In this way the exedras are perfectly integrated with the lateral naves, and also with the central nave.

Stage 13 (Layout OSP-13)

At this stage the upper frieze of the Arch of Constantine is determined. The frieze plays an important role in the harmonic composition of the arch and serves to integrate the elevation and floor plan of the central nave with the whole.

As it has been said, to design a certain building in a beautiful and harmonious way, all its elements must be perfectly related to each other. All architectural elements must form a harmonious ensemble, and therefore when there are no primary architectural elements in a given part of a building, secondary architectural elements must be used in order to make a well balanced composition. These secondary architectural elements can be of all kinds, such as moldings, gaps, friezes, finishes, etc. and they have an especially important role in completely balancing a certain architectural composition.

The design of the basilica was very simple, given its enormous size, and the speed with which it was desired to be built. Therefore, perhaps above the Arch of Constantine it was not planned to have any important architectural element. In this way the central nave and the arch were weakly integrated with the total set, and the general composition was unbalanced. For this reason, a secondary architectural element such as a simple frieze was used, and therefore its location should be very special, and should be determined based on the dimensions of the most important architectural elements on the ground.

In other words, the frieze must constitute a compositional reflection of some important relationships in the section plan, and without a doubt, the most important is the width of the Arch of Constantine.

The upper part of the frieze is determined by drawing a circle of Euclid with respect to the square inscribed between the walls of the central nave (width of the Arch of Constantine), that is, a square of 82 *feet* on each side. In the same way, the lower part of the frieze is obtained by means of the diagonal of half of this square.

Stage 14 (Layout OSP-S14)

The height of the transept columns is determined. Columns do not appear in Letarouilly's drawing, but Alfarano mentions them, and Bramante also draws them in *GDSU 20 A* drawing. The height of these columns could be equivalent to the height of the columns of the colonnades of the central nave, or be slightly lower. Either option may be correct, although these columns probably had dimensions equivalent to those of the central nave, and probably they did not have bases in order to facilitate passage through them. Therefore, it would be necessary to look for a geometric form to achieve geometrically a height slightly less than the columns of the central nave.

The height could be equivalent to the distance between the internal side of the lateral columns and the internal side of the columns of the perimeter colonnades 31.75 *feet* (29.5 + 2.25), that is, 42.33 *palmi*.

Stage 15 (Layout OSP-S15)

The height of the columns of the lateral naves is determined. This height is equivalent to the height of an equilateral triangle with side the distance between the internal face of the lateral columns and the internal face of the perimeter walls (31.75 *feet*). As a result, a height of 27.5 *feet* (36.66 *palmi*) is obtained for the base+shaft+capital set. This indicates that the columns of the lateral colonnades were exactly 20% smaller than those of the central nave (34.375 * 0.8 = 27.5). Furthermore, correctly dimensioning according to their order, it follows that the capitals of the columns had an approximate dimension of 2.7 *feet* (3.6 *palmi*), the shafts 22.3 *feet* (29.73 *palmi*), and the bases about 2.5 *feet* (3.33 *palmi*) (whose dimension coincides with the dimension of the base preserved today of a lateral column). The lateral colonnades, unlike the central colonnades, had large bases, as shown in the drawings cited above and photographs taken in the excavations of the 1940s (Figs. 4.40 and 4.41).

In this way the lateral colonnades are perfectly integrated with the lateral naves located on each of its sides.

These dimensions also basically coincide with what is indicated in the drawing by Alberto Alberti, Rome, Istituto Nazionale della Grafica, n. 2402 fol. 9r. (Fig. 4.39), And the drawing of de Letarouilly (*Le Vatican et la Basilique de Saint-Pierre de Rome*, vol. 1, Cap. Ancienne Basilique de Saint Pierre, plance 5) (Fig. 4.28).

The lateral colonnades had arches on the columns. Throughout the floor plan design process, the distance between the columns of the lateral intercolumns was determined, and based on this, the radius of the arches that rested on these columns was also determined. The wheelbase of the columns was 12.75 *feet* (17 *palmi*), and the separation between the arches was the same as the dimension of the bases, 3.75 *feet*, that is, 5 *palmi*. Therefore, the diameter of the arches was 9 *feet* (12.75 – 3.75), that is, 12 *palmi*, and the radius 4.5 *feet*.

Stage 16 (Layout OSP-16)

The height and position of the transept windows are determined, based on the height of the perimeter walls. Alfarano points out that in the transept there were 16 windows, so they were undoubtedly distributed in two groups of three windows on each side of the apse and a pair on each of the side walls of the exedras [50]. The width had been previously determined in floor plan and height is determined at this stage. At this stage, it is highly likely that design work will be carried out in parallel with the corresponding stage in the floor plan design process. Obviously, when the architectural project was carried out, several geometric relationships between the height and width of the windows had to be tested (which should undoubtedly be similar to the proportions of the windows of the clerestory of the central nave), and therefore various ways of determining the height of the windows.

At this stage, and since the most important aspects of the section design of the old basilica have been completed, the floor plan and section design of the Constantine Canopy is determined. The Canopy had six *vitinee* columns about 2.25 *feet* (3 *palmi*) in diameter. Four of the six columns formed a square, and their axes were 22.5 *feet* apart (30 *palmi*). Two of the four columns were aligned to the inner face of the west wall of the transept, and equally aligned to the other two columns located at the vertices of the apse.

Stage 17 (Layout OSP-S17)

In this last stage, the upper windows of the clerestory of the lateral naves are determined based on the height of the columns of the central nave, and the height of the perimeter wall.

4.4.5. Reconstruction and measurements of section of the old basilica of S. Peter

Based on the 17 stages, previously identified, with which the design process carried out in the project of the section of the old basilica of S. Peter has been reconstructed, all the dimensions of all the architectural elements of section layout have been identified (Layout OSP-S18). Based on this drawing, the complete construction section of the building has been reconstructed in detail, including the structure and the foundation, as well as its precise integration into the terrain of the Vatican hill (Layout OSP-S19).

As has been commented throughout the different stages of the reconstruction process of the design process, the dimensions of the different architectural elements that have been obtained geometrically basically coincide with the dimensions indicated in the available historical references, as well as with the estimates of specialist historians. In a complementary way, the section obtained has been superimposed with the section made with Letarouilly, and it can be seen that they practically coincide (Layout OSP-S20).

Therefore, it can be concluded that the geometrically reconstructed section in this chapter coincides with the section projected in its day, and used for the construction of the old basilica of S. Peter.

The next chapter reconstructs the building process of the old basilica of S. Peter, as well as the evolution of its architectural structure from its completion until it finally began to be demolished, to make way for the construction of the new basilica. Next chapter also analyzes not only the construction stages of the construction process of the old basilica of S. Peter, but also the materials and construction solutions used.

4.4.6. Conclusions

Although there is little historical information available, it has been possible to reconstruct the exact dimensions of the section of the old basilica of S. Peter, as well as all the stages of the design process, from the first stroke to the final project.

Therefore, once the floor plan and section plan have been accurately reconstructed, and with the help of all available historical references, it is relatively easy to reconstruct the elevations and other sections of the old basilica of S. Peter, and as a result, show how it

might have looked throughout history. In fact, chapter 6 reconstructs the appearance that the old basilica may have had at three fundamental moments in its history: when the construction work was completed, in the year 514; in the middle of its existence, in the year 1003; and when it began to be demolished, in the year 1505.

Furthermore, once the floor plan of the old basilica has been reconstructed, and with the help of all available historical references, it is relatively easy to reconstruct the construction process of the old basilica, as well as its evolution throughout history, until it began to be demolished. The identification by stages of the construction process of the ancient basilica, as well as its evolution over time, will be carried out in the next chapter 5.

The identification of the stages of the design process of the old basilica of S. Peter in Vatican has a great value in architecture and in art history since it allows reconstructing with precision the dimensions of a monument that has not been able to survive the passage of time. It also allows knowing the motivations, ideals and compositional strategies of the design of the first Christian basilica, and reveals the secrets of its beauty and architectural quality. In the same way it has an enormous value in architecture and artificial intelligence, since it allows knowing the process carried out by creative architects, and in this way to be able to emulate them by means of artificial intelligence algorithms.

Notes 4

[1] Regarding the construction of the foundational platform on which *the old basilica of S. Peter* was built, the following references are especially interesting: Richard Gem, 'From Constantine to Constans. The chronology of the construction of S. Peter's basilica', in Rosamond McKitterick; John Osborne; Carol M. Richardson and Joanna Story (eds.) *Old Saint Peter's, Rome* (Cambridge: Cambridge University, 2013), pp. 35-64; Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', in Hugo Brandenburg; Antonella Ballardini and Christof Thoenes, *San Pietro. Storia di un Monumento* (Milano: Jaca Book, 2015), pp. 35-75; Richard Krautheimer, Spencer Corbett, Alfred K. Frazer, and Wolfgang Frankl (eds.), *Corpus Basilicarum Christianarum Romae. The Early Christian Basilicas of Rome* (IV-IX cent.), 5 vols. (Vatican City, 1937-77)

[2] It can be considered that the old basilica of S. Peter was completed at the end of the lateral accesses and the paving of the atrium was completed in times of *Symmachus*, although in times of *Liberius* there are references that the anterior body was already built, including the two lateral wings of the atrium and much of the vestibule. To get an idea of the chronological sequence of the construction of the ancient basilica, the following references are especially interesting: Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', p. 44; Hugo Brandenburg, 'L'antica basilica vaticana costantiniana di S. Pietro', in Hugo Brandenburg; Antonella Ballardini and Christof Thoenes, *San Pietro. Storia di un Monumento* (Milano: Jaca Book, 2015), p. 27; Paolo Liverani, 'Saint Peter's and the city of Rome between Late Antiquity and the early Middle Ages', in Rosamond McKitterick; John Osborne; Carol M. Richardson and Joanna Story (eds.), *Old Saint Peter's, Rome* (Cambridge: Cambridge University, 2013), pp. 21-34

[3] There is a huge amount of proposals regarding the exact dimension of the *Roman foot*. In the year 1862, Hultsch established, a commonly accepted conversion, 1 *Roman foot*: 0.2957 meters. The best references are: Friedrich Otto Hultsch, *Griechische und römische Metrologie* (Berlin: Weidmannsche Buchhandlung, 1862), Liz Guiral, *El puente de Alcantara. Arqueología e historia* (Madrid: Centro de estudios y experimentación de obras públicas, 1988), p. 149. However, in Rome, and in the Vatican, the exact conversion was 1 *Roman foot*: 0.2978 meters (D'Anville), as specified by Gabriel Puig y Larraz. See: Gabriel Puig y Larraz, *Valor métrico de la milla romana* (Madrid: Boletín de la Real Academia de la Historia, 24 junio 1898),

Tomo 33, p. 88. The *palmi "di architetti"* used in the Renaissance in Rome was equivalent to 22.34 cm. Therefore, a *Roman foot* was exactly equal to 4/3 *palmi*. And conversely, a *palmi* was equivalent to 3/4 *feet* (*Roman feet*).

[4] There are several references to the excavations carried out under the current new basilica of S. Peter. Many of these references include certain measurements made of some architectural elements of the *old S. Peter*, especially the separation between the bases of the columns of the five naves, and their separation with the side perimeter walls: Bruno Maria Apollonj Ghetti, Antonio Ferrua, Enrico Josi, Engelbert Kirschbaum, *Esplorazioni sotto la confessione di San Pietro in Vaticano eseguite negli anni 1940-1949*, relazione a cura di B. M. Apollonj Ghetti, A. Ferrua, S. J. E. Josi, E. Kirschbaum, Prefazione di Mons, L. Kaas, Appendice numismática di C. Serafini, 2 vols. (Città del Vaticano: Tipografia Poliglotta Vaticana, 1951); Richard Krautheimer, Spencer Corbett, Alfred K. Frazer, and Wolfgang Frankl (eds.), *Corpus Basilicarum Christianarum Romae. The Early Christian Basilicas of Rome* (IV-IX cent.), 5 vols. (Vatican City, 1937-77); Alberto Carlo Carpiceci and Richard Krautheimer, 'Nuovi dati sull'antica basilica di S. Pietro in Vaticano', in *Bollettino d'Arte* 93-4, (1995), pp. 1-70, 95; (1996), pp. 1-84; Jocelyn Mary Catherine Toynbee, and John Brian Ward-Perkins, *The Shrine of Saint Peter and the Vatican Excavations* (London: Pantheon Books, 1956); Engelbert Kirschbaum, *The Tombs of Saint Peter and Saint* Paul, John Murray S. J. (Translator), CBCR, V., pp. 165-279, (London: St. Martin's Press, 1959); Jonathan M. Hall, The Bones of Sant Peter, in *Artifact and Artifice. Classical Archeology and the Ancient Historian* (Chicago and London: The University of Chicago Press, 2014), pp. 187-206; Pietro Zander, *La Necropoli di San Pietro. Arte e Fede nei sotterranei della Basilica Vaticana* (Fabbrica di San Pietro in Vaticano: Elio de Rosa Editore, 2014)

[5] Details of the use of *spolia* in the *old basilica of S. Peter* can be found in the following references: Lex Bosman, '*Spolia* in the fourth-century basilica', in Rosamond McKitterick; John Osborne; Carol M. Richardson and Joanna Story (eds.), *Old Saint Peter's, Rome* (Cambridge: Cambridge University, 2013), pp. 65-80; Hugo Brandenburg, 'L'antica basilica vaticana costantiniana di S. Pietro', in Brandenburg, Hugo; Ballardini, Antonella; and Thoenes, Christof, *San Pietro. Storia di un Monumento* (Milano: Jaca Book, 2015), pp. 9-34

[6] Filippo Buonanni, *Numismata Summorum Pontificum Templi Vaticani Fabricam Indicantia*, Chronologica ejusdem Fabricae narratione, ac multiplici eruditione explicata. Opus secundò impressum cum correctione, & aditamento (Rome: Ed. Imp.

Domenico Antonio Herculi, 1696)

[7] Alberto Carlo Carpiceci, 'La Basilica Vaticana vista da Martin van Heemskerck', in *Bollettino d'Arte*, 44-45, Instituto Poligrafico e Zecca dello Stato, (1987), pp. 67-128

[8] Onofrio Panvinio, *De rebus antiques memorabilibus, et praestantia basilicae Sancti Petri* (1560s)

[9] Giacomo Grimaldi 1972: *La Descrizione della basilica antica di S. Pietro in Vaticano, Codice Barberini latino 2733*, Grimaldi, Giacomo and edited by Reto Niggl (Vatican City: Biblioteca Apostolica Vaticana, 1972)

[10] See Paul-Marie Letarouilly, *Le Vatican et la Basilique de Saint-Pierre de Rome* (Paris: VTE A. Morel et CIE Éditeurs, 1882); Paul-Marie Letarouilly, *Il Vaticano e La Basilica di San Pietro,* Di Luggo Aversa Antonella (ed.) (Novara: De Agostini, 1999)

[11] Rodolfo Amedeo Lanciani, *The ruins and excavations of ancient Rome. A companion book for students and travellers* (London: Macmillan, 1897)

[12] There are many historians and publications related to the old basilica of S. Peter, but especially interesting are the following: Christoph Jobst, 'La Basilica di S. Pietro e il dibattito sui tipi edili, Onofrio Panvinio e Tiberio Alfarano', in Gianfranco Spagnesi (ed.), *L'architettura della basilica di San Pietro, Storia e costruzione* (Roma, 1997); Richard Krautheimer, Spencer Corbett, Alfred K. Frazer, and Wolfgang Frankl (eds.), *Corpus Basilicarum Christianarum Romae. The Early Christian Basilicas of Rome* (IV-IX cent.); Brandenburg, Hugo; Ballardini, Antonella; and Thoenes, Christof, *San Pietro. Storia di un Monumento*; Paolo Liverani, 'Saint Peter's and the city of Rome between Late Antiquity and the early Middle Ages', 21-34; Rosamond McKitterick; John Osborne; Carol M. Richardson and Joanna Story (eds.), *Old Saint Peter's, Rome* (Cambridge: Cambridge University, 2013)

[13] Regarding this *GDSU 11Ar* drawing by Peruzzi, see: Christoph Luitpold Frommel, *Architettura e Committenza, Da Alberti a Bramante* (Mantova: Leo S. Olschki, 2006), pp. 116-119; About *Peruzzi* projects for the new basilica of S. Peter is especially interesting: Arnaldo Bruschi, 'Le idee del Peruzzi per il nuovo San Pietro', in Arnaldo Bruschi, Christoph Luitpold Frommel, Franz Graf Wolff Metternich, Christof Thoenes (coords.), *San Pietro che non c'è: da Bramante a Sangallo il Giovane*, Cristiano Tessari (ed.), Cristiano (Milano: Electa, 1996), pp. 197-248

[14] Turpin C. Bannister, 'The Constantinian basilica of St. Peter al Roma', *Journal of the Society of Architecural Historians, JSAH* 27, no. 1 (1968), pp. 3-32

[15] *Alfarano* points out different measurements of the *old S. Peter*: Tiberio Alfarano, m.

1596, and Michele Cerrati, *Tiberii Alpharanii. De Basilicae Vaticanae Antiquissima et Nova Structura* (Roma: Tipografia Poliglotta Vaticana, 1914); Enzo Bentivoglio, "Tiberio Alfarano: Le piante del vecchio San Pietro sulla pianta del nuovo edita dal Dupérac", In *L'Architettura della Basilica di San Pietro Storia e Costruzione*, edited by Gianfranco Spagnesi (Roma: Bonsignori, 1997), pp. 247-254

[16] Richard Krautheimer, Spencer Corbett, Alfred K. Frazer, and Wolfgang Frankl (eds.), *Corpus Basilicarum Christianarum Romae. The Early Christian Basilicas of Rome* (IV-IX cent.), 5 vols. (Vatican City, 1937-77)

[17] This strategy has been widely used successfully, and documented in: Luis De Garrido, *Applications of Artificial Intelligence in the composition of architectural objects*. PhD. Thesis (Valencia: Universidad Politécnica de Valencia, 1989)

[18] Tertuliano, *Adversus Praxeam* (year 215). English translation: Peter Holmes (The Ante-Nicene Christian Library 15, 1870), pp. 333-409; reprinted (ANF 3, 1885), 597-627. Traducción en español: Julio Cesar Clavijo Sierra (2017)

[19] Kenneth Scott Latourette, *A history of Christianity*, with a new foreword and supplemental bibliographies by Ralph D. Winter (New York: HarperCollins Paperback, 1975)

[20] Turpin C. Bannister, *The Constantinian basilica of St. Peter al Roma*, pp. 3-32

[21] L. Bosman, '*Spolia* in the fourth-century basilica', pp. 65-80

[22] There are several floor plans of *Antonio da Sangallo the Younger* and *Peruzzi* in which a separation of 107 *palmi* between the 4 large crossing piers of *Bramante* is indicated, just as it was built. *Bramante* used an octagon for the integration of the dome with the main nave of the *old basilica of S. Peter*. And for the dome diameter to be 185 1/3 *palmi* (as it was finally built), the octagon side would necessarily have to be 107 *palmi* in dimension. In this regard, the following references can be consulted in general: Christoph L. Frommel, La chiesa di San Pietro sotto papa Giulio II alla luce di nuovi documenti, in Bruschi, A.; Frommel, C.L.; Wolff Metternich, F.G.; Thoenes, C. (coords.), *San Pietro che non c'è: da Bramante a Sangallo il Giovane*, Cristiano Tessari (ed.) (Milano: Electa, 1996), pp. 23-49; Christoph L. Frommel, Capella Iulia: la cappella sepolcrale di papa Giulio II nel nuovo San Pietro, in Bruschi, A.; Frommel, C.L.; Wolff Metternich, F.G.; Thoenes, C. (coords.), *San Pietro che non c'è: da Bramante a Sangallo il Giovane*, Cristiano Tessari (ed.) (Milano: Electa, 1996), pp. 85-118

[23] In order to know the different construction techniques used in the construction of the

old basilica of S. Peter, the following references are very useful: Richard Gem, 'From Constantine to Constans. The chronology of the construction of Saint Peter's basilica', p. 50; Hugo Brandenburg, 'L'antica basilica vaticana costantiniana di S. Pietro', pp. 9-34

[24] Richard Gem, 'From Constantine to Constans. The chronology of the construction of Saint Peter's basilica', p. 42

[25] Richard Gem, 'From Constantine to Constans. The chronology of the construction of Saint Peter's basilica', p. 54

[26] Tiberio Alfarano, m. 1596, and Michele Cerrati, *Tiberii Alpharanii. De Basilicae Vaticanae Antiquissima et Nova Structura*

[27] To know the details of the reform of the stairs and the access platform carried out by Pius II, see: Hugo Brandenburg, 'L'antica basilica vaticana costantiniana di S. Pietro', pp. 9-34; Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', p. 44

[28] Christoph Luitpold Frommel, *Architettura e Committenza, Da Alberti a Bramante*, (Mantova: Leo S. Olschki, 2006), pp. 116-117

[29] ASR, Camerale I, vol. 1503, f. 57v sg.

[30] Christoph Luitpold Frommel, *Architettura e Committenza, Da Alberti a Bramante*, pp. 116-117

[31] Christoph Luitpold Frommel, *Architettura e Committenza, Da Alberti a Bramante*, pp. 117-118

[32] Tiberio Alfarano, m. 1596, and Michele Cerrati, *Tiberii Alpharanii. De Basilicae Vaticanae Antiquissima et Nova Structura*

[33] John Capgrave, *Ye Solace of Pilgrimes. Una guida di Roma per i pellegrini del Quattrocento*, (written in the middle of the XV century), Introduzione e traduzione integrale a cura di Daniela Giosuè (Roma: Roma nel Rinascimento, 1995), p. 100

[34] Nikolaus Muffel, *Descrizione della città di Roma nel 1452. Delle indulgenze e dei luogi sacri di Roma (Der Ablas und die Heiligen Stet zu Rom),* G. Wiedmann (ed. And trans.) (Bologna, 1999), p. 47

[35] Christoph Luitpold Frommel, *Architettura e Committenza, Da Alberti a Bramante*, p. 117

[36] Christoph Luitpold Frommel, *Architettura e Committenza, Da Alberti a Bramante*, p. 118

[37] Tiberio Alfarano, m. 1596, and Michele Cerrati, *Tiberii Alpharanii. De Basilicae Vaticanae Antiquissima et Nova Structura*

[38] The exact relationship between the old red retaining wall -within which the apostle's tomb is said to have been- with the west wall of the transept of the *old S. Peter* can be seen exactly in: Richard Gem, 'From Constantine to Constans. The chronology of the construction of Saint Peter's basilica', p. 45

[39] Hugo Brandenburg, 'L'antica basilica vaticana costantiniana di S. Pietro', pp. 9-34

[40] Bruno Maria Apollonj Ghetti, Antonio Ferrua, Enrico Josi, Engelbert Kirschbaum, *Esplorazioni sotto la confessione di San Pietro in Vaticano eseguite negli anni 1940-1949*; A. Arbeiter, *Alt-St. Peter in Geschichte und Wissenschaft. Abfolde der Bauten, Reconstruktion, Architekturprogramm* (Berlin: Mann, 1988)

[41] Hugo Brandenburg, 'L'antica basilica vaticana costantiniana di S. Pietro', pp. 9-34

[42] Ann C. Hupert, 'Envisioning New St. Peter's. Perspectival Drawings and the Process of Design', *Journal of the Society of Architecural Historians, JSAH* 72, no. 2 (2013), pp. 166-188

[43] Domenico Fontana, *Della trasportatione dell'Obelisco vaticano et delle fabriche di nostro signore Papa Sisto V* (Roma: D. Basa, 1590)

[44] Giovanni Guerra made this fresco in the Palazzo Apostolico Vaticano, Biblioteca Sistina, sala II, in the year 1586, faithfully following an engraving that he made previously, in the same year 1586, together with Natale Bonifacio da Sebenico, (which is preserved in The British Museum, nº 1892,0714.41.

[45] Paul-Marie Letarouilly, *Le Vatican et la Basilique de Saint-Pierre de Rome* (Paris: VTE A. Morel et CIE Éditeurs, 1882)

[46] Luis De Garrido, *Applications of Artificial Intelligence in the composition of architectural objects*, PhD. Thesis, Escuela Técnica Superior de Arquitectura, Universidad Politécnica de Valencia (Valencia, 1989); Luis De Garrido, *Geometric relationships, dimensional deduction and sequential stages of the design process followed by Apollodorus of Damascus in the project of the Pantheon of Rome* (2020). Submitted and under review; Luis De Garrido, *Identification of the design process and the compositional mesh of the 'Vitruvian man', by Leonardo da Vinci. Applications for architectural design* (2020). Submitted and under review. Luis De Garrido, *Reconstruction of the stages of the design process and architectural definition of the project of the old basilica of Saint Peter in Vatican* (2020). Submitted and under review.

[47] The commonly accepted dimensions of the most important elements of *the old basilica of S. Peter* can be found in the following references: Jürgen Christern, 'Der Aufriß von Alt-St. Peter', *in Römische Quartalschrift*, 61 (1967), pp. 133-183; Jürgen

Christern, and Katharina Thiersch, 'Der Aufriß von Alt-St. Peter II, Ergänzungen zum Langhaus, Querschiffhöhe', in "*Römische Quartalschrift*", 64 (1969), pp, 1-34; Richard Krautheimer, Spencer Corbett, Alfred K. Frazer, and Wolfgang Frankl (eds.), *Corpus Basilicarum Christianarum Romae. The Early Christian Basilicas of Rome* (IV-IX cent.), 5 vols. (Vatican City, 1937-77), vol. V, pp. 251-256; Achim Arbeiter, *Alt-St. Peter in Geschichte und Wissenschaft. Abfolde der Bauten, Reconstruktion, Architekturprogramm* (Berlin: Mann, 1988), pp. 144-166. They indicate a dimension of 32 m. (143.24 *palmi*) for the height of the central nave, which basically coincides with the dimension deduced geometrically at this stage of 142 *palmi*.

[48] *Brandenburg* indicates that the *Arch of Constantine* had dimensions of 17 * 22 m, that is, 76 *palmi* * 98.47 *palmi* in: Hugo Brandenburg, L'antica basilica constantiniana di S. Pietro, in *San Pietro. Storia di un Monumento* (Milano: Jaca Book, 2015), p. 14). These dimensions basically coincides with the dimensions that have been deduced geometrically in this work. Previously it has been deduced that the width of the arch was 80 *palmi*, and at this stage it has been deduced that the height of the arch was 99 *palmi*

[49] Jürgen Christern, and Katharina Thiersch, 'Der Aufriß von Alt-St. Peter II, Ergänzungen zum Langhaus, Querschiffhöhe', in "*Römische Quartalschrift*", 64 (1969), pp. 1-34*;* Richard Krautheimer CBCR V, vol. V, pp. 251-263; Achim Arbeiter, *Alt-St. Peter in Geschichte und Wissenschaft. Abfolde der Bauten, Reconstruktion, Architekturprogramm*, pp. 144-154. These references indicate a height of 30 meters (134.28 *palmi*) for the maximum height of the roof deck of the transept and a height of 25 meters (111.90 *palmi*) for the height of the walls of the transept, which basically coincide with the geometrically deduced dimensions in this stage of 136.33 *palmi* and 114.33 *palmi* respectively.

[50] Hugo Brandenburg, 'Die Architektur der Basilika S. Paolo fuori le mura. Das Apostelgrab als Zentrum der Liturgie und des Märtyrerkultes', in *Römische Abteilungen*, 112 (2005/6), p. 240; Hugo Brandenburg, *Le prime chiese di Roma* (Milano: Jaca Book, 2013), p. 313; Richard Krautheimer CBCR V, vol. V, p.18

FIGURES 4

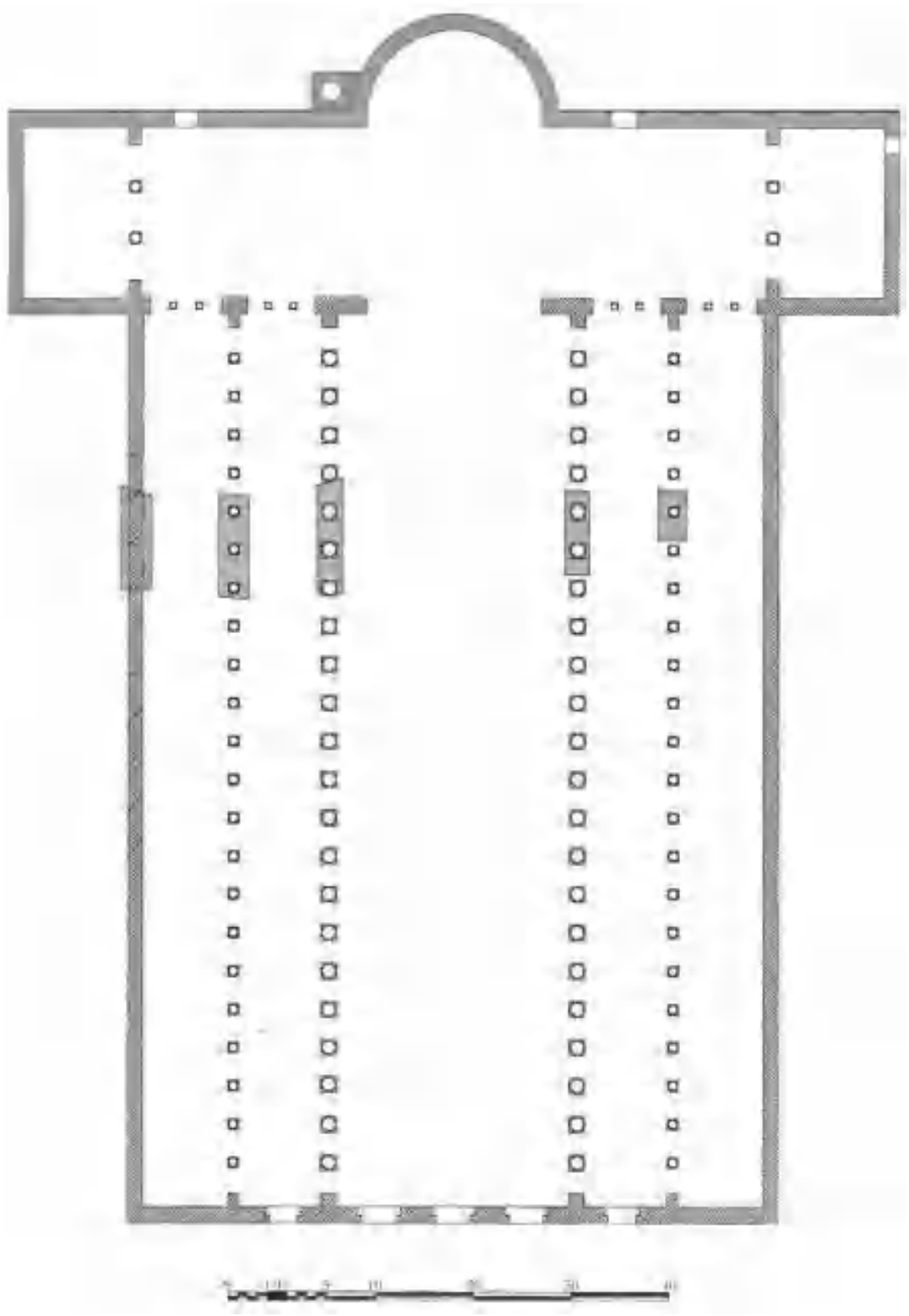


Figure 4.1

Plan of the Basilica with the features of the original walls detected by the excavations

K. Brandenburg from Apollonj Ghettiet al 1951

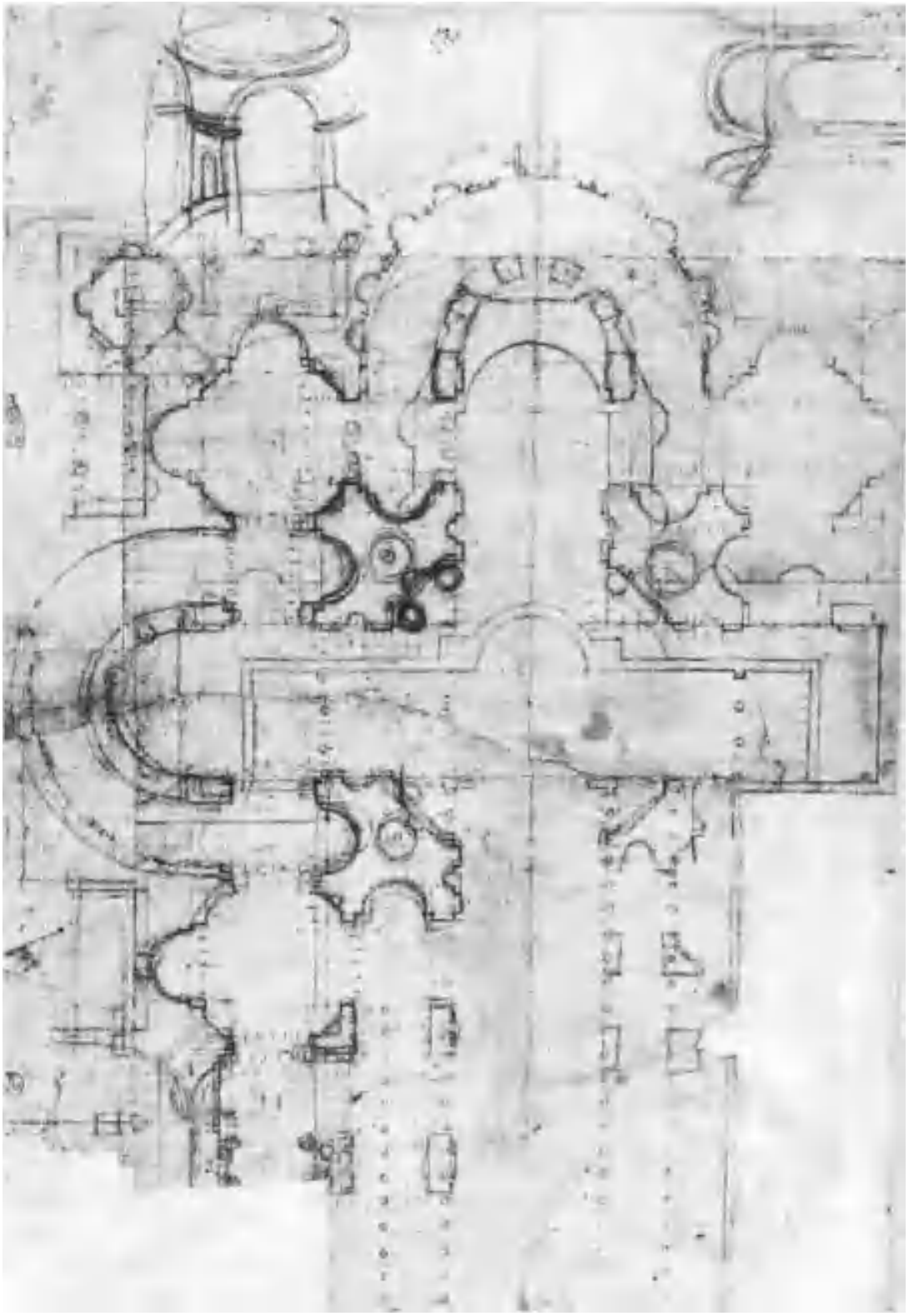


Figure 4.2

Three superimposed plans and two internal elevations for St. Peter's Basilica

Donato Bramante, autum-winter of 1505

GDSU 20 Ar

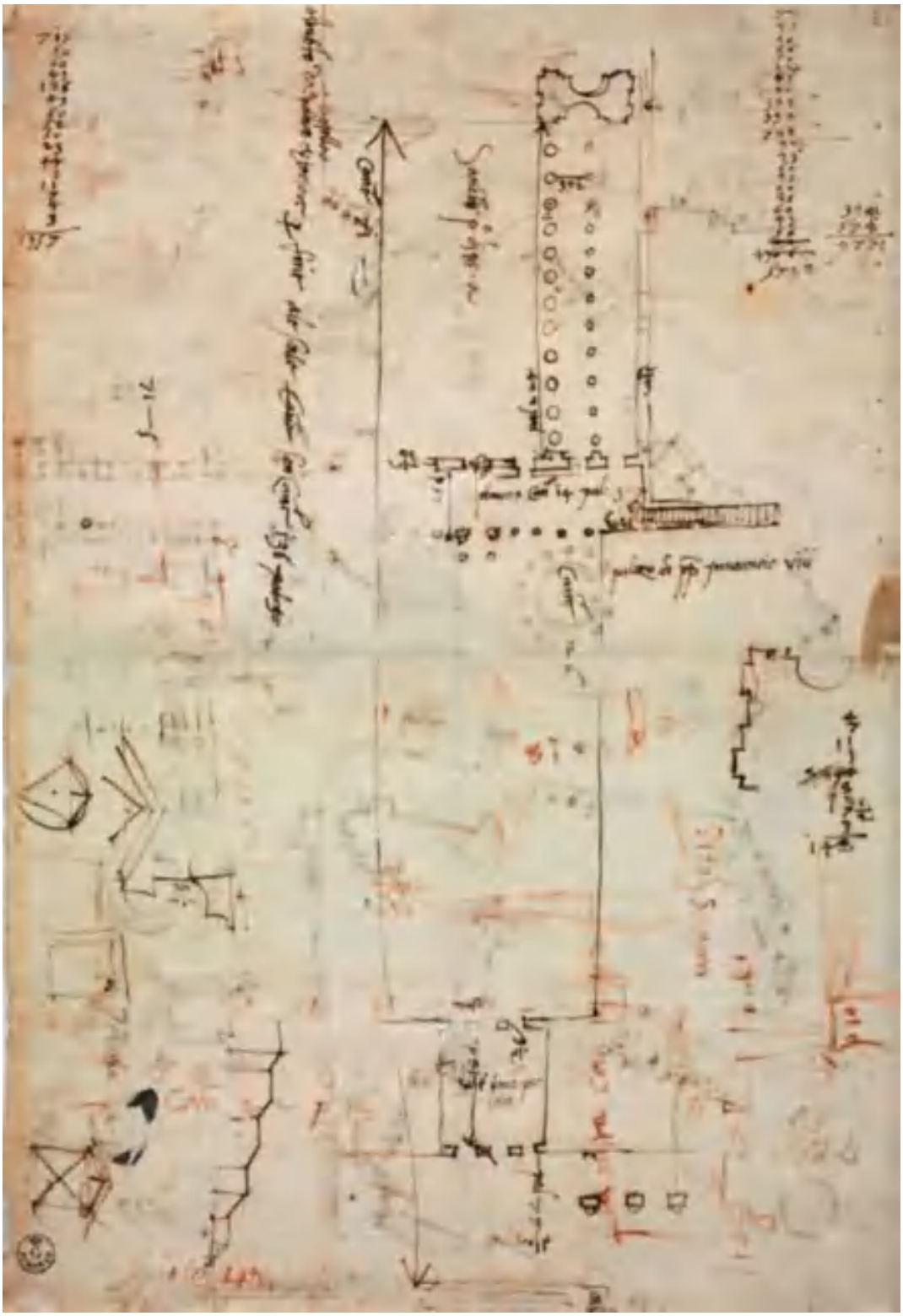


Figure 4.3

Sketch of a floorplan for S. Peter in Rome

Baldasarre Peruzzi (made in 1518 according to Luis de Garrido)

GDSU 11 Ar

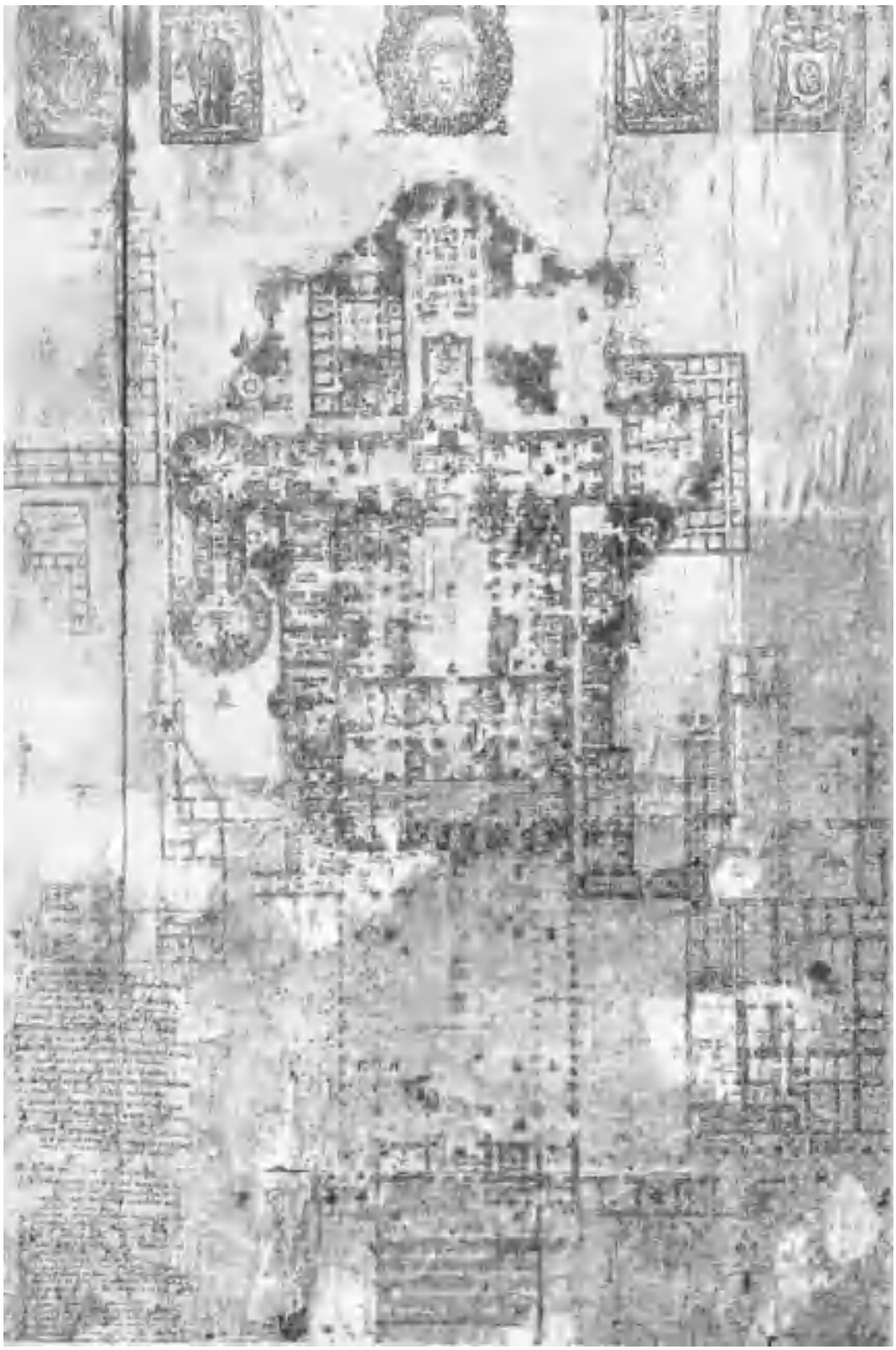


Figure 4.4

Ichonographia of the ancient basilica designed in 1571 by Tiberio Alfarano above the Michelangelo's plant of the new San Pietro

Historical archive of the Fabbrica di San Pietro

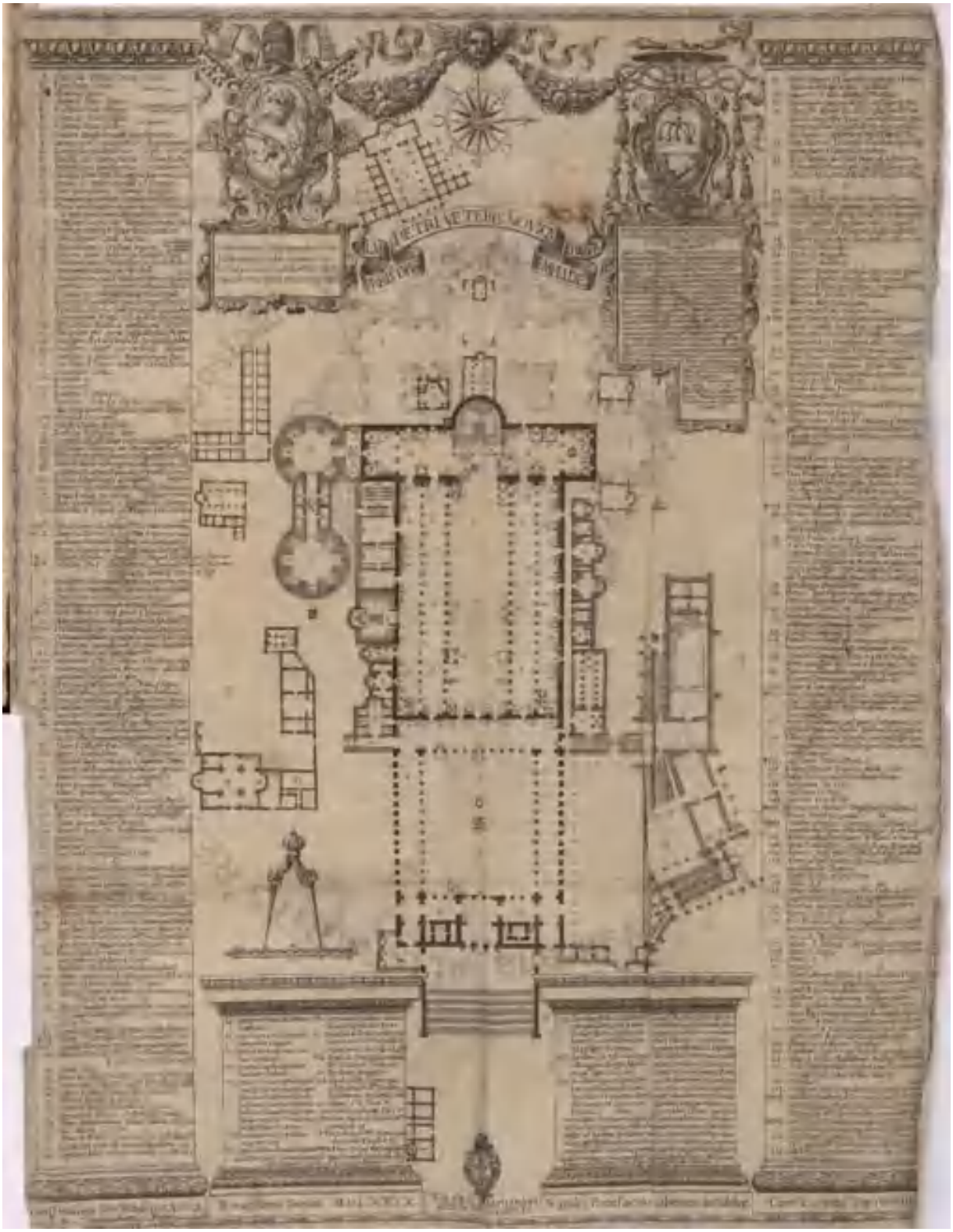


Figure 4.5

Plan of old S. Peter

Tiberio Alfarano and Natale Bonifacio da Sebenico, 1590

Biblioteca Apostolica Vaticana, Arch.Cap.S.Pietro.H.3, f. 206r

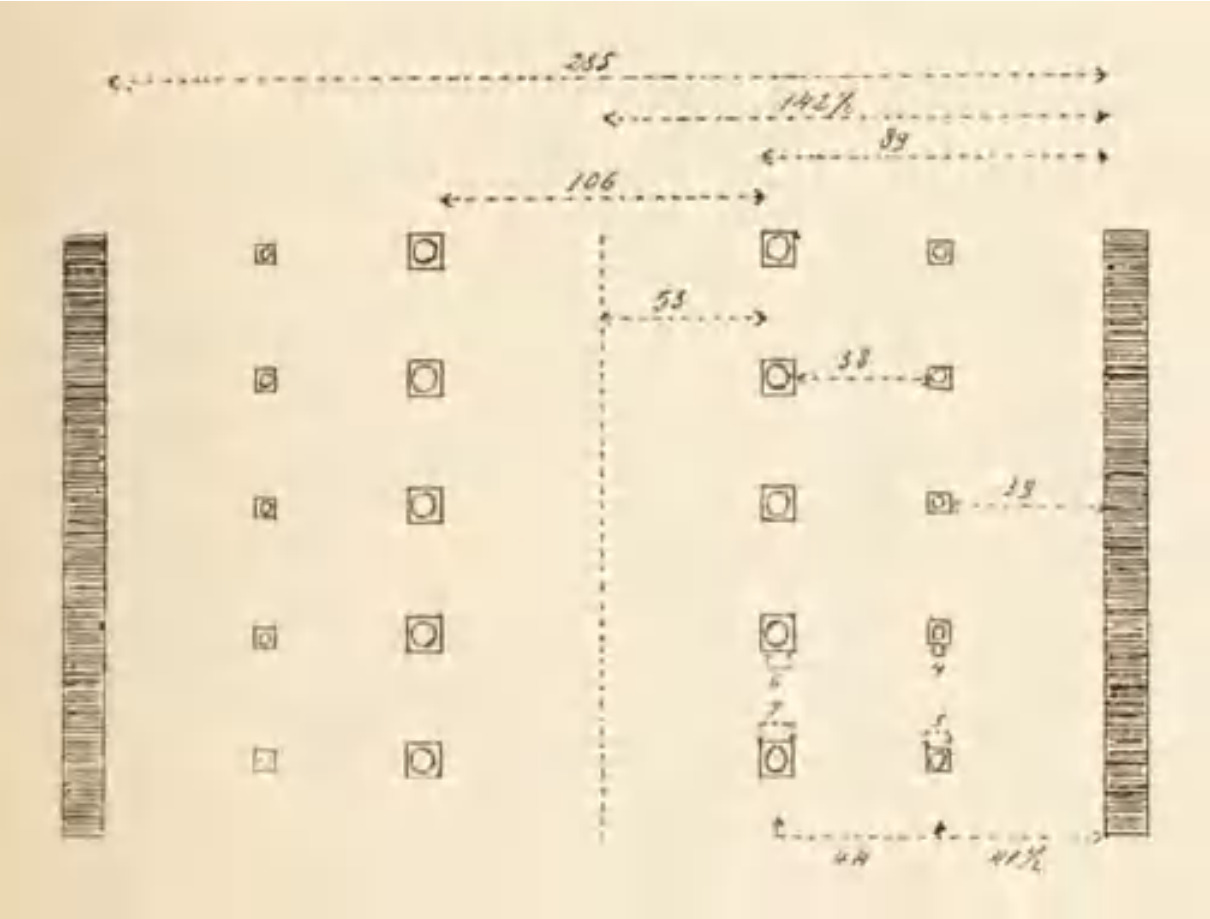


Figure 4.6

Summary of dimensions indicated by Alfarano, drawn by Cerrati

Michele Cerrati, 1914

Tiberio Alfarano; Michele Cerrati. *De Basilicae Vaticanae Antiquissima et nova structura*. Roma: Tipografia poliglotta vaticana, (1914), p. XXXV

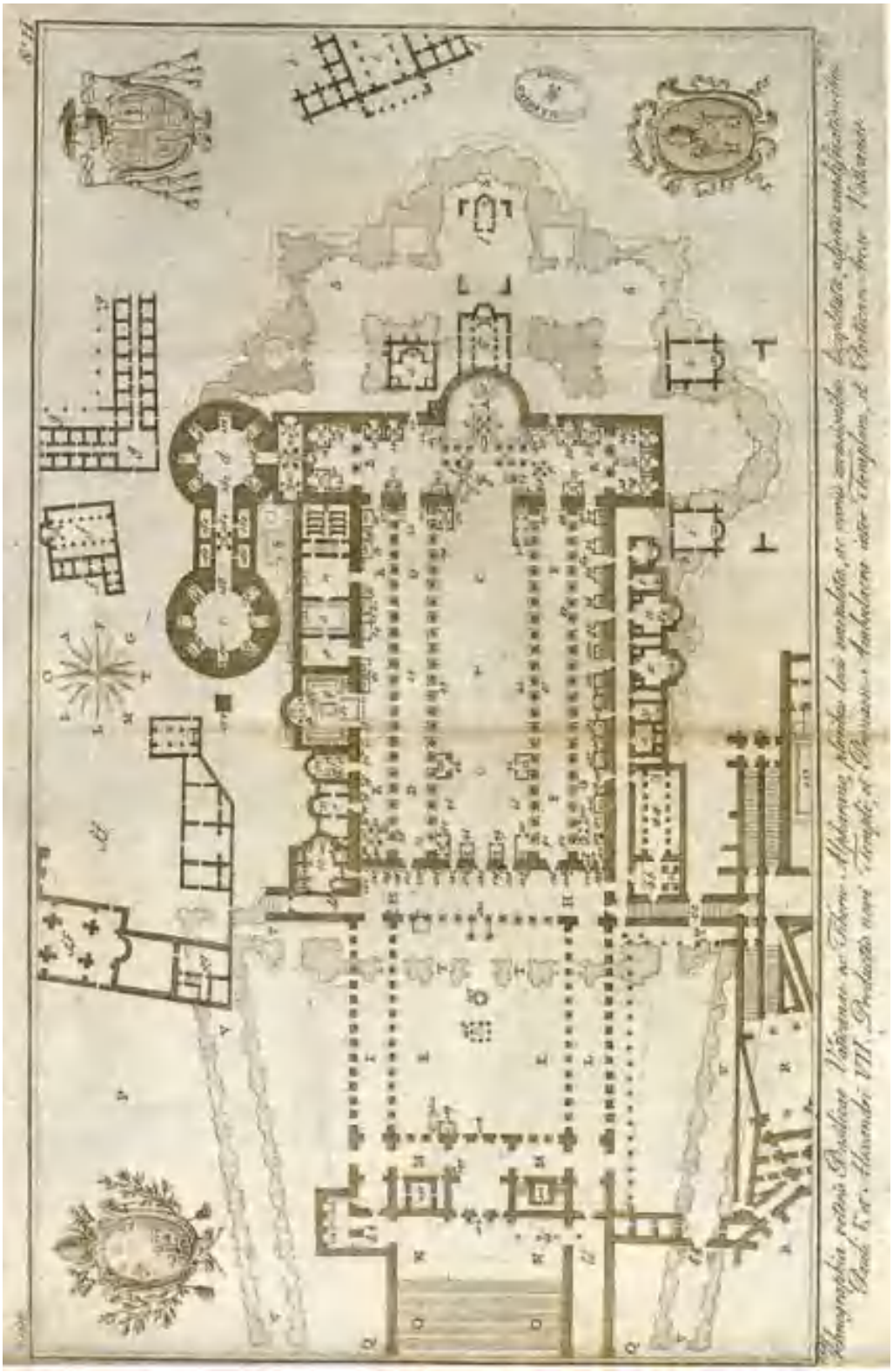


Figure 4.7

Plan of the ancient basilica of S. Pietro

Francesco Cancellieri, 1786

Francesco Cancellieri. *De secretariis novae Basilicae Vaticanae*, Liber II, vol. III, ex Officina Salvioniana ad lyceum sapientiae, Rome 1786, pag. 1616, tav. II

Detail

Figure 4.8

St. Peter's square. The work shows the conformation of the square and the building in front of the large atrium of the ancient basilica in relation to the Vatican palace. On the left, the facade is right, a small portion of the new Bramante building at the beginning of its construction

Maarten van Heemskerck, 1532-1534

Graphische Sammlung Albertina, nro. 31681

Figure 4.9

View of the basilica from the southeast, showing the obelisk and Santa Maria della Febbre

Maarten van Heemskerck, 1532-1536

Staatliche Museen zu Berlin, Kupferstichkabinett, no. 79 D 2 a, f. 22 verso

Figure 4.10

Interior view towards the left transept. In the heart of the Bramante building (in the center the tegurio above the tomb of Peter) still survive parts of the old building

Maerten van Heemskerck, 1536

Stockholm, Nationalmuseum, NMH, collection Anckarvärd, nro. NMH Anck 637

Detail

Figure 4.11

San Peter's square with the statue of Marco Aurelio

Maarten van Heemskerck, 1532-1536

Staatliche Museen zu Berlin, Kupferstichkabinett, nro. 79 D 2 a, f. 53 recto

Figure 4.12

View of the northern side of St. Peter from the Vatican; the detail of the counter piers, visible in front of the dividing wall of the Constantinian Basilica

Maarten van Heemskerck, 1541

Staatliche Museen zu Berlin, Kupferstichkabinett, nro. 79 D 2, f. 15 verso

Figure 4.13

Interior of the old Basilica, with the new building in sight

Maarten van Heemskerck, 1534-1535

Staatliche Museen zu Berlin, Kupferstichkabinett, nro. 79 D 2 a, f. 52 recto

Figure 4.14

View of the basilica from the south-west (from the apse). On the left is visible the choir of Julius II built by Bramante. Through the arched windows you can recognize, inside, one of the great parasite bramantesche of the pillars of the dome. Outside the building is divided by pairs of parasite very thin, always bramantesche. Between the pillars of the dome is also bramantesca the formwork of the cross arch. Still visible on the right, the ancient longitudinal body of the basilica, the ancient mausoleum of San Andrea and the medieval bell tower. According to Karel Van Mander, Coecke made a trip to Italy between 1525 and 1526. Bottom right in pencil: Briquet 761 / year: 1533, lower #153

Pieter Coecke van Aelst, 1525-1526

Biblioteca Apostolica Vaticana, cod. Ashby 329 r-v

Figure 4.15

Facade of the Ancient Basilica of Saint Peter in Rome

Domenico Tasselli da Lugo, 1609

Biblioteca Apostólica Vaticana, Arch. Cap. S.Pietro A.64, ter 025, f. 10r

Figure 4.16

The interior of the Ancient Basilica of Saint Peter in Rome. Section of the hall of the ancient S. Pietro up to the partition wall of Paolo III

Domenico Tasselli da Lugo, 1500-50

Biblioteca Apostólica Vaticana, Arch. Cap. S.Pietro A.64, ter 029, f. 12r

Figure 4.17

Partition wall of Paolo III erected in 1538 between the old S. Peter and the new building site

Domenico Tasselli da Lugo, 1538

Biblioteca Apostólica Vaticana, Arch. Cap. S.Pietro A.64, ter 039, f. 17r

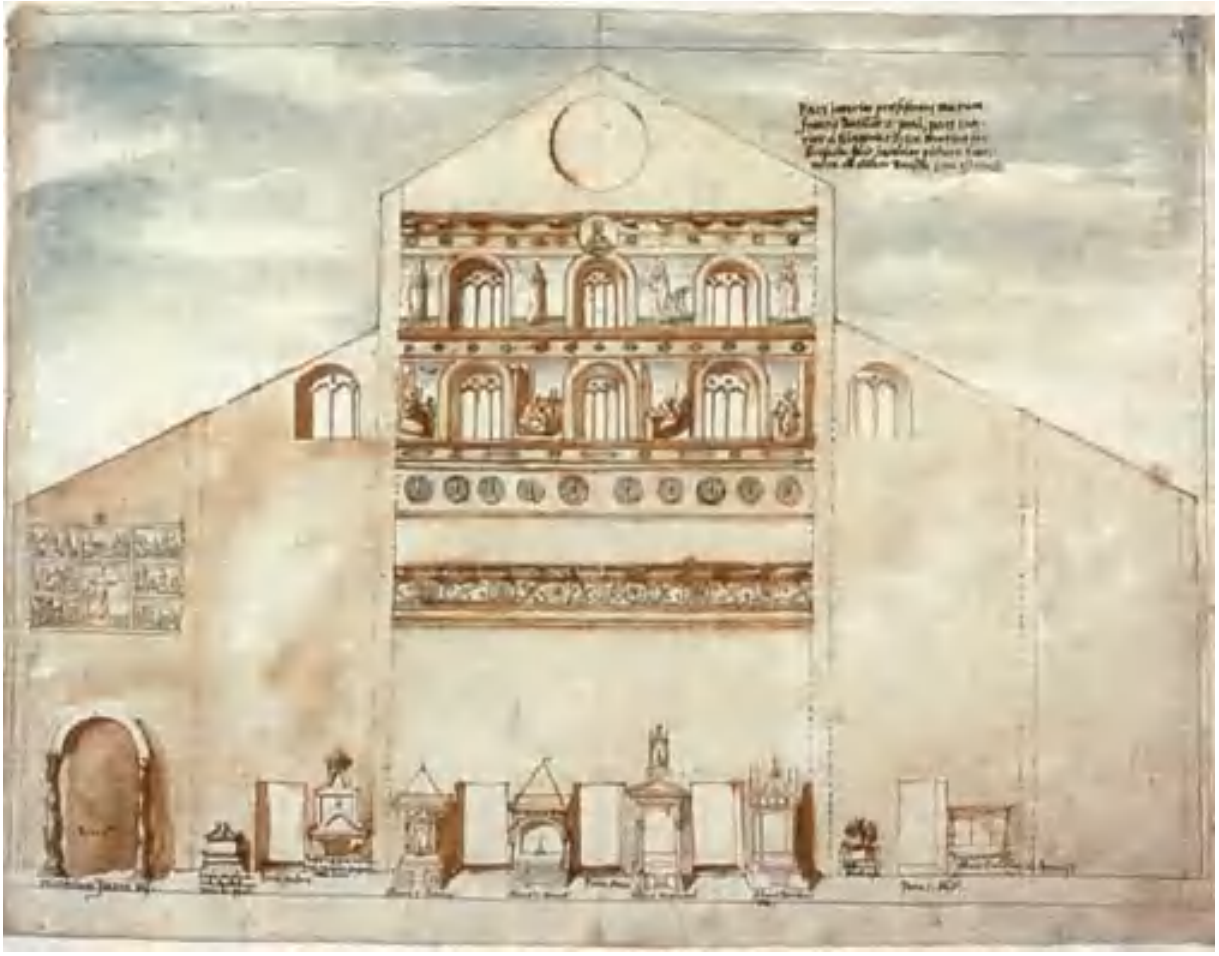


Figure 4.18

The counter-facade of the ancient S. Pietro with the five doors of the basilica.

Watercolour drawing of the inner facade of old St. Peter's Basilica

Domenico Tasselli da Lugo, 1600-1610

Biblioteca Apostólica Vaticana, Arch. Cap. S.Pietro A.64, ter 041, f. 18r

Figure 4.19

Construction of the dome of the basilica of S. Peter, in front of it the longitudinal body of the Constantinian church and the atrium

Giovanni Antonio Dosio, 1569 (?)

GDSU 2555 A

Figure 4.20

The Obelisk of Cesare in S. Peter's square in Rome with surrounding buildings

Giovanni Antonio Dosio, 1569

GDSU 2536 A

Figure 4.21

The front of Santa Maria in Turri and the access passages to the atrium of San Peter

Giacomo Grimaldi, XVII century

Biblioteca Apostolica Vaticana, Arch. Cap. S.Pietro, H. 2, f. 62r

Figure 4.22

Atrium of old St. Peter

Giacomo Grimaldi, XVII century

Biblioteca Apostolica Vaticana, Barb. Lat 2733 fig. 133 v and 134 r

Figure 4.23

Sketch of the interior of S. Peter's internal side during its reconstruction, showing the temporary placement of some of the papal tombs

Giacomo Grimaldi, late 16th century

Biblioteca Apostolica Vaticana, Barb. Lat. 2733, f. 115v and 116r

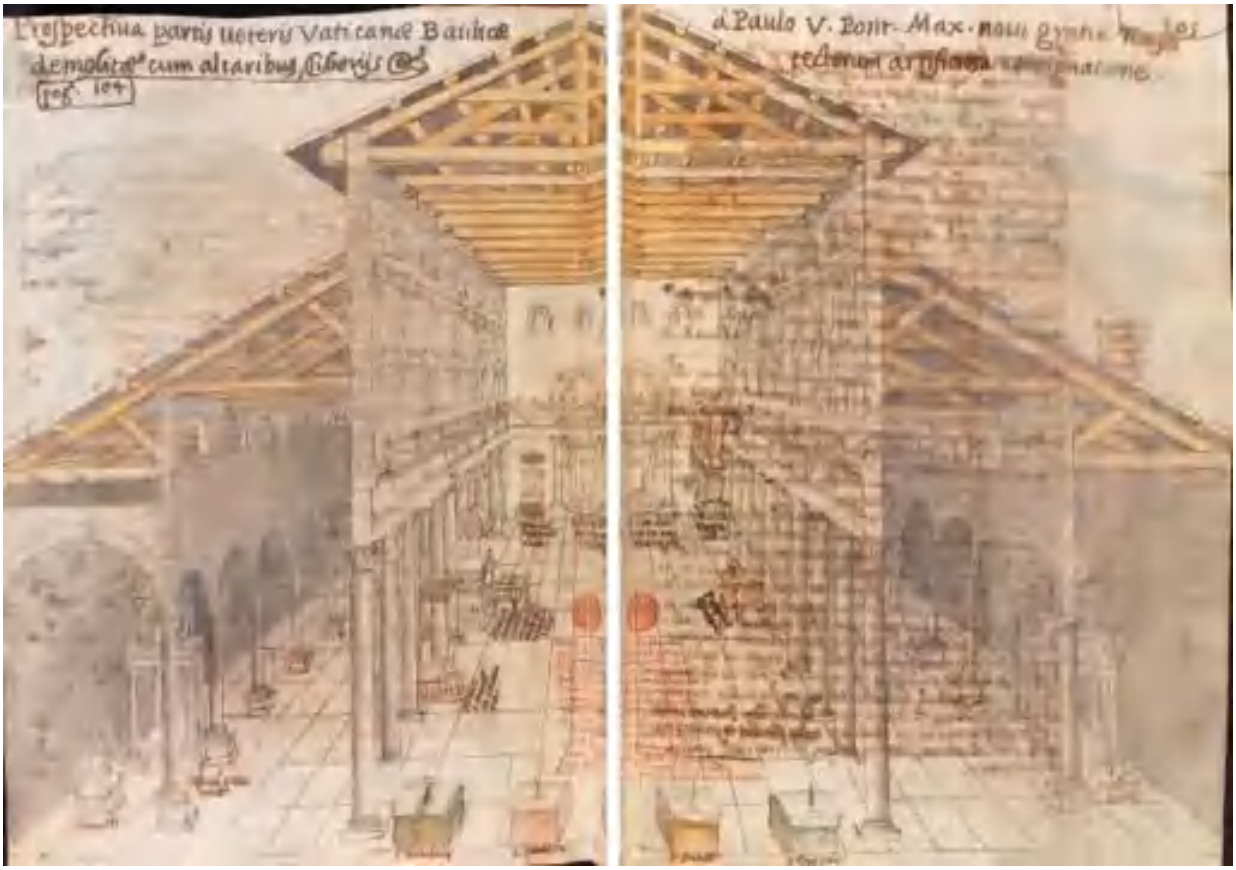


Figure 4.24

Old St. Peter's interior

Giacomo Grimaldi, 17th century

Biblioteca Apostolica Vaticana, Barb. Lat 2733, f. 104 v and 105 r

Figure 4.25

The transport of the Vaticano obelisk, engraving

Natale Bonifacio da Sebenico and Giovanni Guerra, 1586

The British Museum, nro. 1892,0714.41

Detail

Figure 4.26

La Donazione di Costantino. In this work is reproduced the basilica in the sixth century, in wich is visible the transformation of the altar of the apostle, wich was partially disassembled and whose columns vitinee were aligned on the source of the podium and crowned by a beam

Giulio Romano (Scuola di Raffaello), 1520-1524

Musei Vaticani, Stanze di Raffaello

Detail

Figure 4.27

La traslazione di san Gregorio Nazianzeno. Fresco

A. Tempesta and M. Bril, ca. 1580

Palazzo Apostolico Vaticano, III Loggia Nord

Figure 4.28

Veduta della Fabbrica nuova e dell'antico S. Pietro al tempo del trasferimento dell'obelisco. Behind the body in front of the atrium of the ancient basilica income the drum of the dome

Fresco by Giovanni Guerra, 1586

Palazzo Apostolico Vaticano, Biblioteca Sistina, II sala

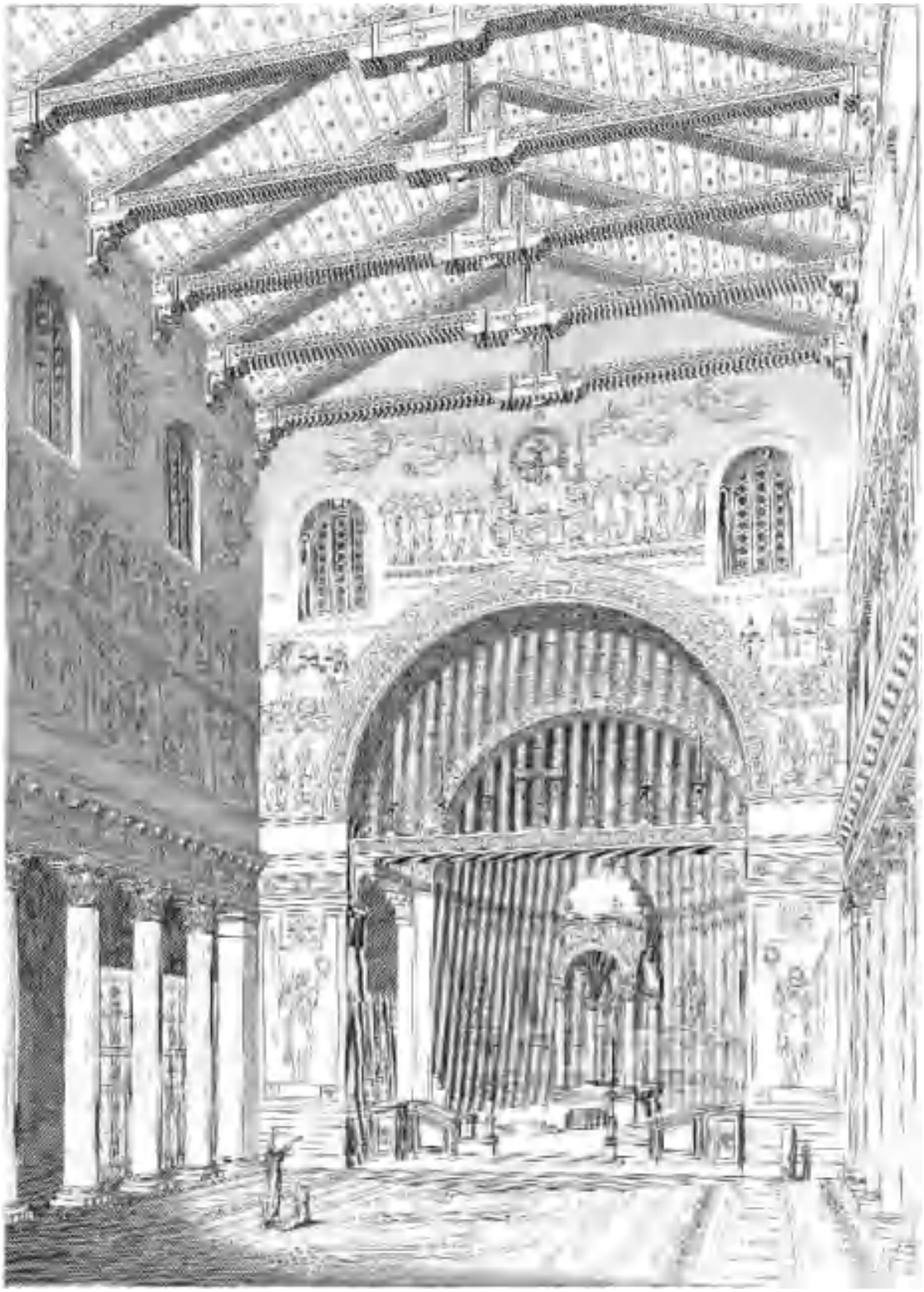


Figure 4.29

Interior view of Old San Pietro, restauration by Constantino, in the year 326

Paul Marie Letarouilly, 1882

Letarouilly, Paul Marie. *Le Vatican et la basilique de Saint-Pierre de Rome*, vol.1, Paris (1882). Cap. Ancienne Basilique de Saint-Pierre, PL3

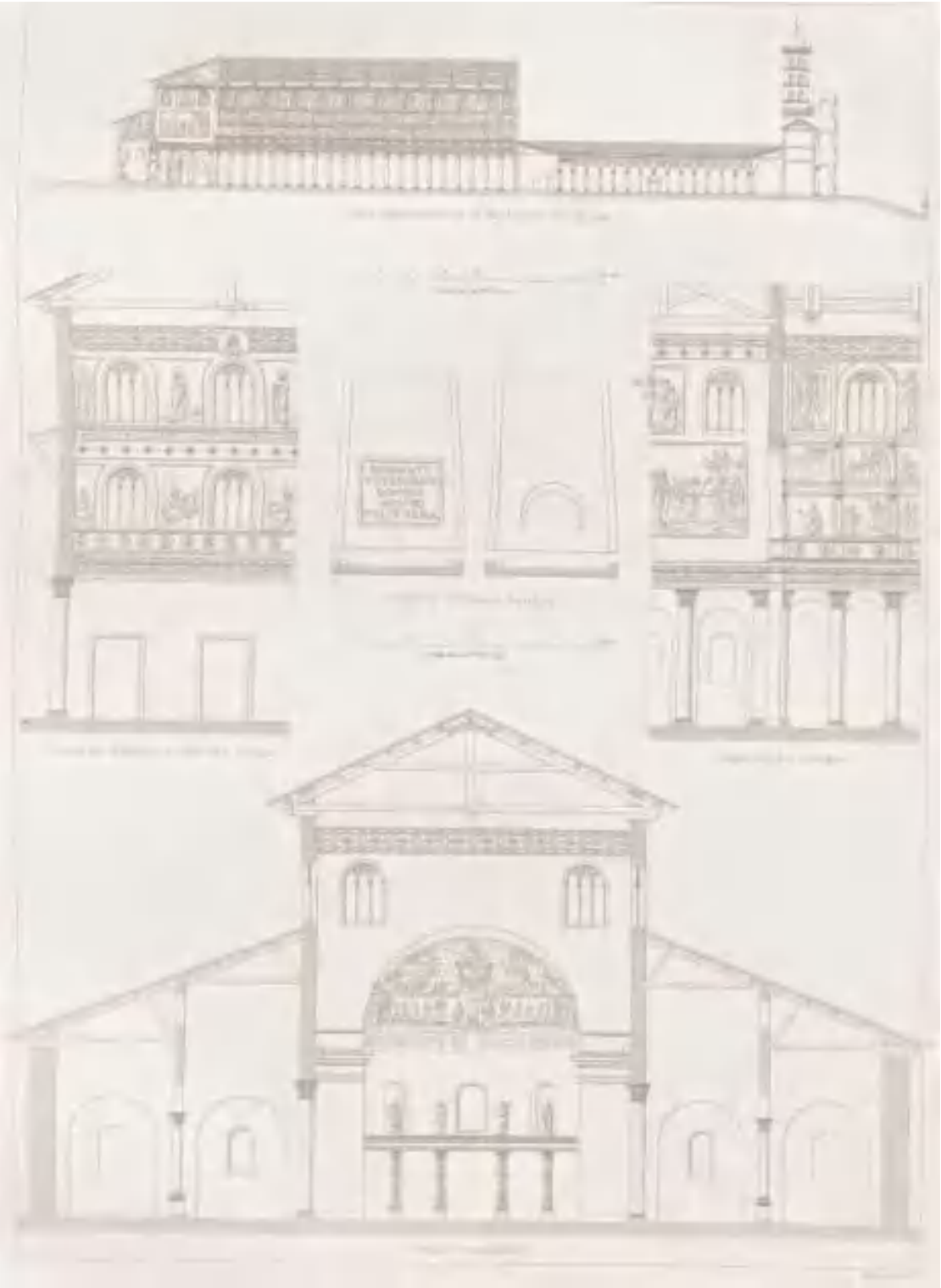


Figure 4.30

Longitudinal and transverse section of the Basilica. Section of the Triumphal arch and the atrium, in the year 326

Paul Marie Letarouilly, 1882

Letarouilly, Paul Marie. *Le Vatican et la basilique de Saint-Pierre de Rome*, vol.1, Paris (1882). Cap. Ancienne Basilique de Saint-Pierre, PL5

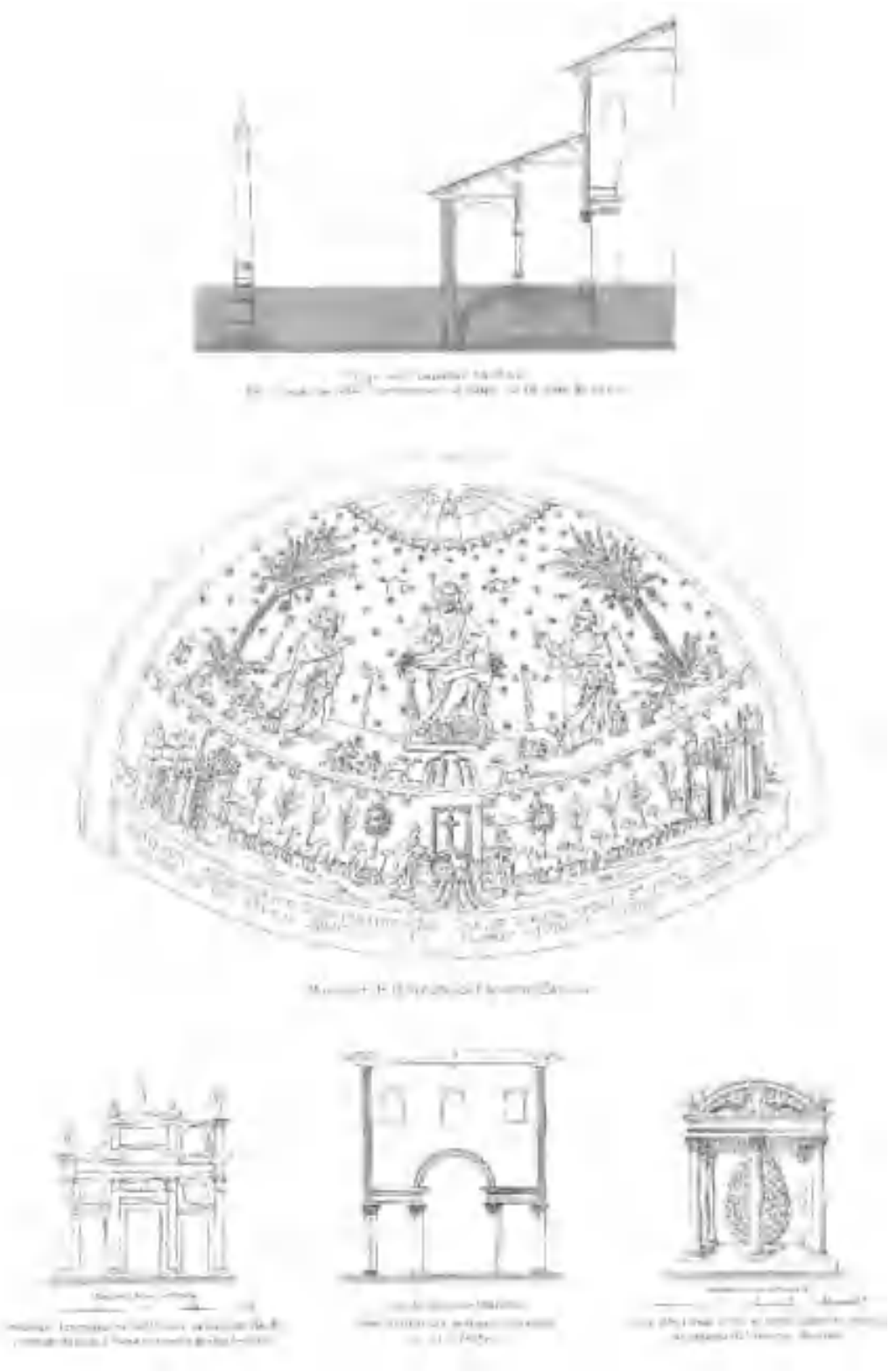


Figure 4.31

Ancient Basilica of S. Peter in Rome, between the years 300-350

Paul Marie Letarouilly, 1882

Letarouilly, Paul Marie. *Le Vatican et la basilique de Saint-Pierre de Rome*, vol.1, Paris (1882). Cap. Ancienne Basilique de Saint-Pierre, PL7

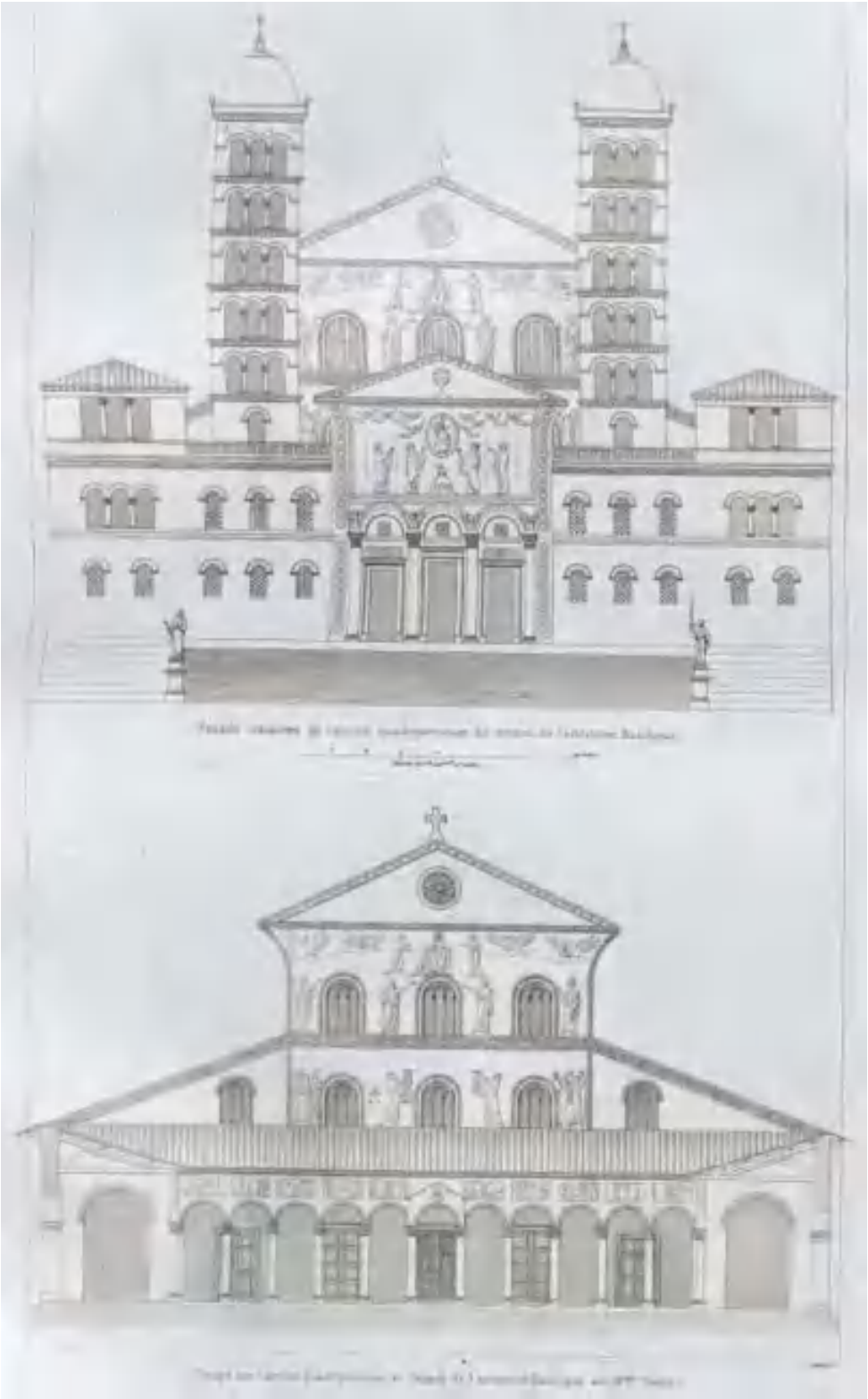


Figure 4.32

Ancient Basilica of S. Peter in Rome. IV- XVI century

Paul Marie Letarouilly, 1882

Letarouilly, Paul Marie. *Le Vatican et la basilique de Saint-Pierre de Rome*, vol.1, Paris (1882). Cap. Ancienne Basilique de Saint-Pierre, PL6

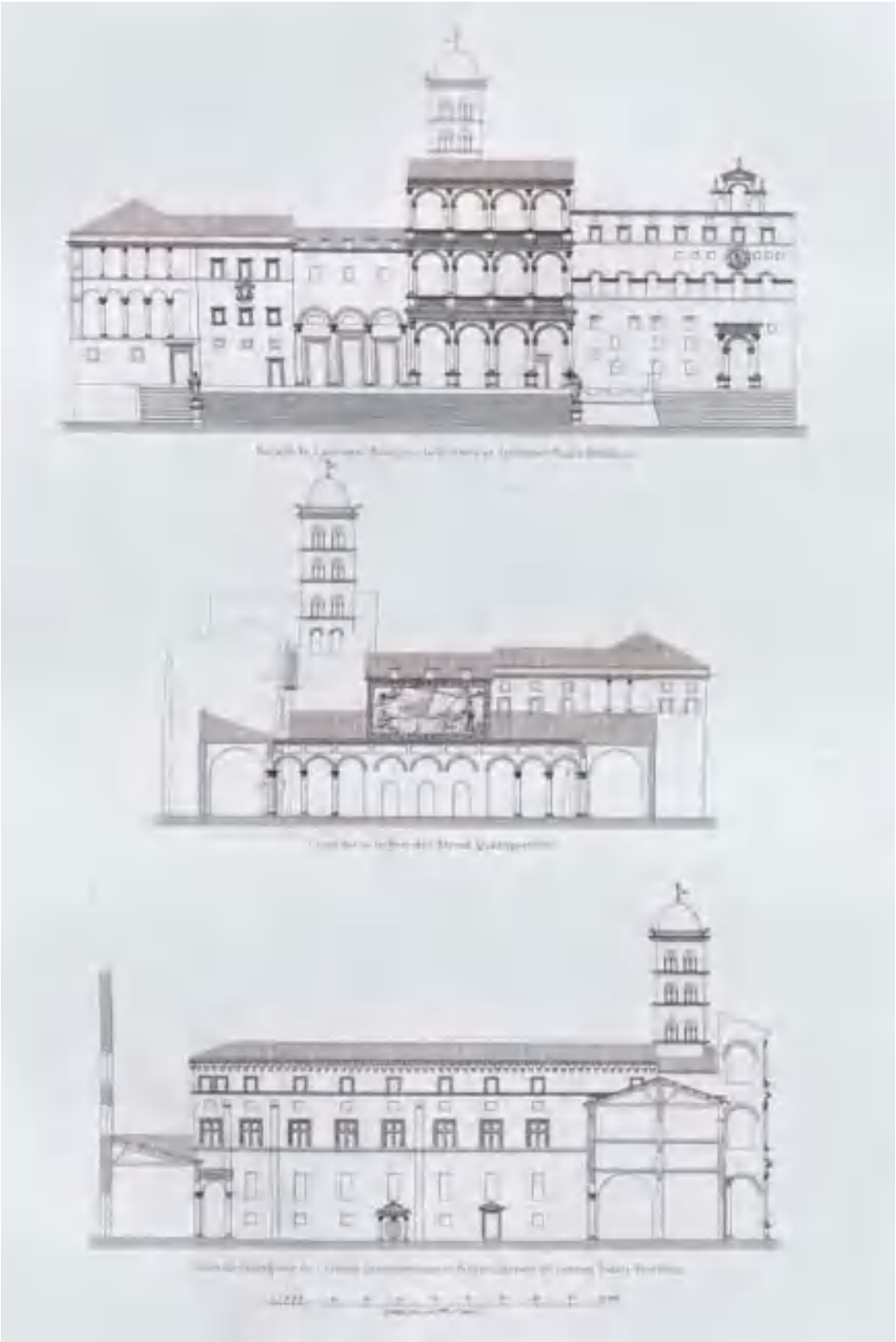


Figure 4.33

Ancient Basilica of S. Peter in Rome. IV- XVI century

Paul Marie Letarouilly, 1882

Letarouilly, Paul Marie. *Le Vatican et la basilique de Saint-Pierre de Rome*, vol.1, Paris (1882). Cap. Ancienne Basilique de Saint-Pierre, PL8

Figure 4.34

Ancient Basilica of S. Peter in Rome, IV – XVI century

Paul Marie Letarouilly, 1882

Letarouilly, Paul Marie. *Le Vatican et la basilique de Saint-Pierre de Rome*, vol.1, Paris (1882). Cap. Ancienne Basilique de Saint-Pierre, PL1

Figure 4.35

Ancient Basilica of Saint Pietro in Rome, in 1558

Paul Marie Letarouilly, 1882

Letarouilly, Paul Marie. *Le Vatican et la basilique de Saint-Pierre de Rome*, vol.1, Paris (1882). Cap. Ancienne Basilique de Saint-Pierre, PL9

Figure 4.36

Sketch of ancient columns of Saint Peter in Rome

Baldassarre Peruzzi, 1515-1520

GDSU 108 Ar

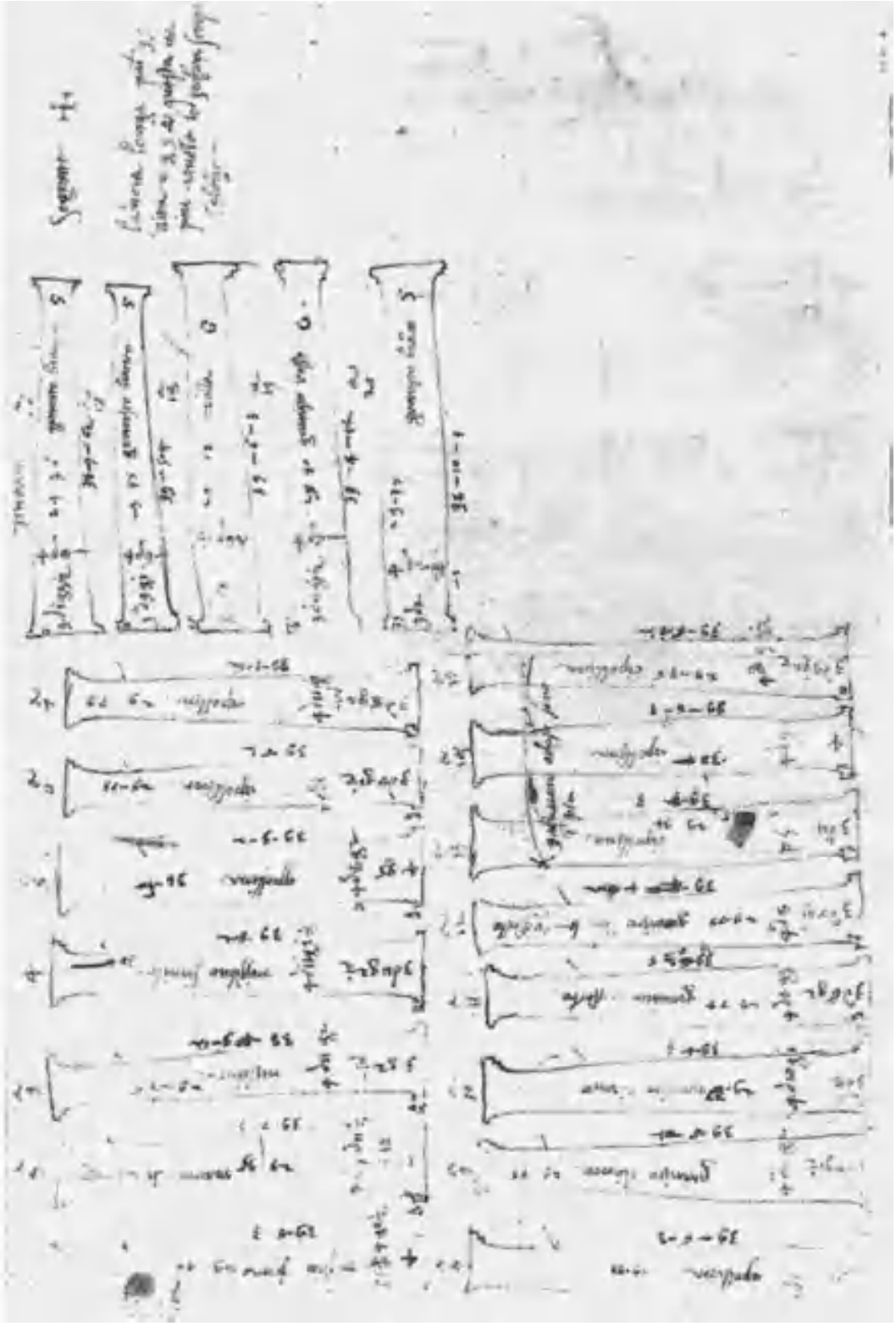


Figure 4.37

Sketch of ancient columns of Saint Peter in Rome

Baldassarre Peruzzi, 1515-1520

GDSU 108 Av

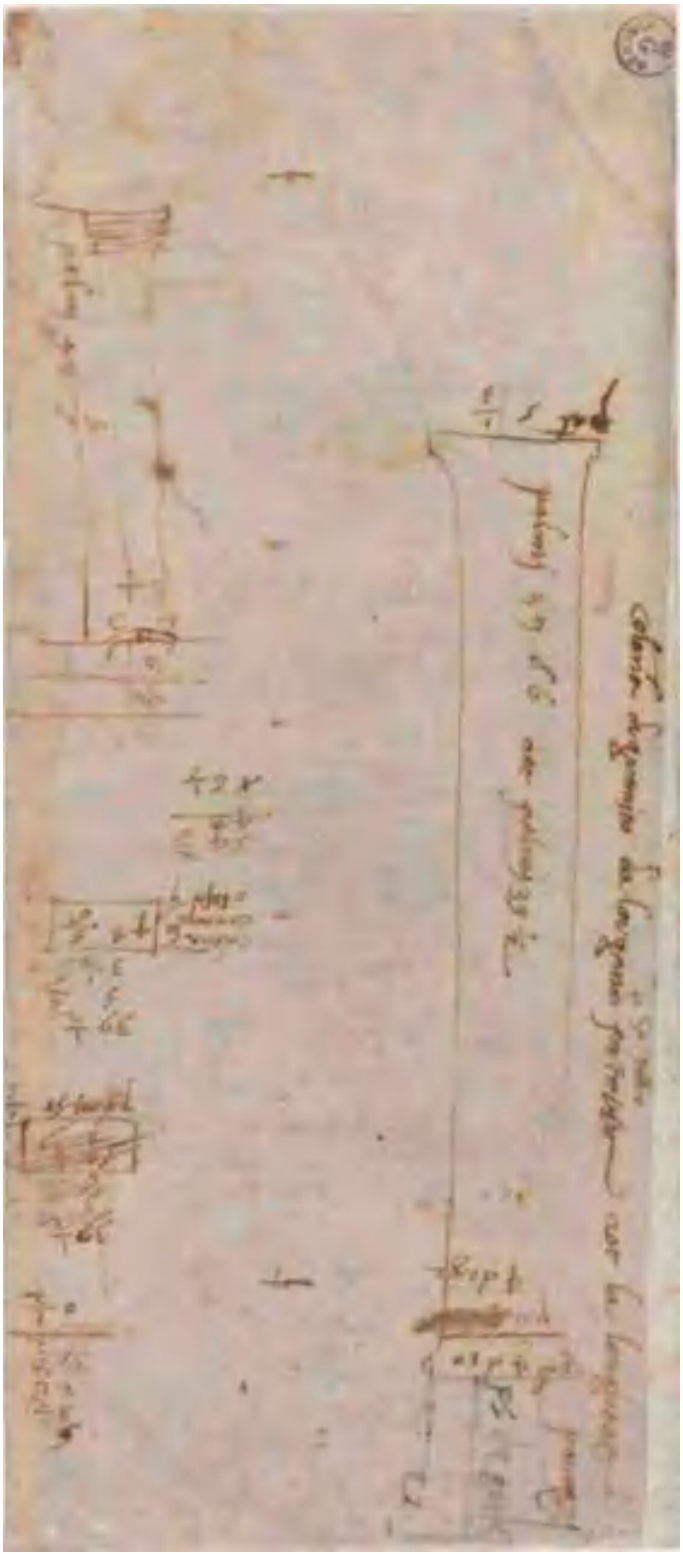


Figure 4.38

Sketch of a column

Baldassarre Peruzzi, 1515-1520

GDSU 120 Ar

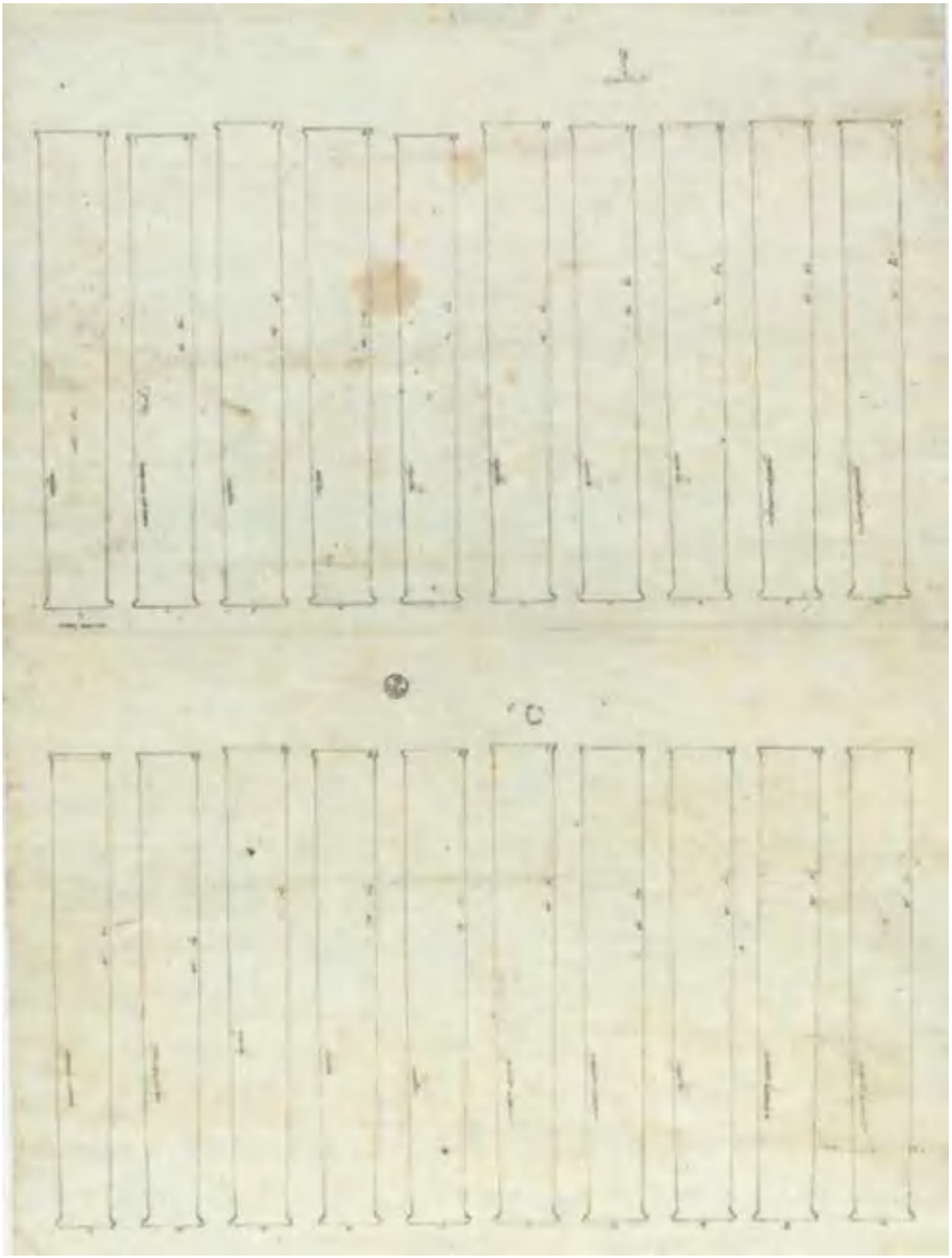


Figure 4.39

Drawing of the columns of the Constantinian basilica

Cordini Giovan Battista called Giovan Battista da Sangallo il Gobbo, 1515-1520

GDSU 1079 Ar

Figure 4.40

Twenty ancient columns existing in the church of San Peter in Rome

Cordini Giovan Battista called Giovan Battista da Sangallo il Gobbo, 1515-1520

GDSU 1079 Av

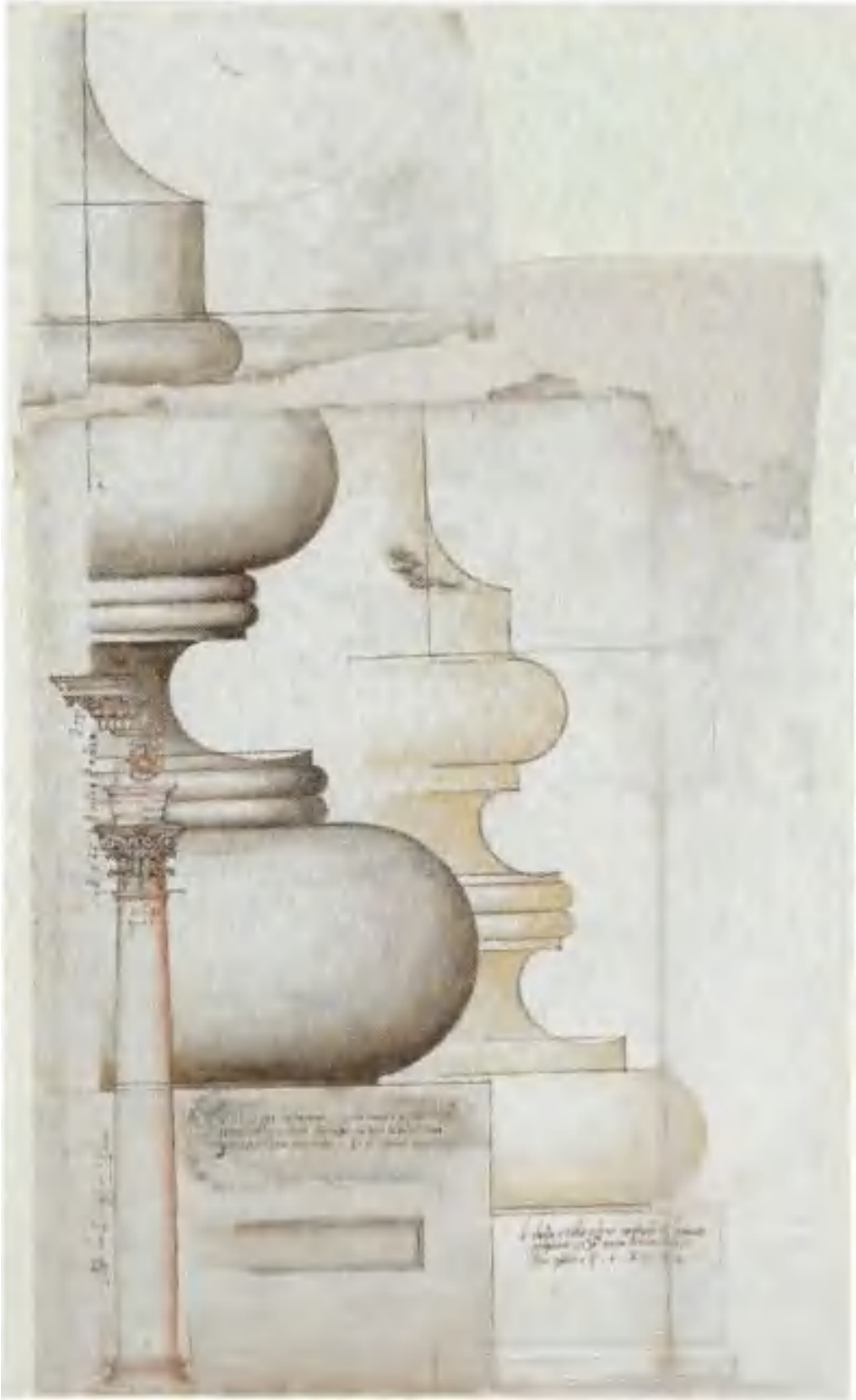


Figure 4.41

A drawing of two bases of the colonnades, a column with a capital and a trabeation trunk of the Old basilica of S. Peter

Alberto Alberti, 1526-1599

Rome, Istituto Nazionale della Grafica, nro. 2402, f. 9r

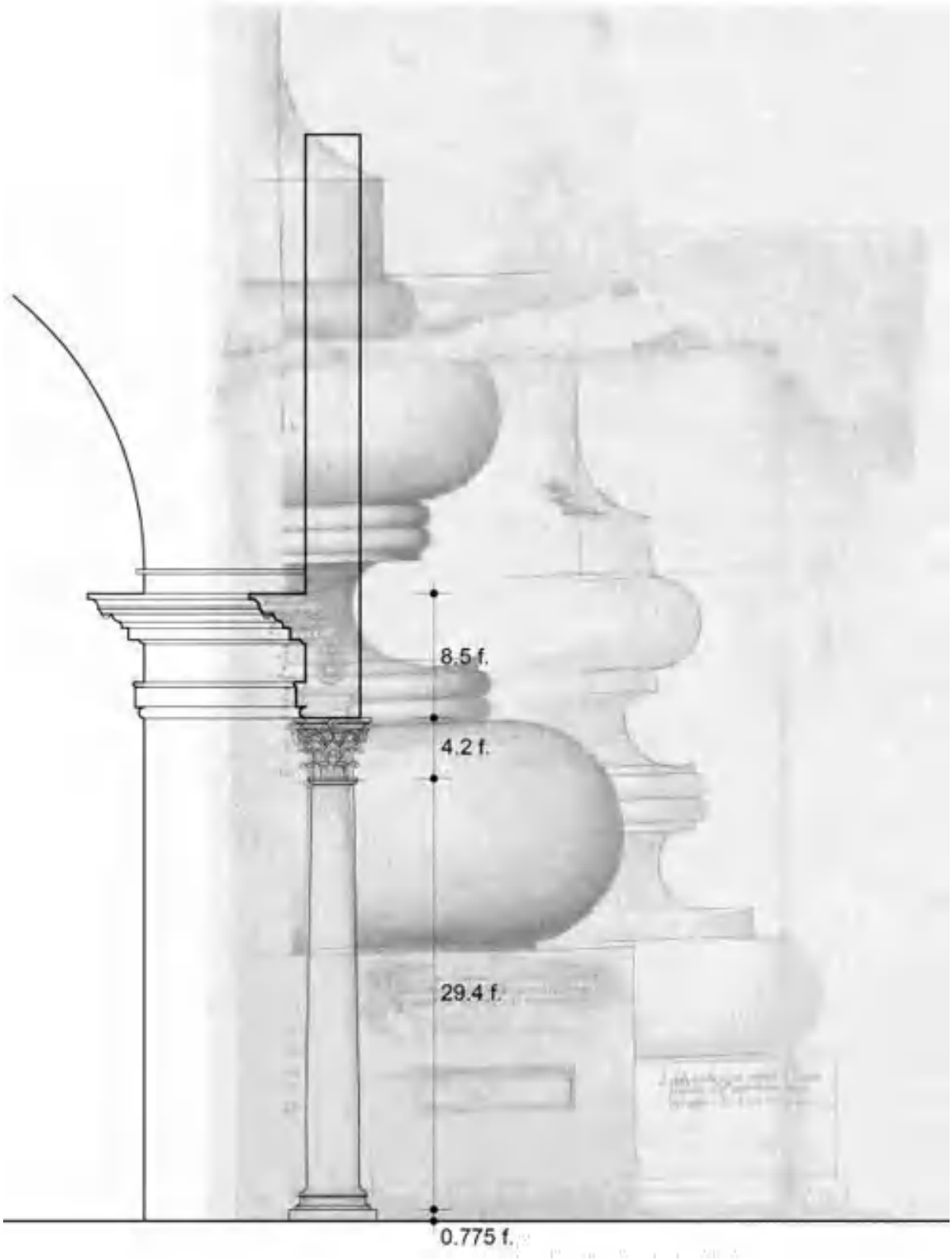


Figure 4.42

Reconstruction of the dimensions of the columns and architraves

Drawing by Luis de Garrido, 2020

Figure 4.43

Base of the eleventh column of the northern colonnade of the median nave in situ

Vatican Grottoes (Fabbrica di San Pietro, photo of the excavations)

Figure 4.44

Base of the eleventh column of the colonnade of the northern secondary naves in situ

Vatican Grottoes (Fabbrica di San Pietro, photo of the excavations)

Figure 4.45

The northern colonnade from the eleventh column to the counter-facade; the frieze with the clipeate portraits of the popes; the paintings of the old testament; Giotto's angel and the figures of prophets between the windows with gothic tracery

Domenico Tasseli da Lugo, 1605

Biblioteca Apostolica Vaticana, Arch. Cap. S.Pietro A. 64 ter, f.13

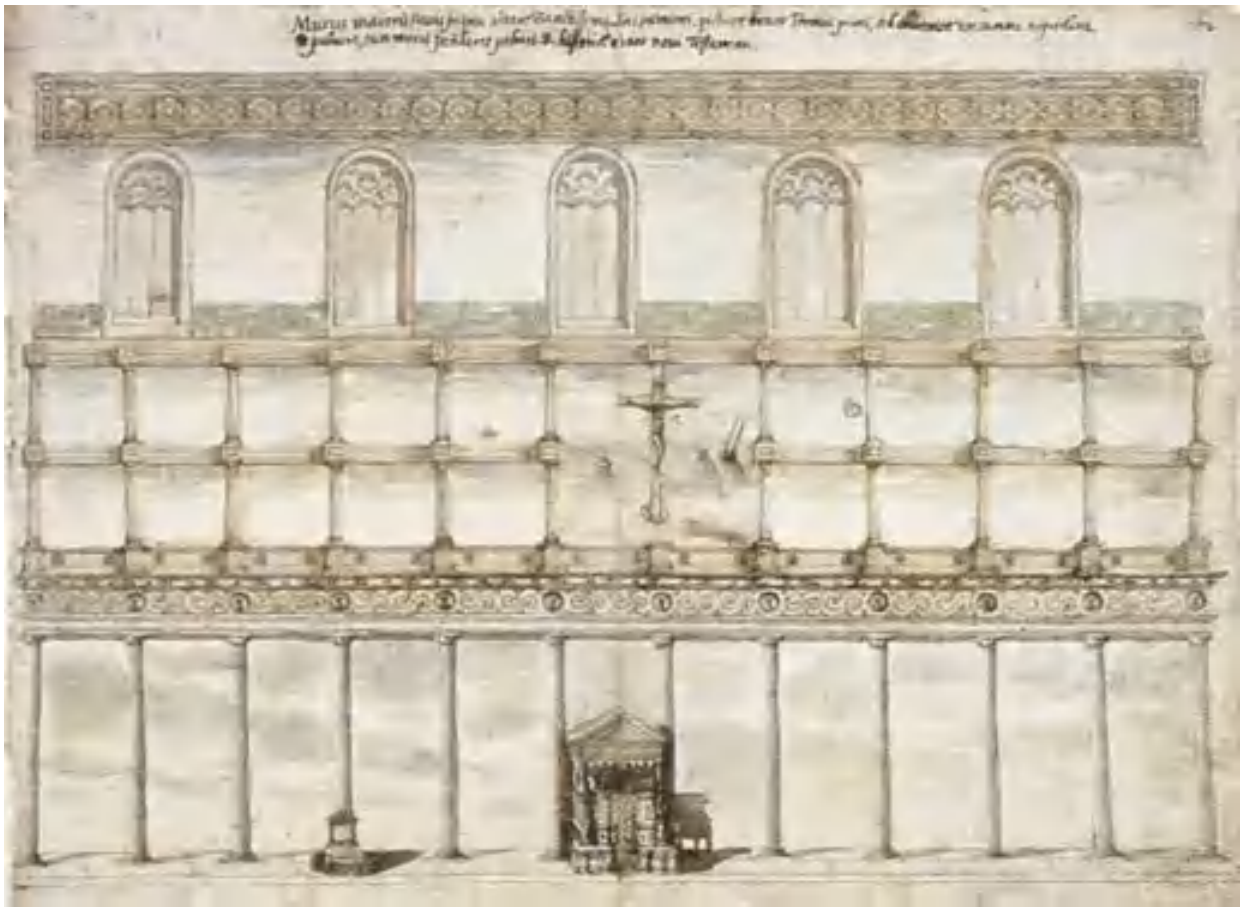


Figure 4.46

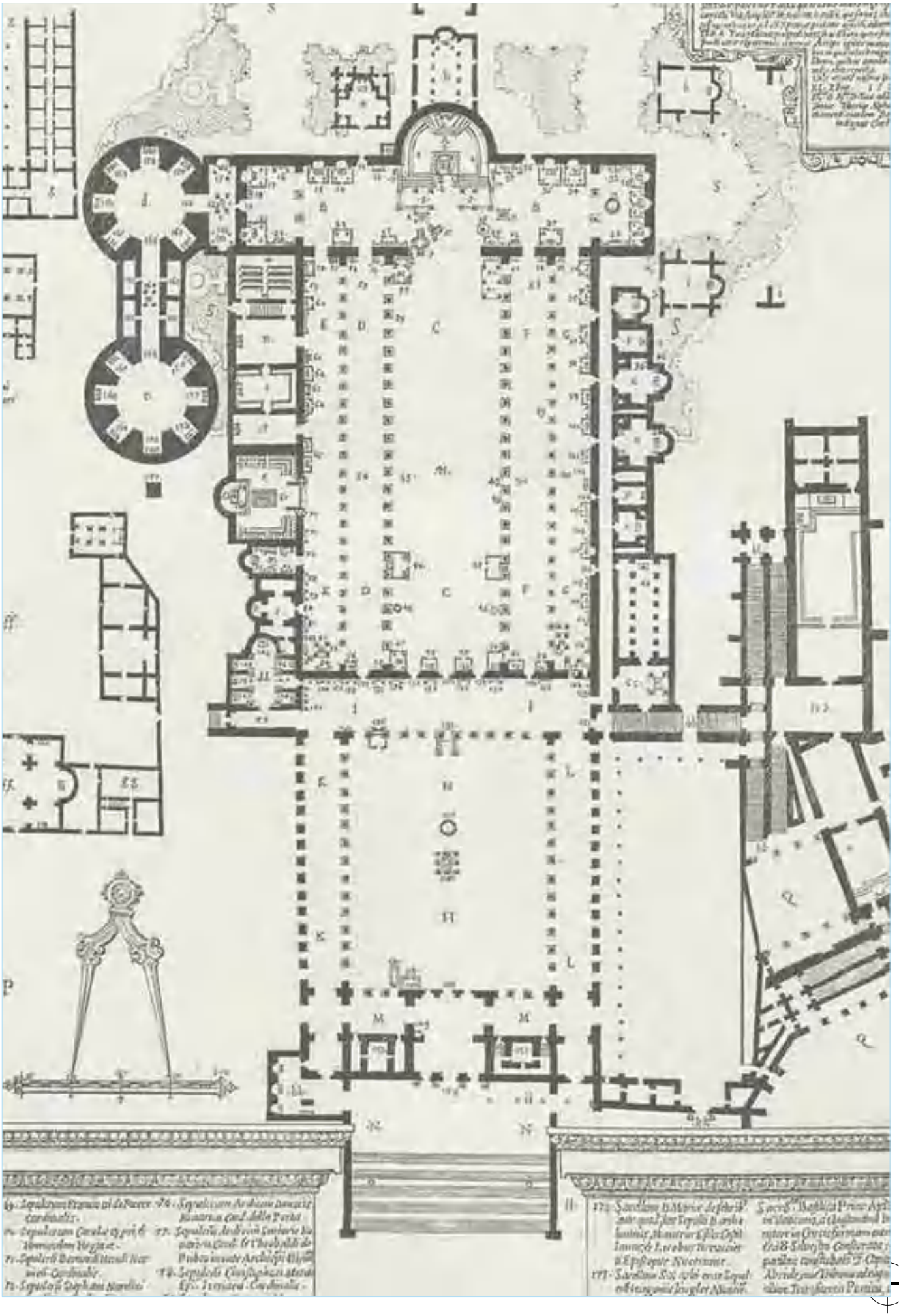
The southern colonnade up to the eleventh column with the altars of the Madonna of the column and the Blessed Sacrament; the frieze with the clipeate portraits of the popes; the great crucifixion; the lost paintings of the new testament; the windows with gothic tracery

Domenico Tasseli da Lugo, 1605

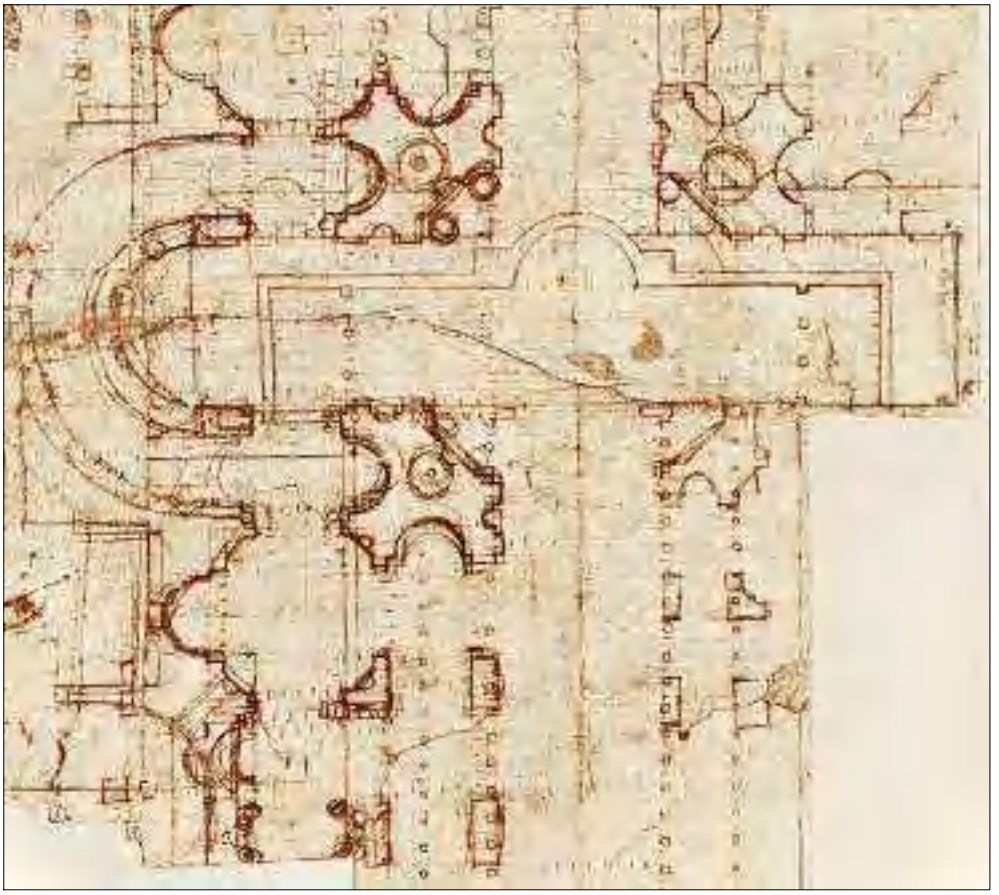
Biblioteca Apostolica Vaticana, Arch. Cap. S.Pietro A. 64 ter, f.15

LAYOUTS 4

RECONSTRUCTION BY STAGES OF THE DESIGN PROCESS OF THE OLD BASILICA OF S. PETER IN VATICAN



RESEARCH AND DRAWING LUIS DE GARRIDO



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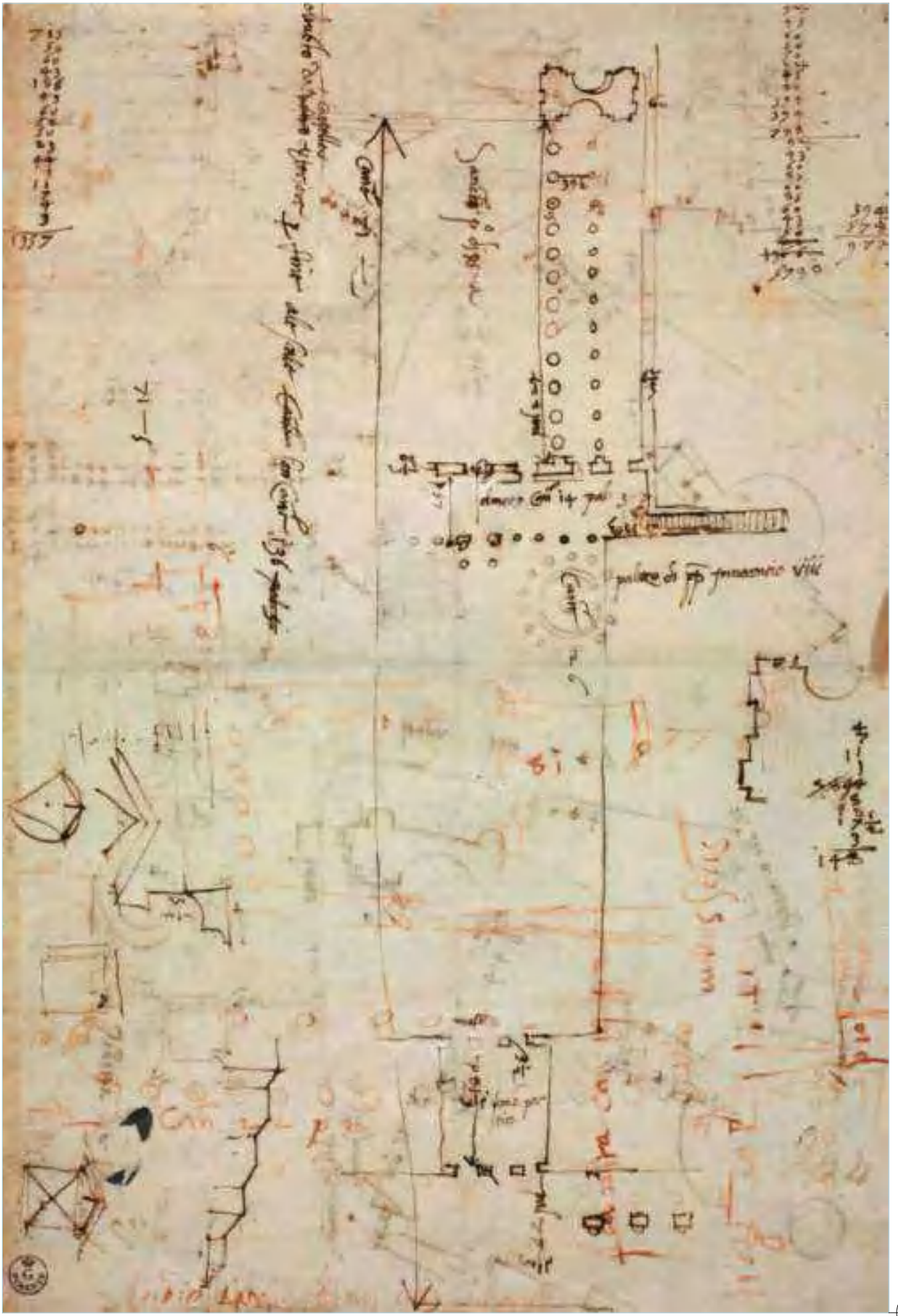

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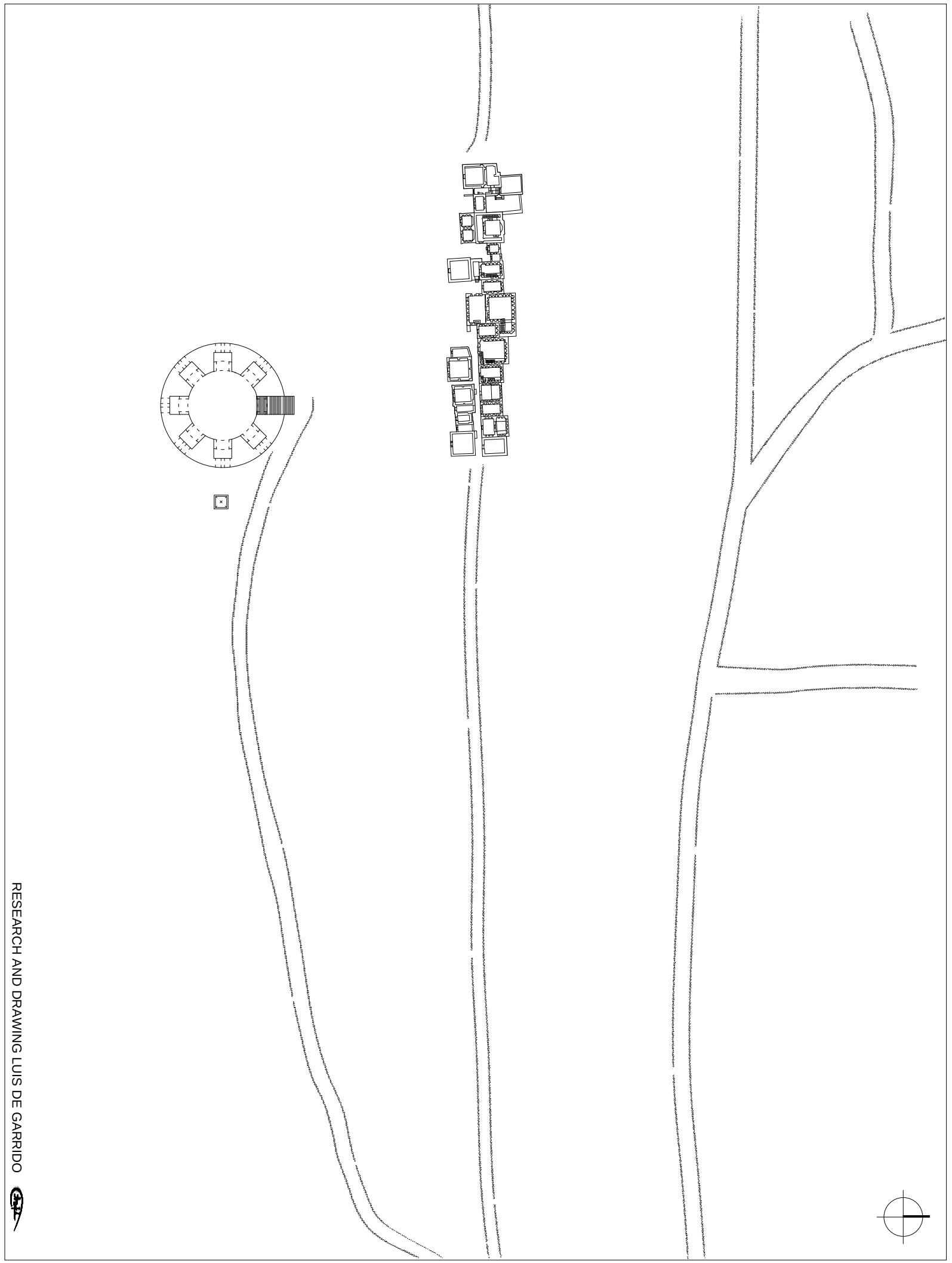
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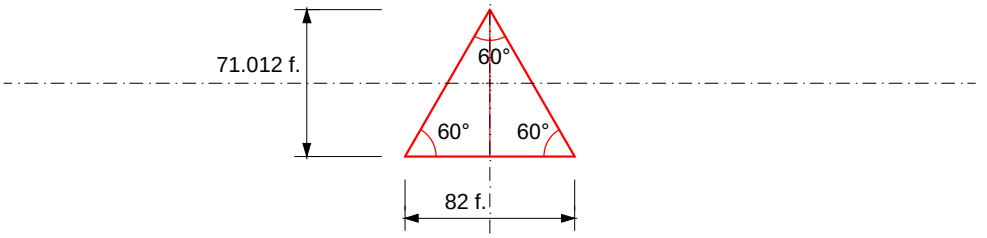

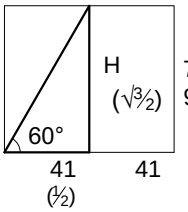

71.012 f.
94.682 p.

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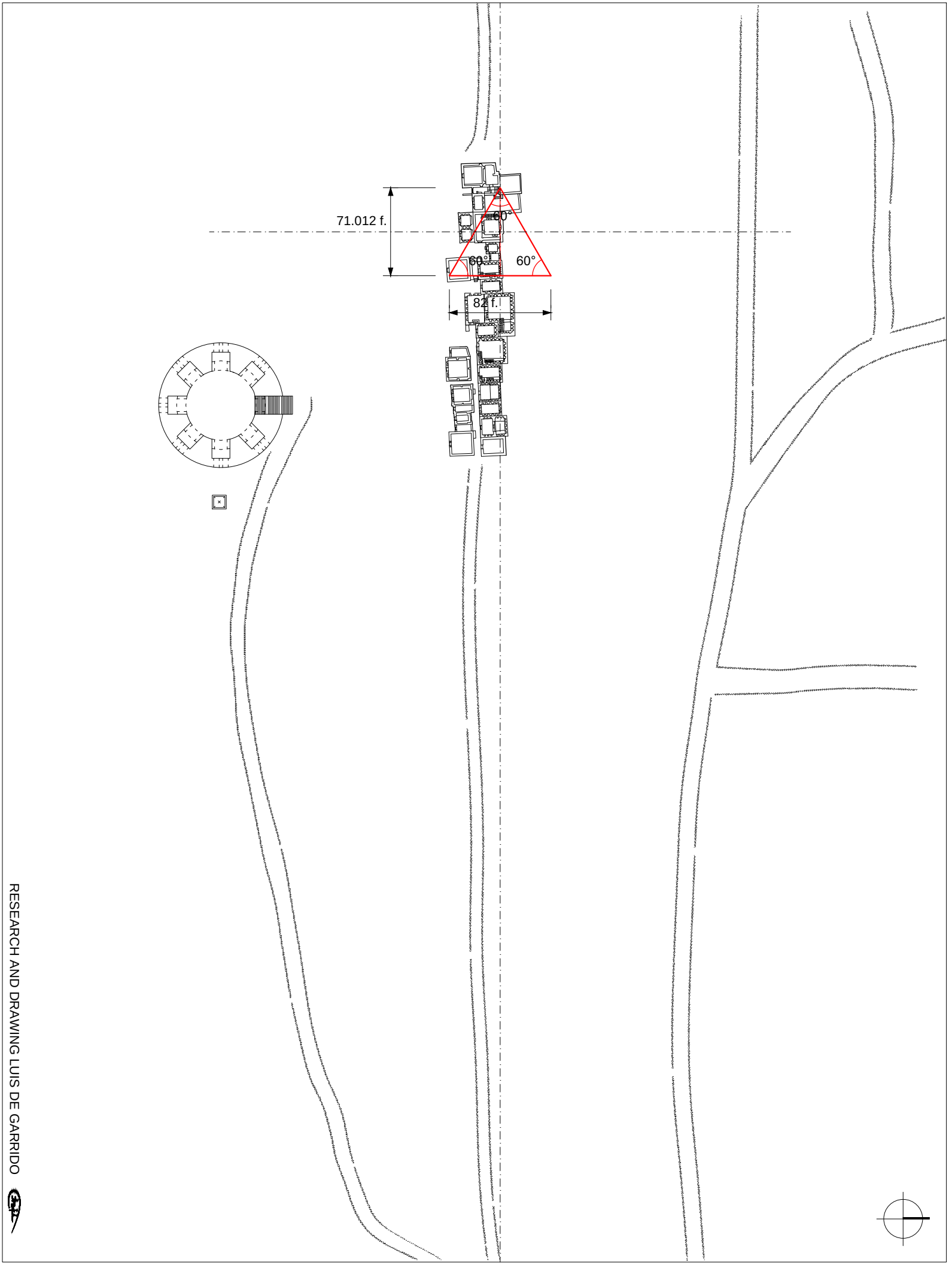
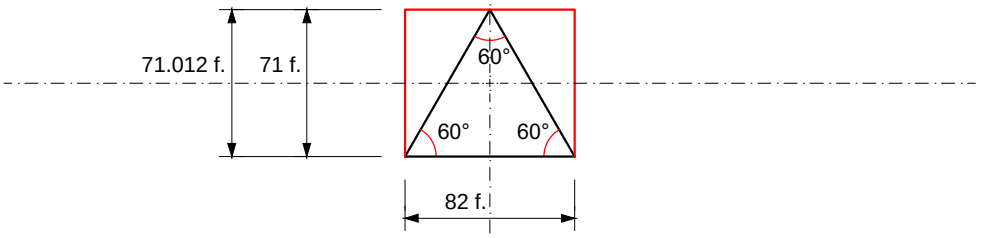
H = 71.012 feet (94.682 p.)

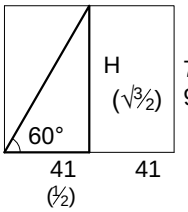
RESEARCH AND DRAWING LUIS DE GARRIDO



RESEARCH AND DRAWING LUIS DE GARRIDO

324	ORIGINAL COMPOSITING TRIANGLE SUPERPOSE WITH NECROPOLIS	OLD S. PETER	OSP-F6





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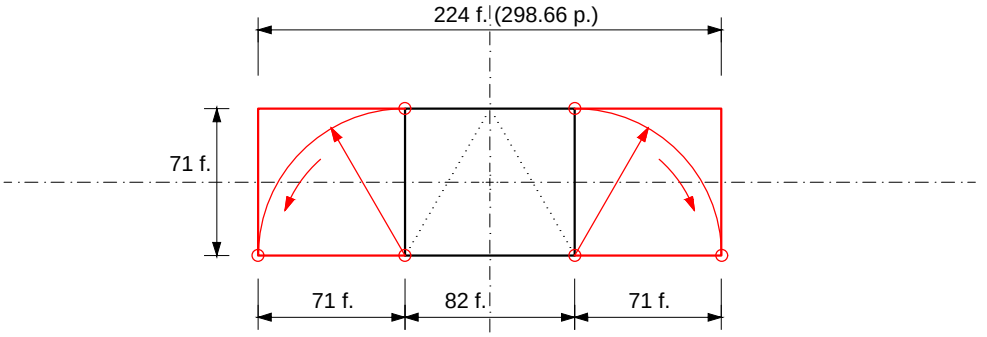

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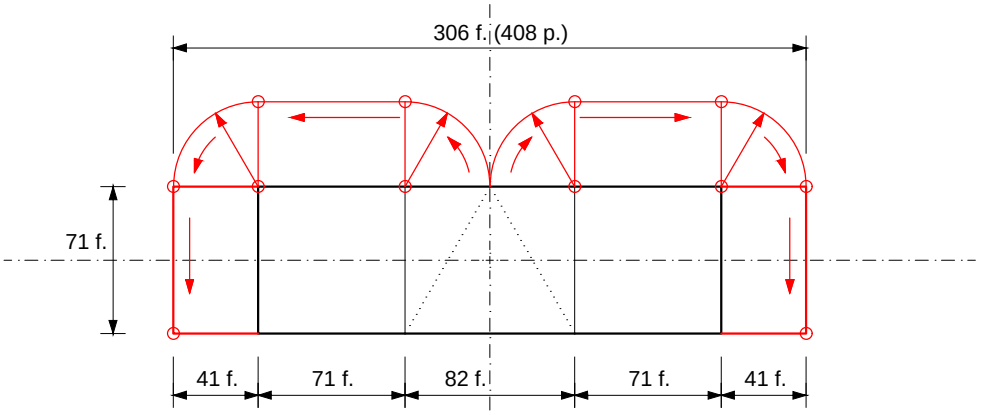

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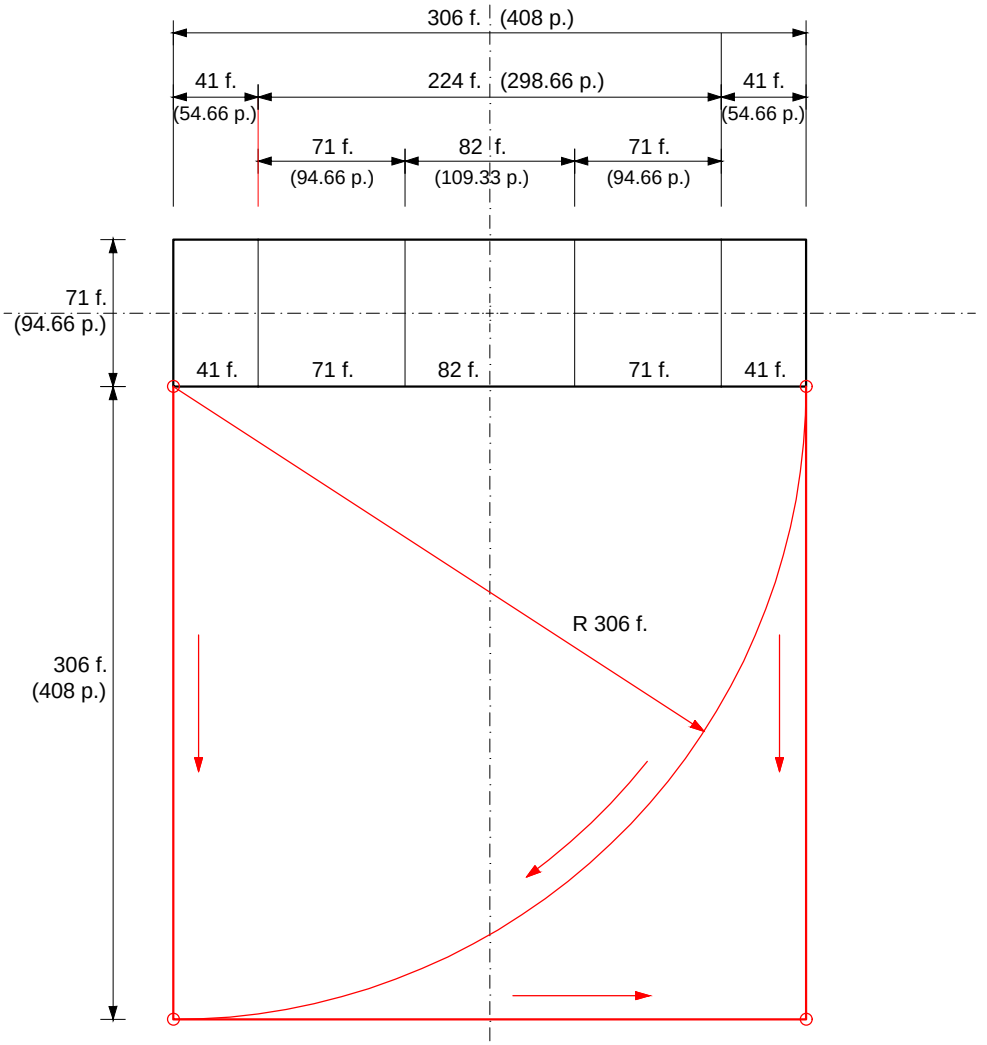

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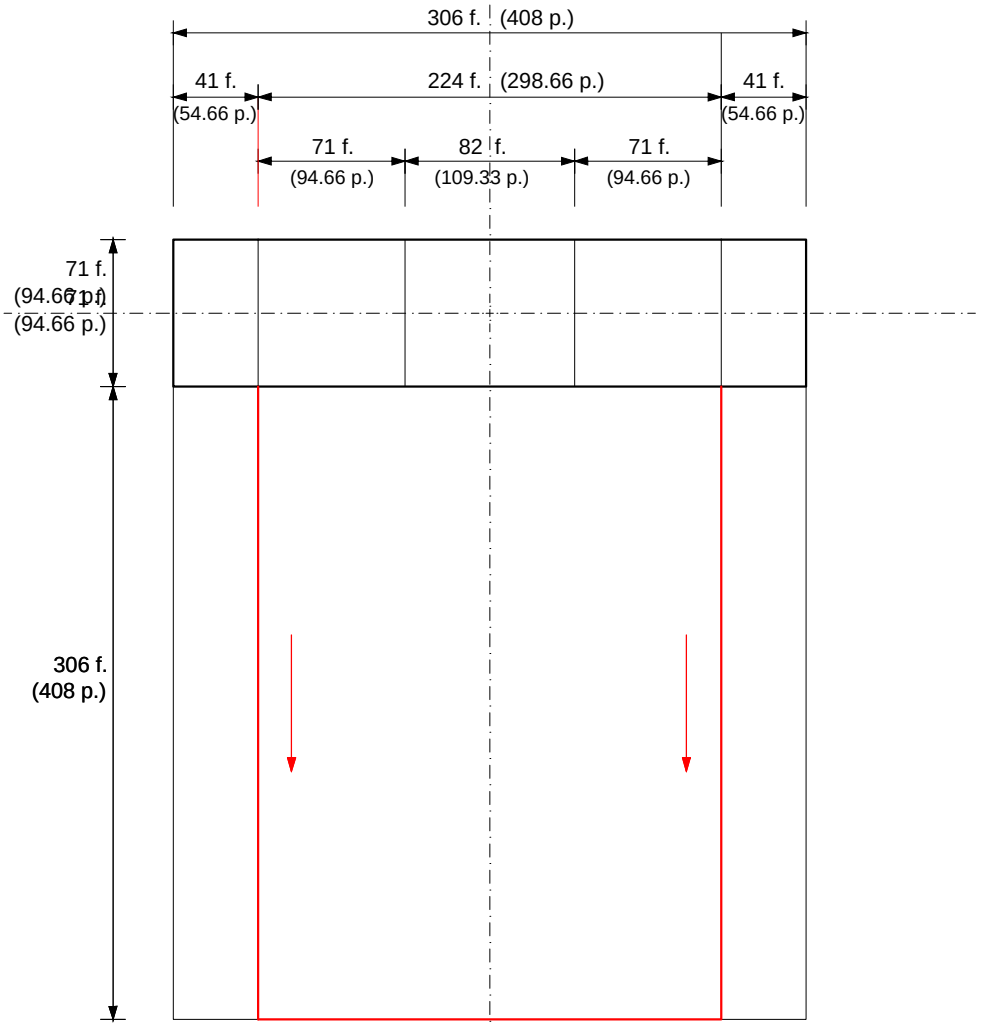

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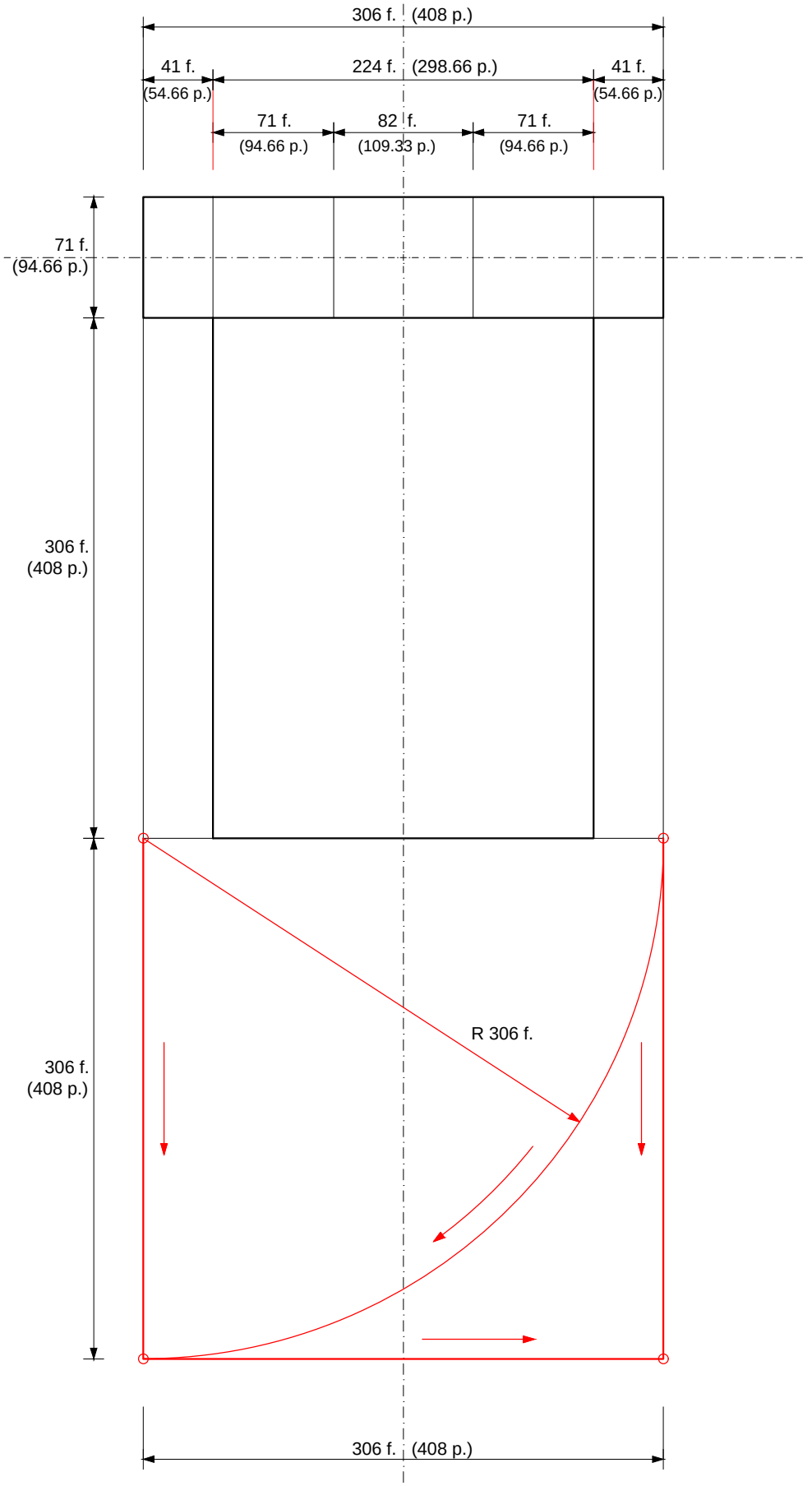

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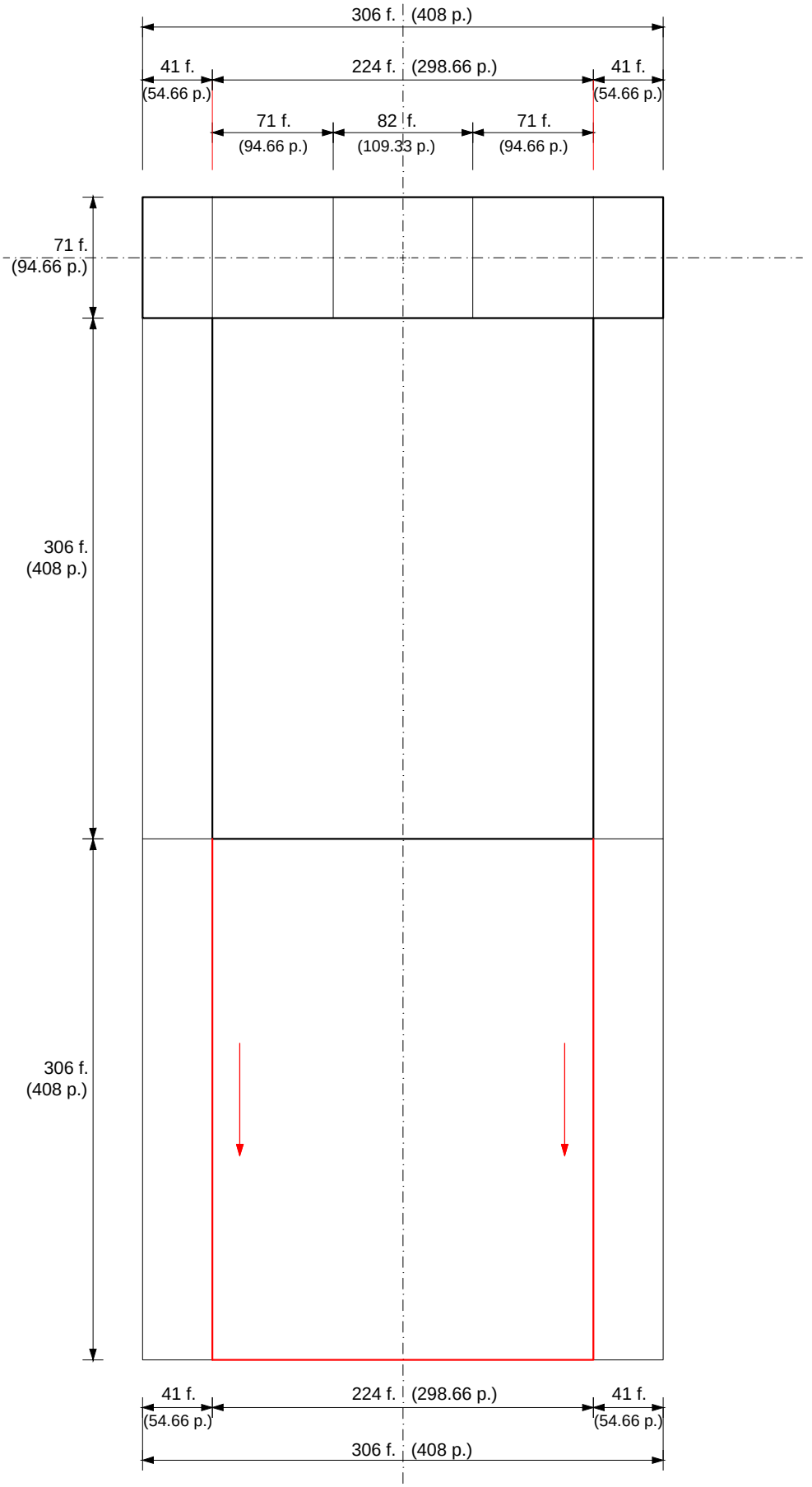

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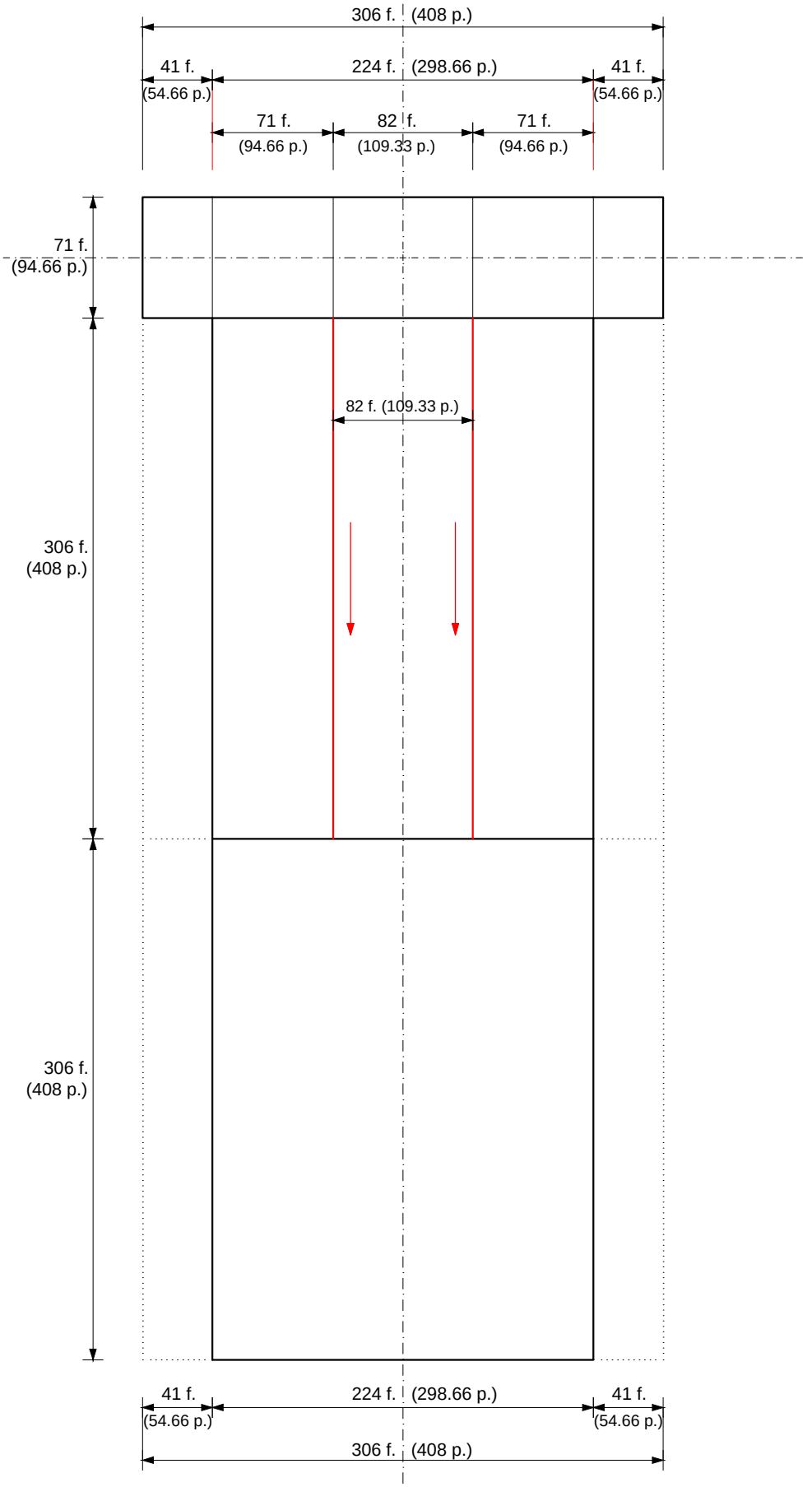

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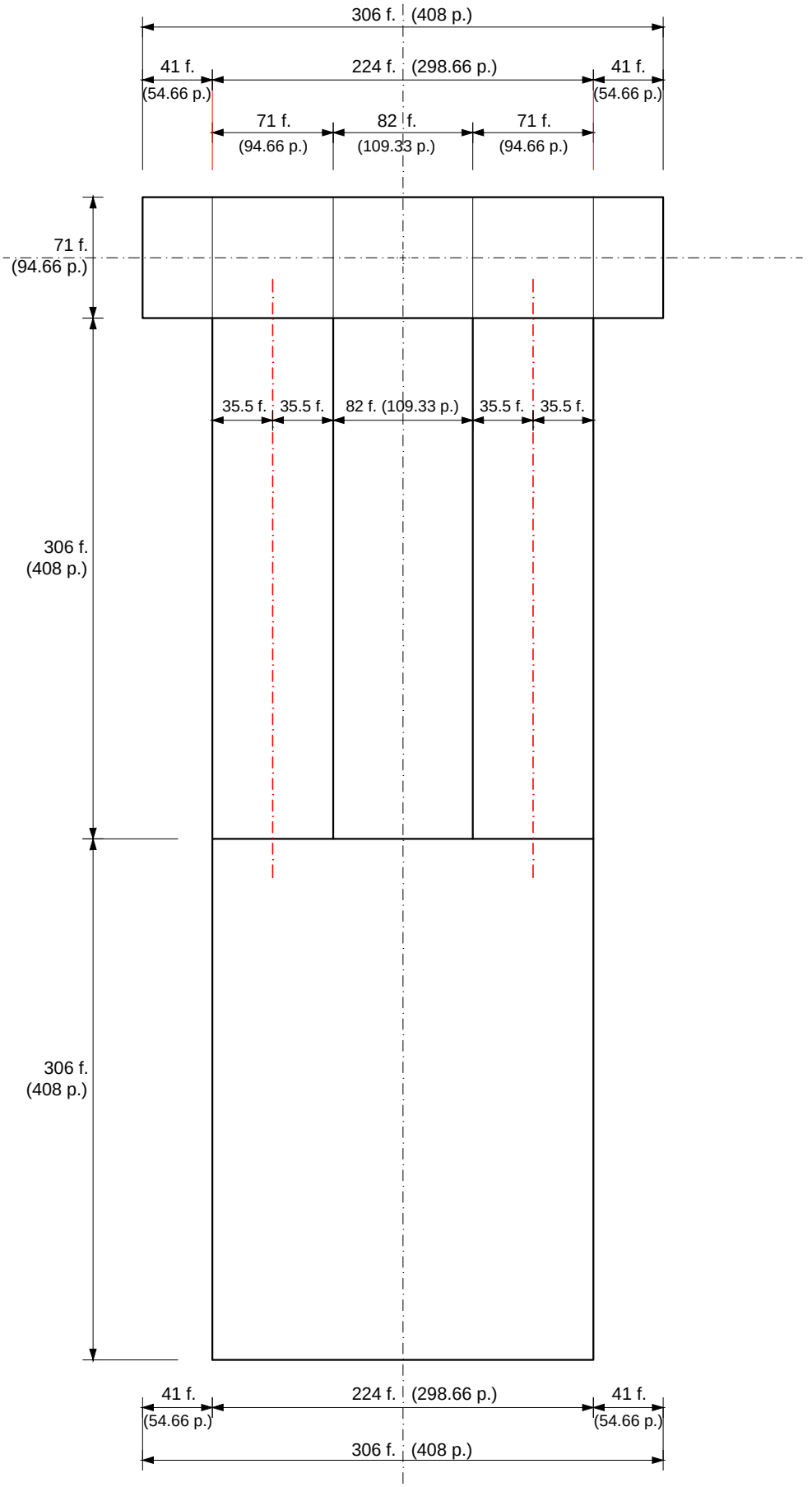
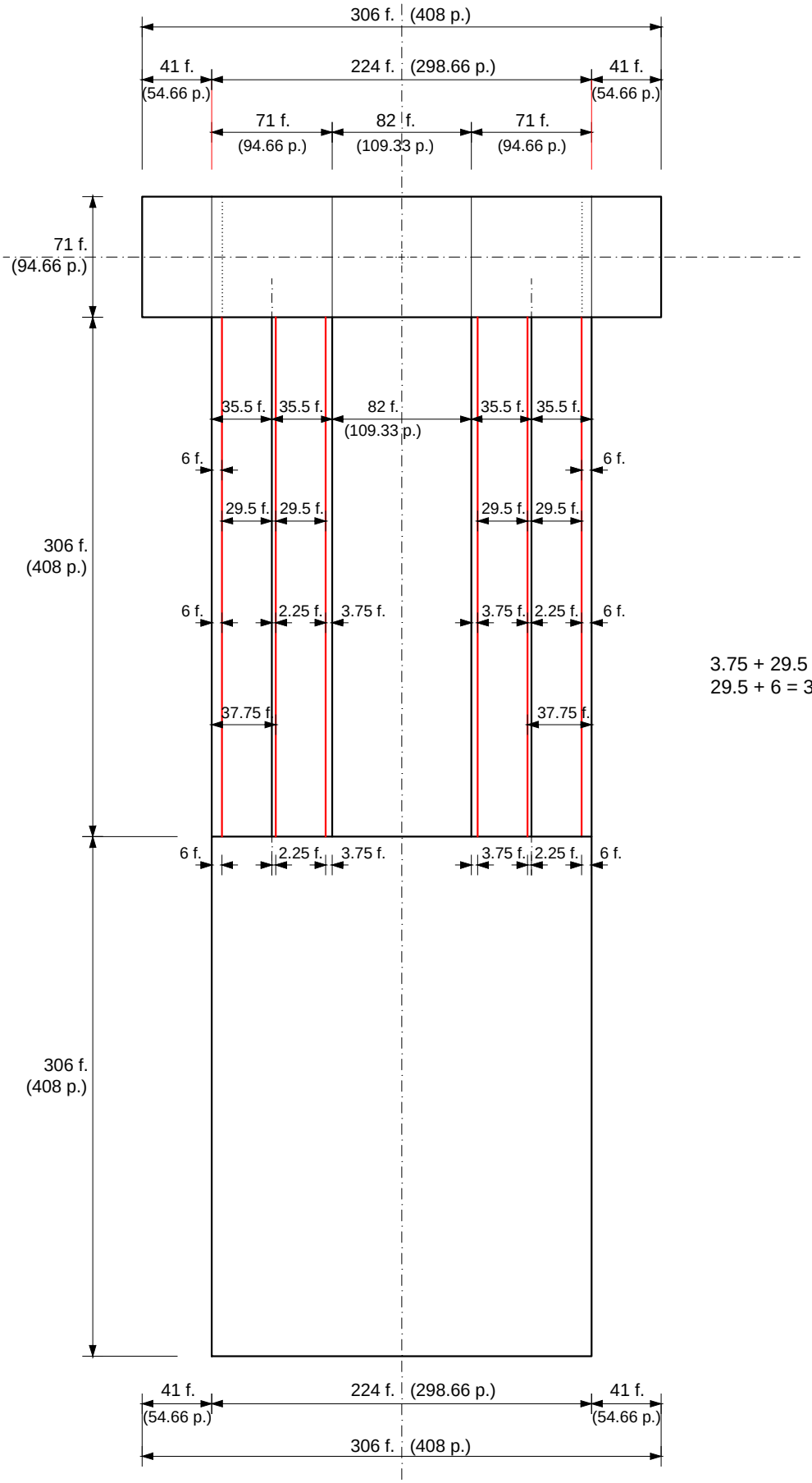
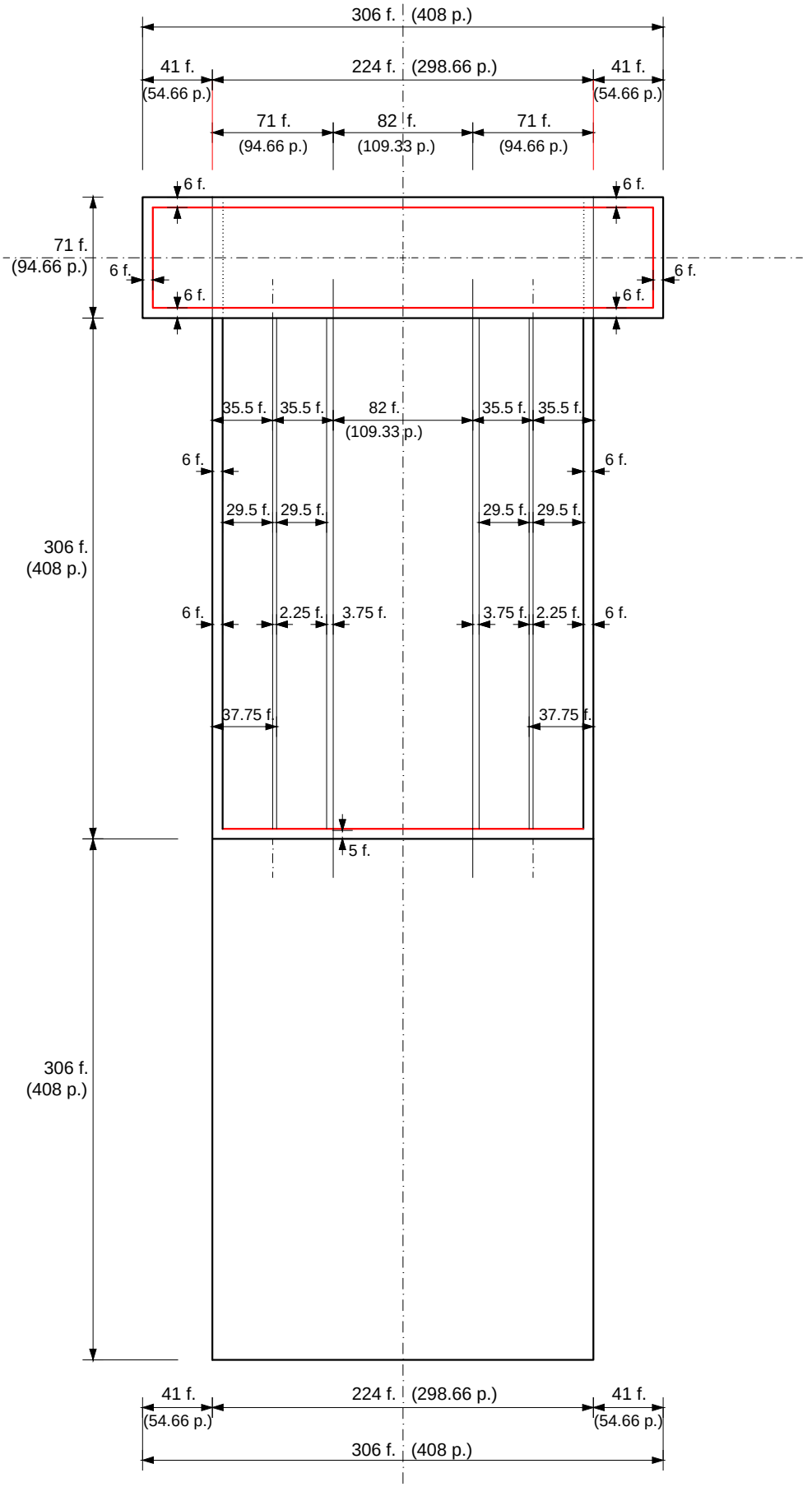


RESEARCH AND DRAWING LUIS DE GARRIDO

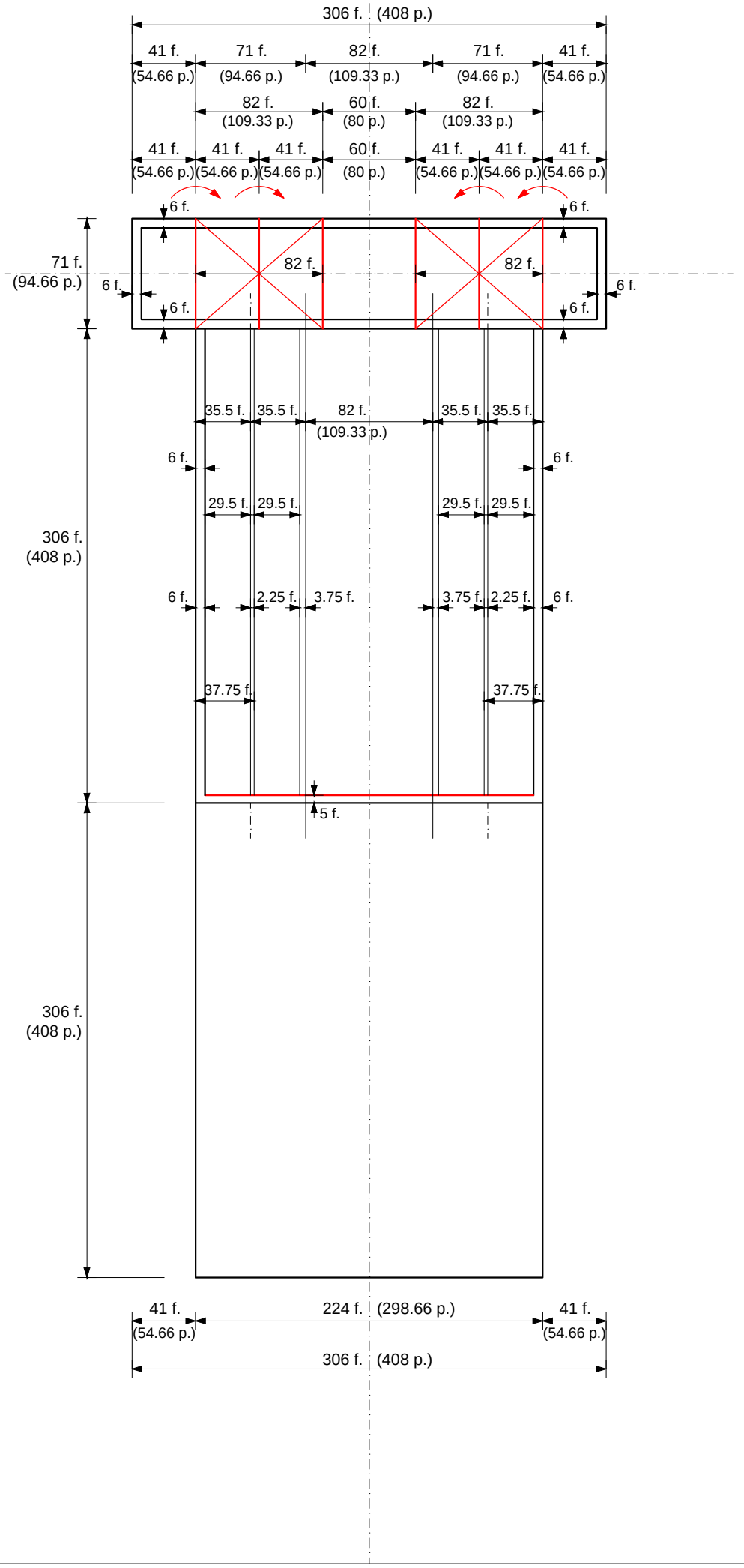


3.75 + 29.5 + 2.25 = 35.5 f.
29.5 + 6 = 35.5 f.

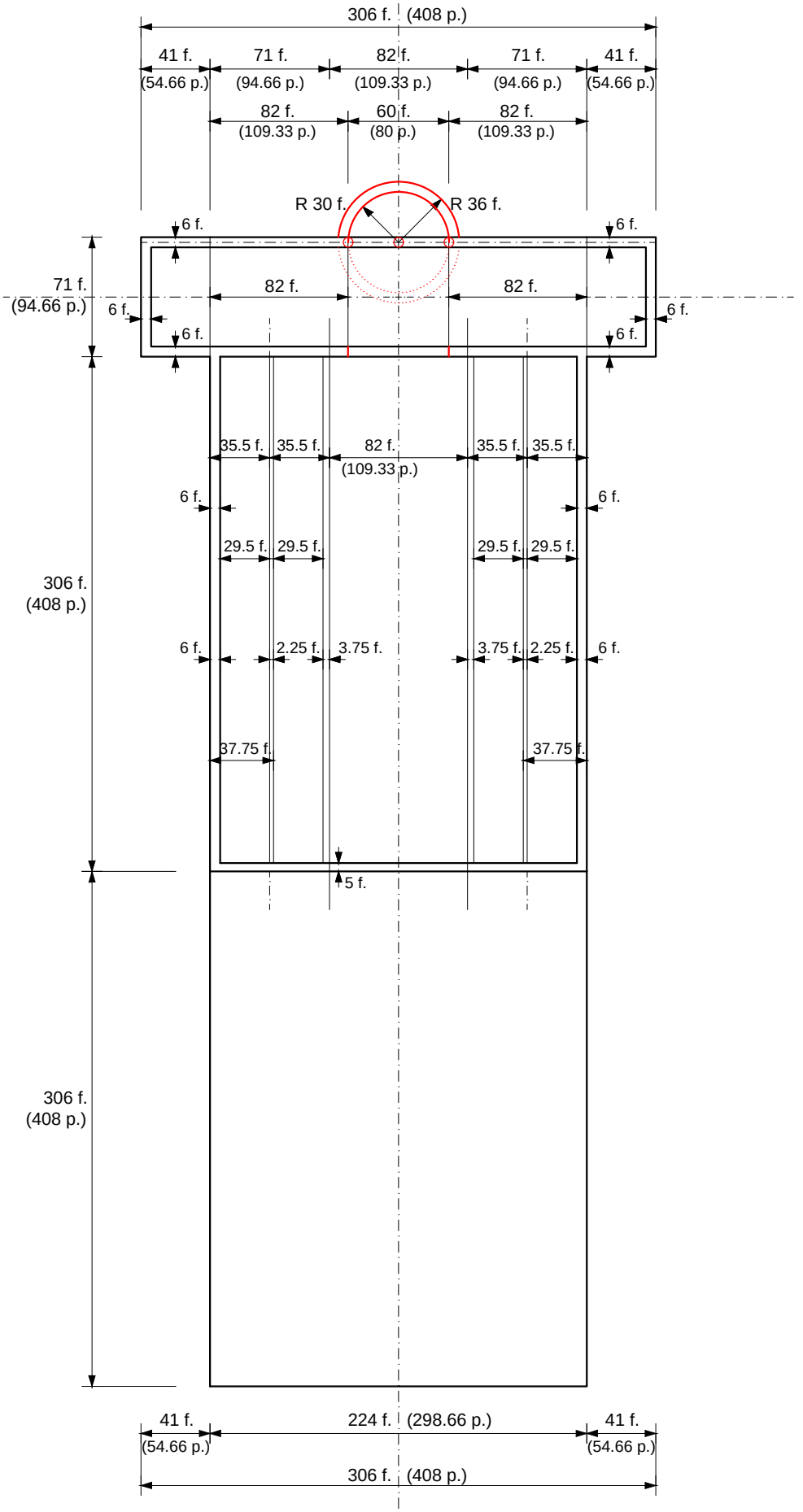
RESEARCH AND DRAWING LUIS DE GARRIDO



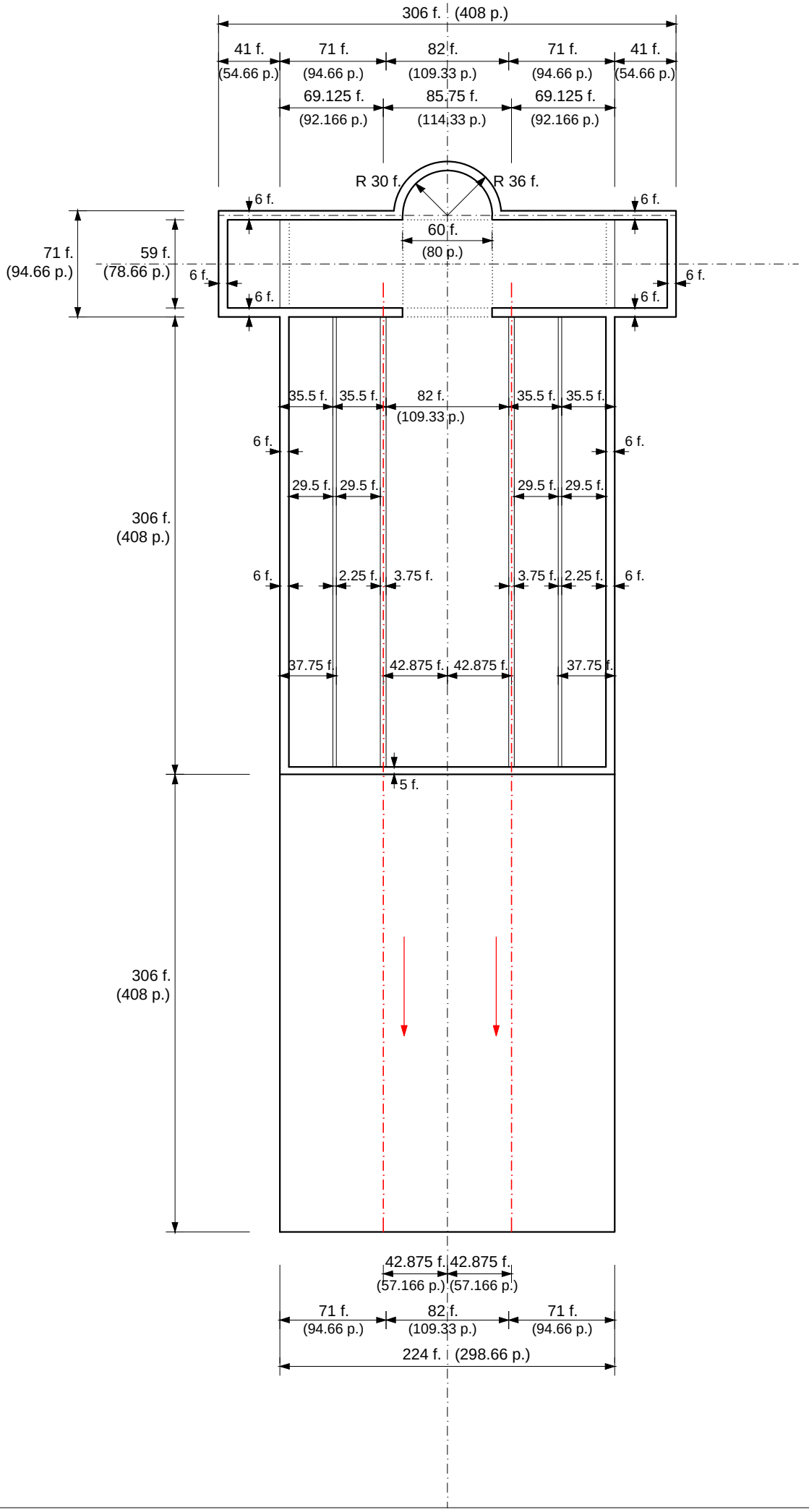
RESEARCH AND DRAWING LUIS DE GARRIDO



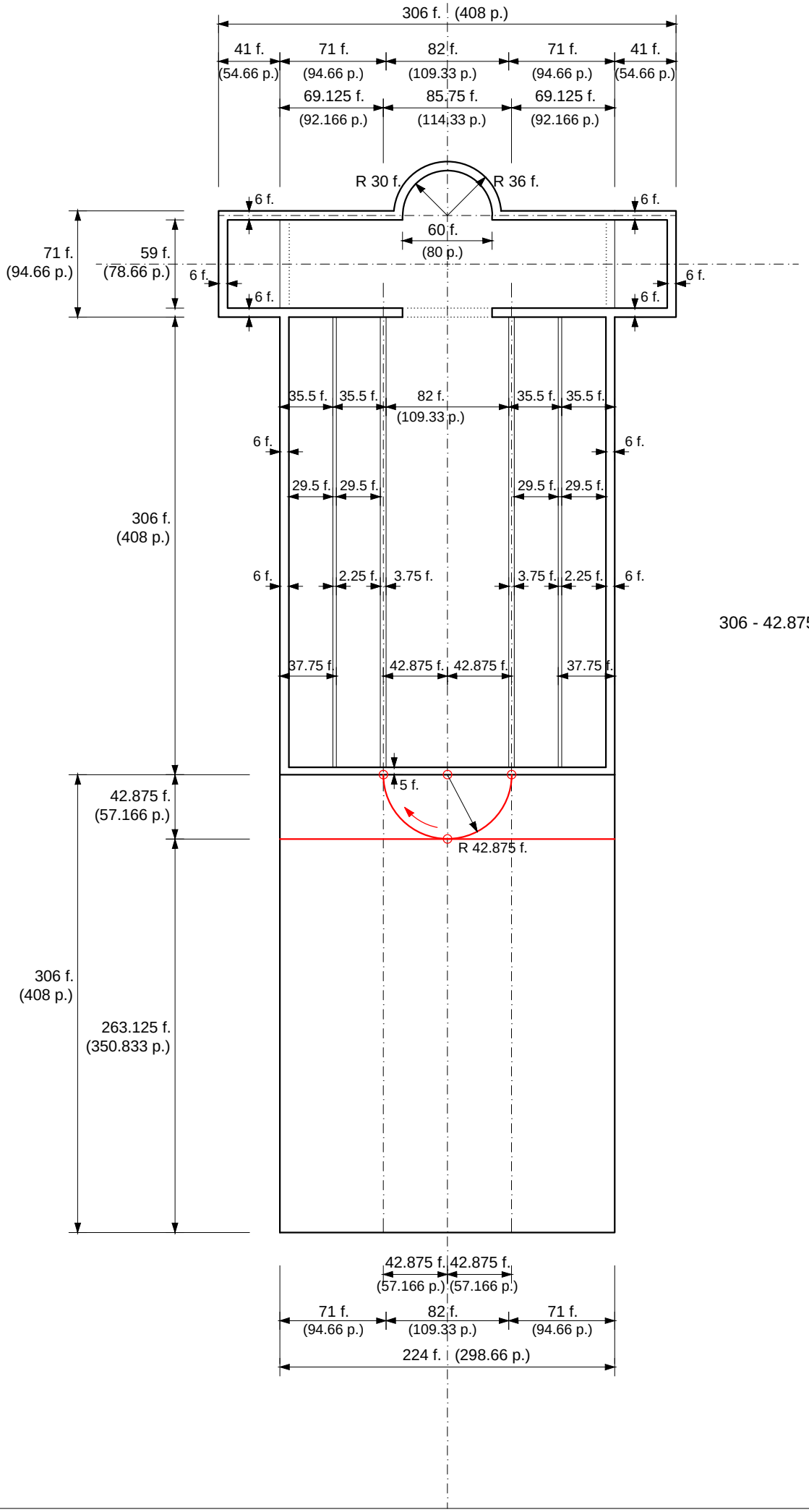
RESEARCH AND DRAWING LUIS DE GARRIDO



RESEARCH AND DRAWING LUIS DE GARRIDO

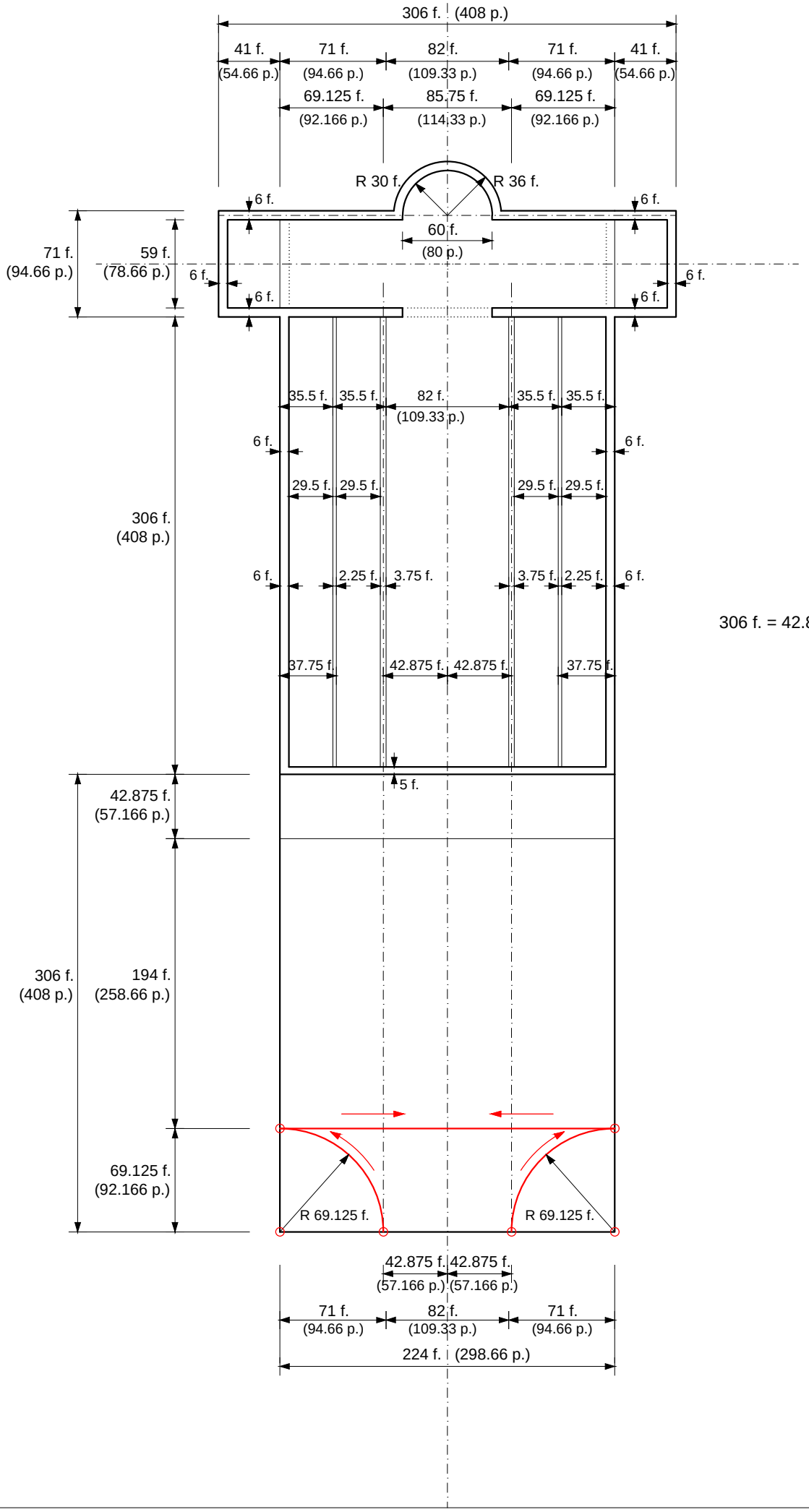


RESEARCH AND DRAWING LUIS DE GARRIDO



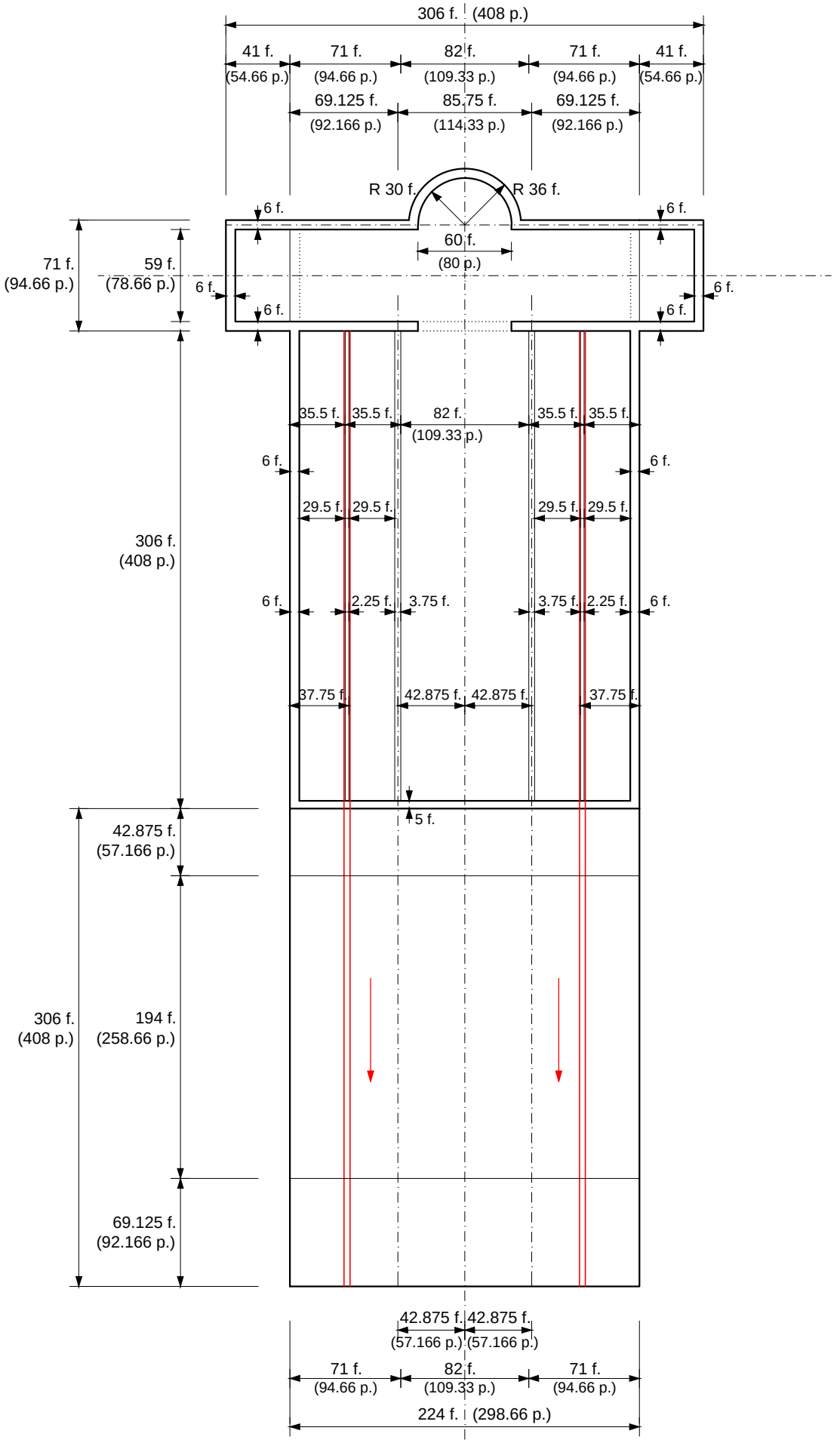
306 - 42.875 = 263.125 f.

RESEARCH AND DRAWING LUIS DE GARRIDO

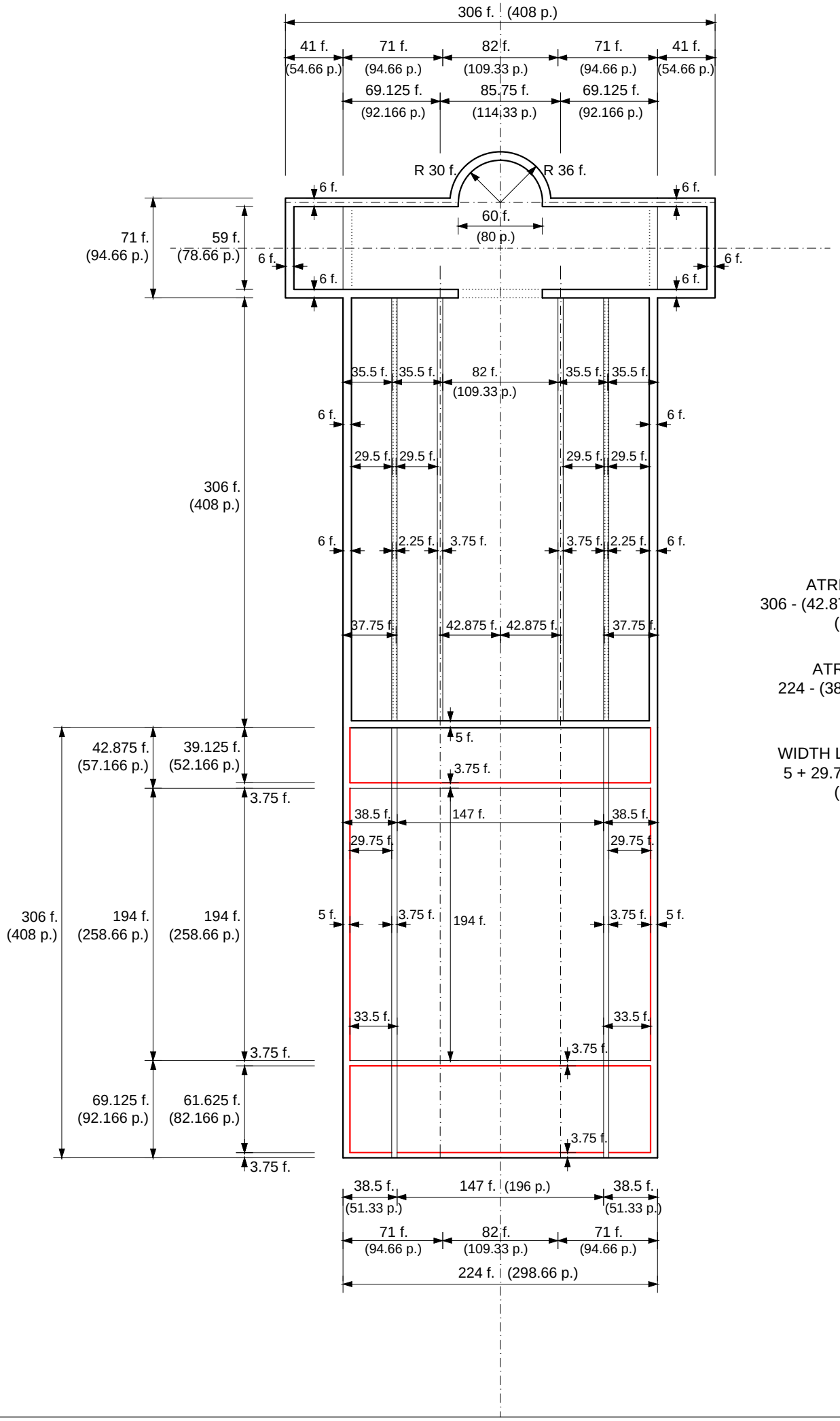


306 f. = 42.875 + 194 + 69.125

RESEARCH AND DRAWING LUIS DE GARRIDO



RESEARCH AND DRAWING LUIS DE GARRIDO

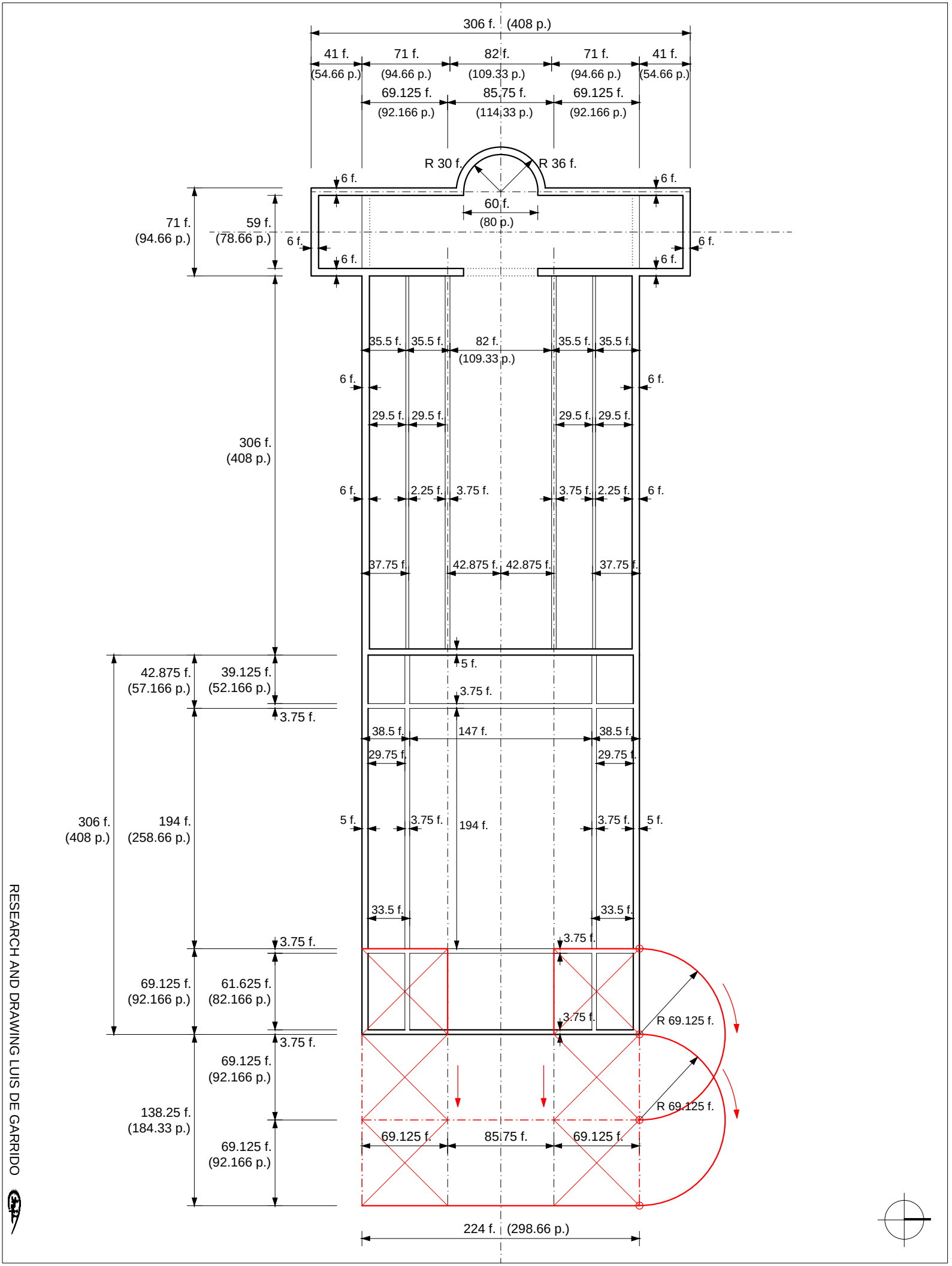


ATRIUM LENGHT:
306 - (42.875 + 69.125) = 194 f.
(158.66 p.)

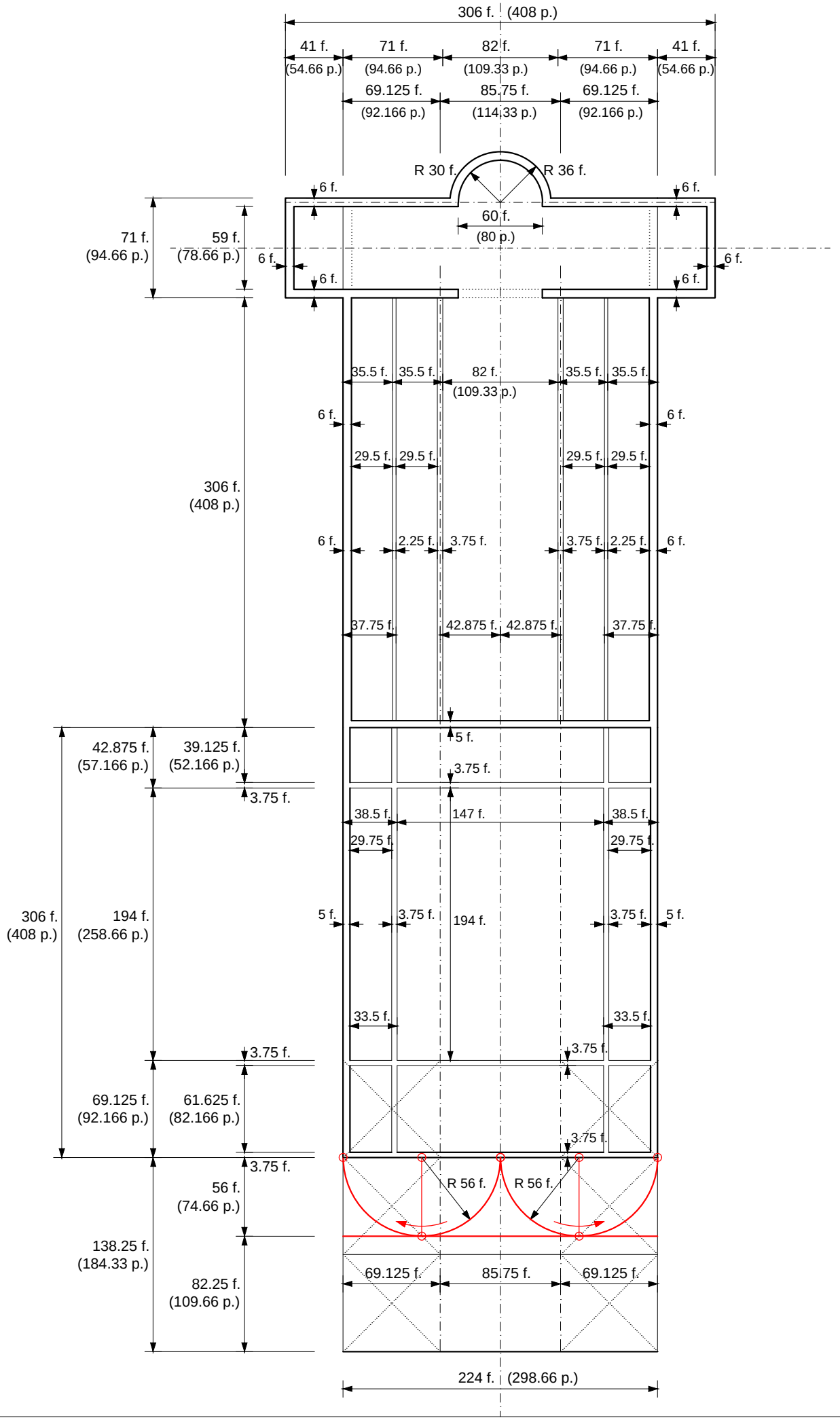
ATRIUM WIDTH:
224 - (38.5 + 38.5) = 147 f.
(196 p.)

WIDTH LATERAL NAVES:
5 + 29.75 + 3.75 = 38.5 f.
(51.333 p.)

RESEARCH AND DRAWING LUIS DE GARRIDO



RESEARCH AND DRAWING LUIS DE GARRIDO



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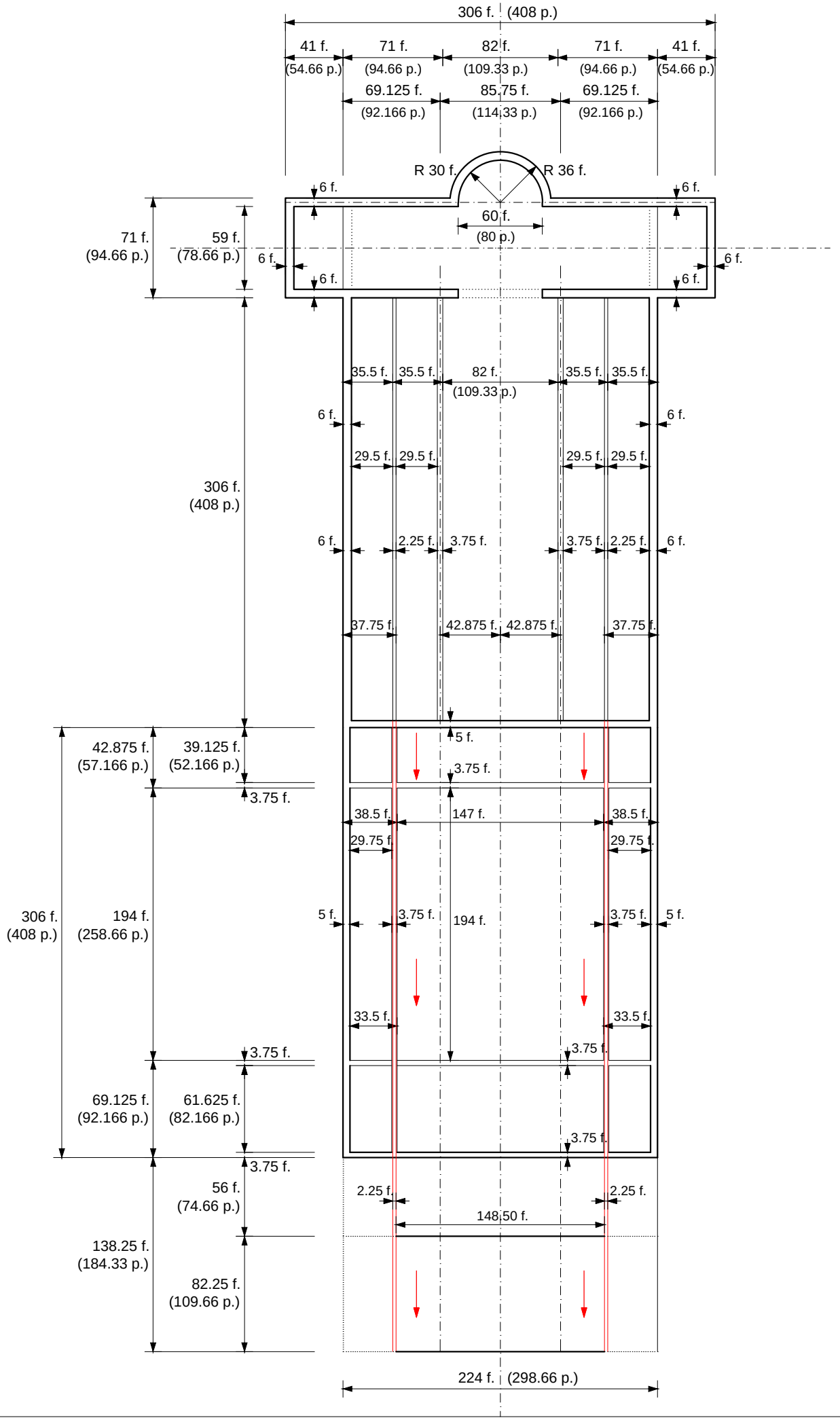
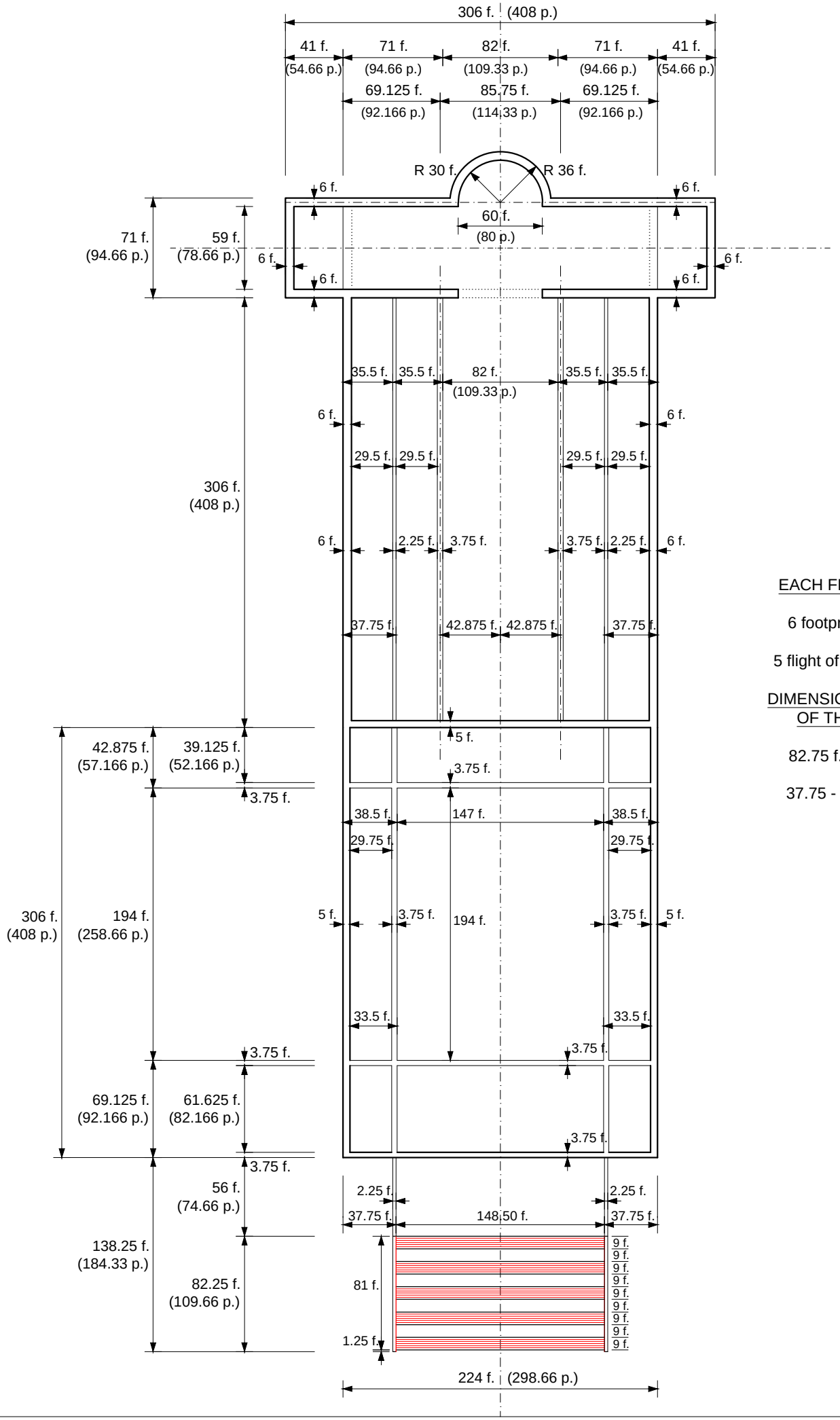


RESEARCH AND DRAWING LUIS DE GARRIDO



EACH FLIGHT OF STEPS

6 footprints x 1.5 f. = 9 f.

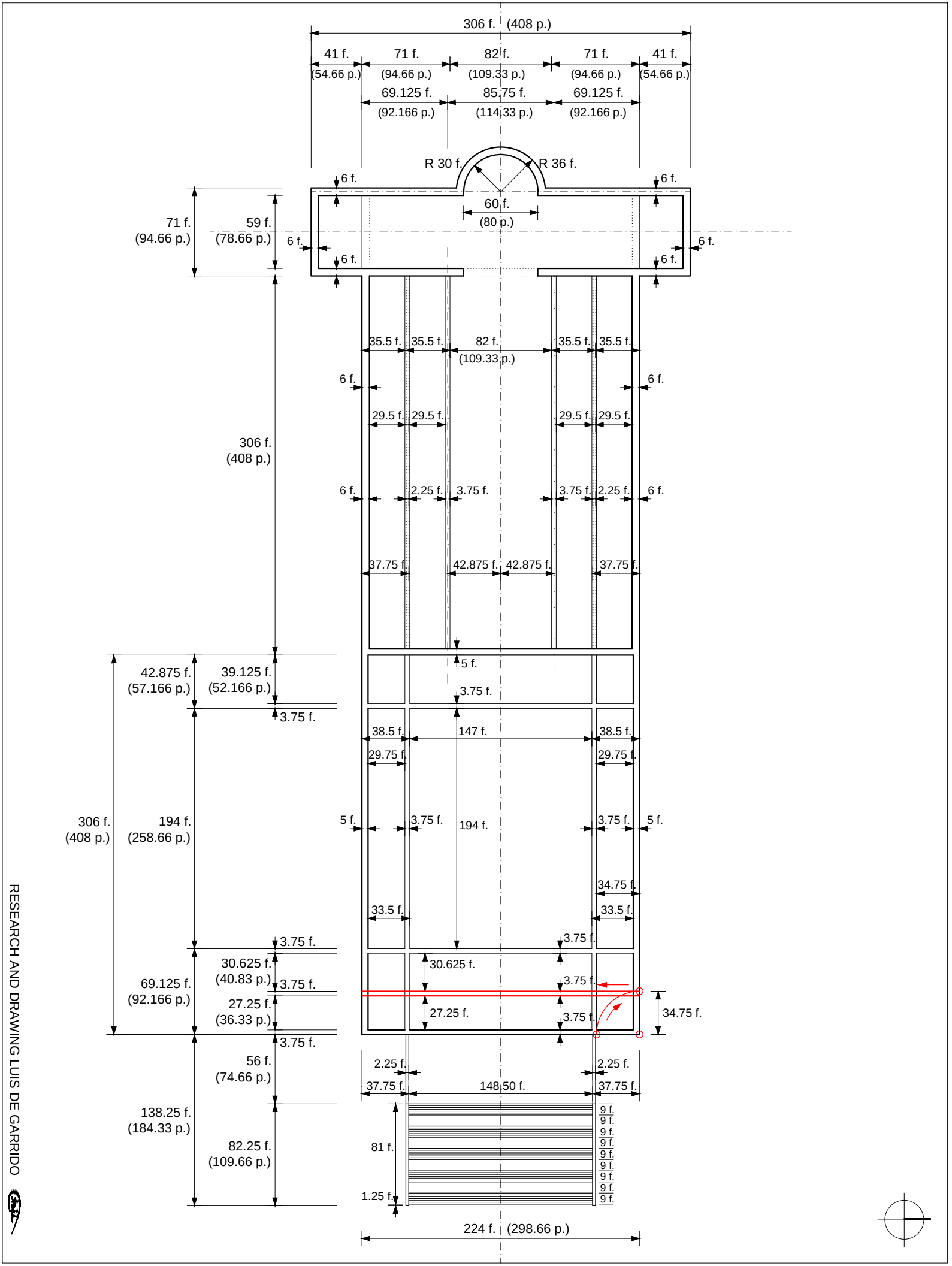
5 flight of steps: 9 x 5 = 45 f.

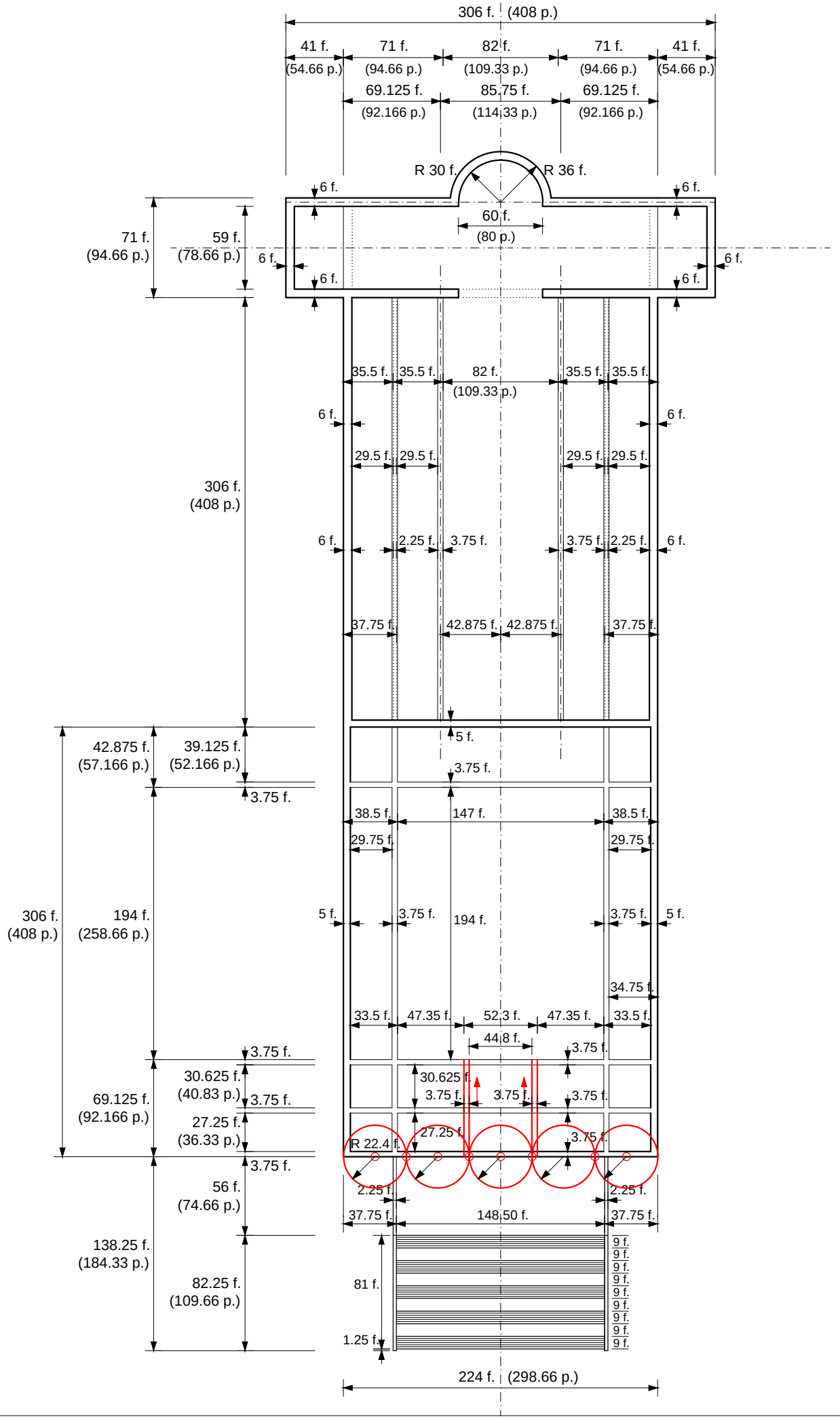
DIMENSION OF THE RESTS OF THE STAIRCASE

82.75 f. - 45 f. = 37.75 f.

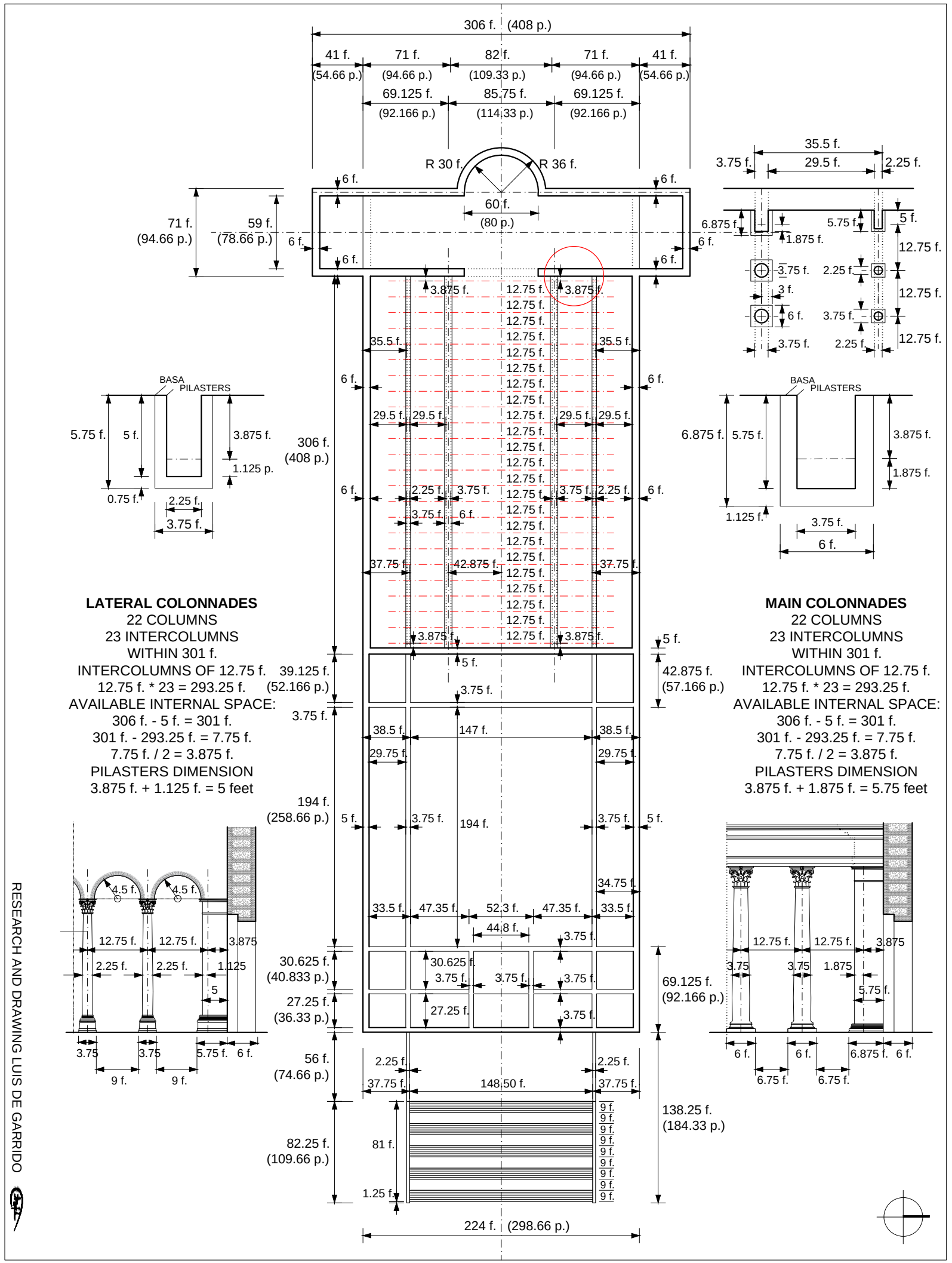
37.75 - (4 x 9 f.) = 1.25 f.

RESEARCH AND DRAWING LUIS DE GARRIDO


306 f. (408 p.)
41 f. (54.66 p.)
71 f. (94.66 p.)
82 f. (109.33 p.)
71 f. (94.66 p.)
41 f. (54.66 p.)
69.125 f. (92.166 p.)
85.75 f. (114.33 p.)
69.125 f. (92.166 p.)
R 30 f.
R 36 f.
6 f.
60 f. (80 p.)
71 f. (94.66 p.)
59 f. (78.66 p.)
35.5 f.
82 f. (109.33 p.)
29.5 f.
306 f. (408 p.)
2.25 f.
3.75 f.
37.75 f.
42.875 f.
5 f.
42.875 f. (57.166 p.)
39.125 f. (52.166 p.)
38.5 f.
147 f.
29.75 f.
194 f. (258.66 p.)
34.75 f.
33.5 f.
30.625 f. (40.83 p.)
69.125 f. (92.166 p.)
27.25 f. (36.33 p.)
56 f. (74.66 p.)
138.25 f. (184.33 p.)
82.25 f. (109.66 p.)
148.50 f.
9 f.
81 f.
1.25 f.
224 f. (298.66 p.)
RESEARCH AND DRAWING LUIS DE GARRIDO



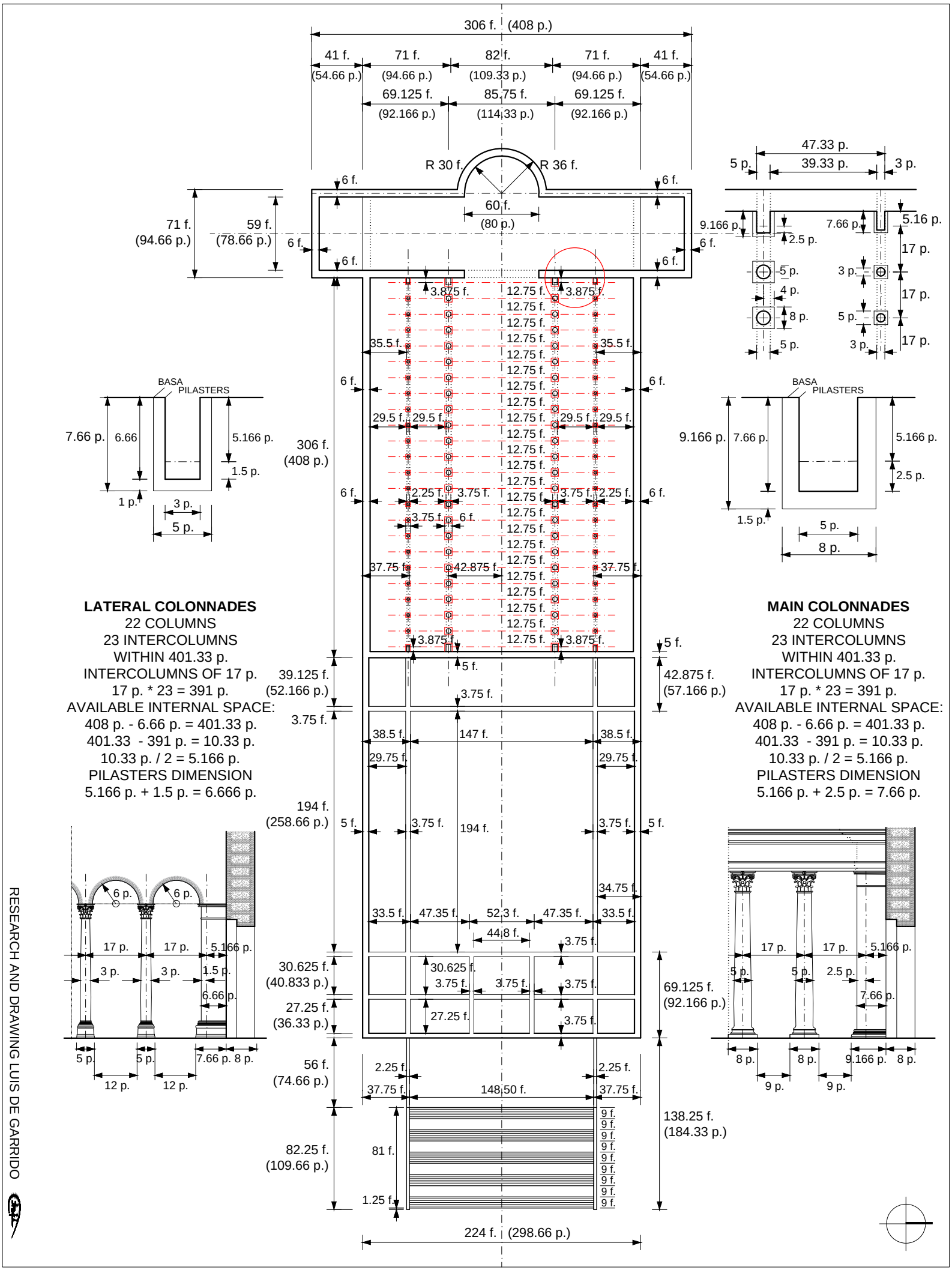
RESEARCH AND DRAWING LUIS DE GARRIDO



LATERAL COLONNADES
22 COLUMNS
23 INTERCOLUMNS
WITHIN 301 f.
INTERCOLUMNS OF 12.75 f.
12.75 f. * 23 = 293.25 f.
AVAILABLE INTERNAL SPACE:
306 f. - 5 f. = 301 f.
301 f. - 293.25 f. = 7.75 f.
7.75 f. / 2 = 3.875 f.
PILASTERS DIMENSION
3.875 f. + 1.125 f. = 5 feet

MAIN COLONNADES
22 COLUMNS
23 INTERCOLUMNS
WITHIN 301 f.
INTERCOLUMNS OF 12.75 f.
12.75 f. * 23 = 293.25 f.
AVAILABLE INTERNAL SPACE:
306 f. - 5 f. = 301 f.
301 f. - 293.25 f. = 7.75 f.
7.75 f. / 2 = 3.875 f.
PILASTERS DIMENSION
3.875 f. + 1.875 f. = 5.75 feet

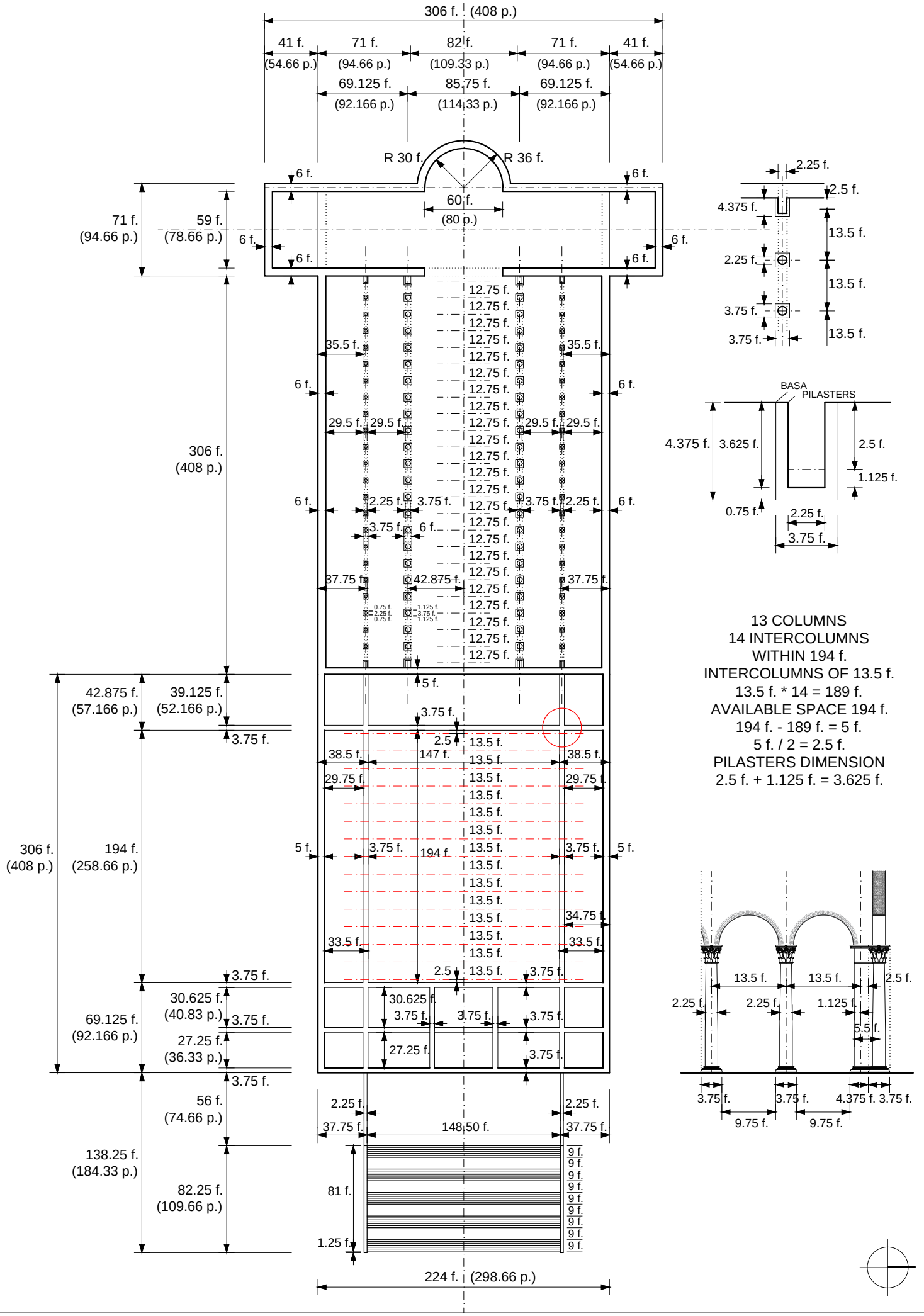
RESEARCH AND DRAWING LUIS DE GARRIDO



LATERAL COLONNADES
22 COLUMNS
23 INTERCOLUMNS
WITHIN 401.33 p.
INTERCOLUMNS OF 17 p.
17 p. * 23 = 391 p.
AVAILABLE INTERNAL SPACE:
408 p. - 6.66 p. = 401.33 p.
401.33 - 391 p. = 10.33 p.
10.33 p. / 2 = 5.166 p.
PILASTERS DIMENSION
5.166 p. + 1.5 p. = 6.666 p.

MAIN COLONNADES
22 COLUMNS
23 INTERCOLUMNS
WITHIN 401.33 p.
INTERCOLUMNS OF 17 p.
17 p. * 23 = 391 p.
AVAILABLE INTERNAL SPACE:
408 p. - 6.66 p. = 401.33 p.
401.33 - 391 p. = 10.33 p.
10.33 p. / 2 = 5.166 p.
PILASTERS DIMENSION
5.166 p. + 2.5 p. = 7.66 p.

RESEARCH AND DRAWING LUIS DE GARRIDO



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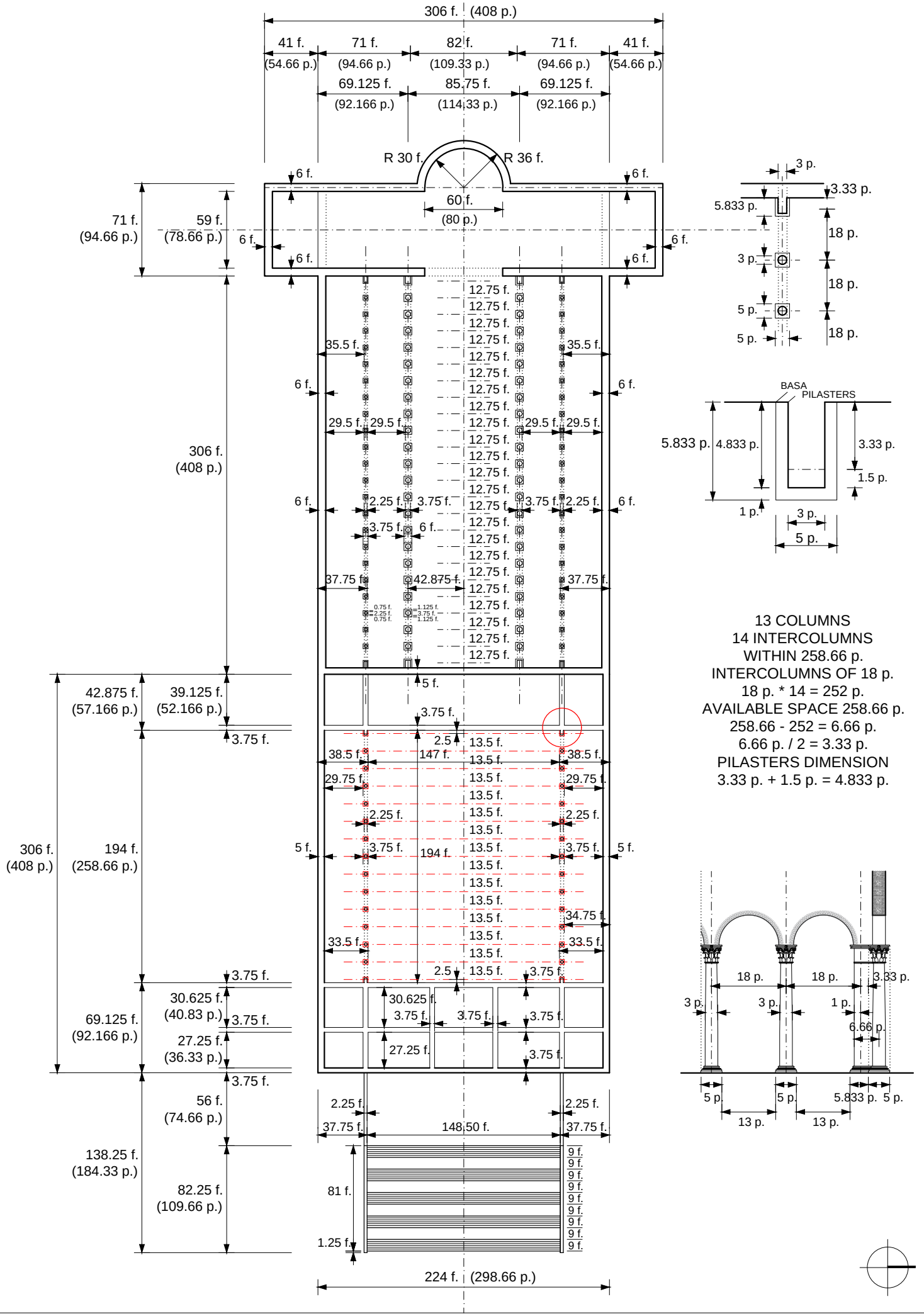
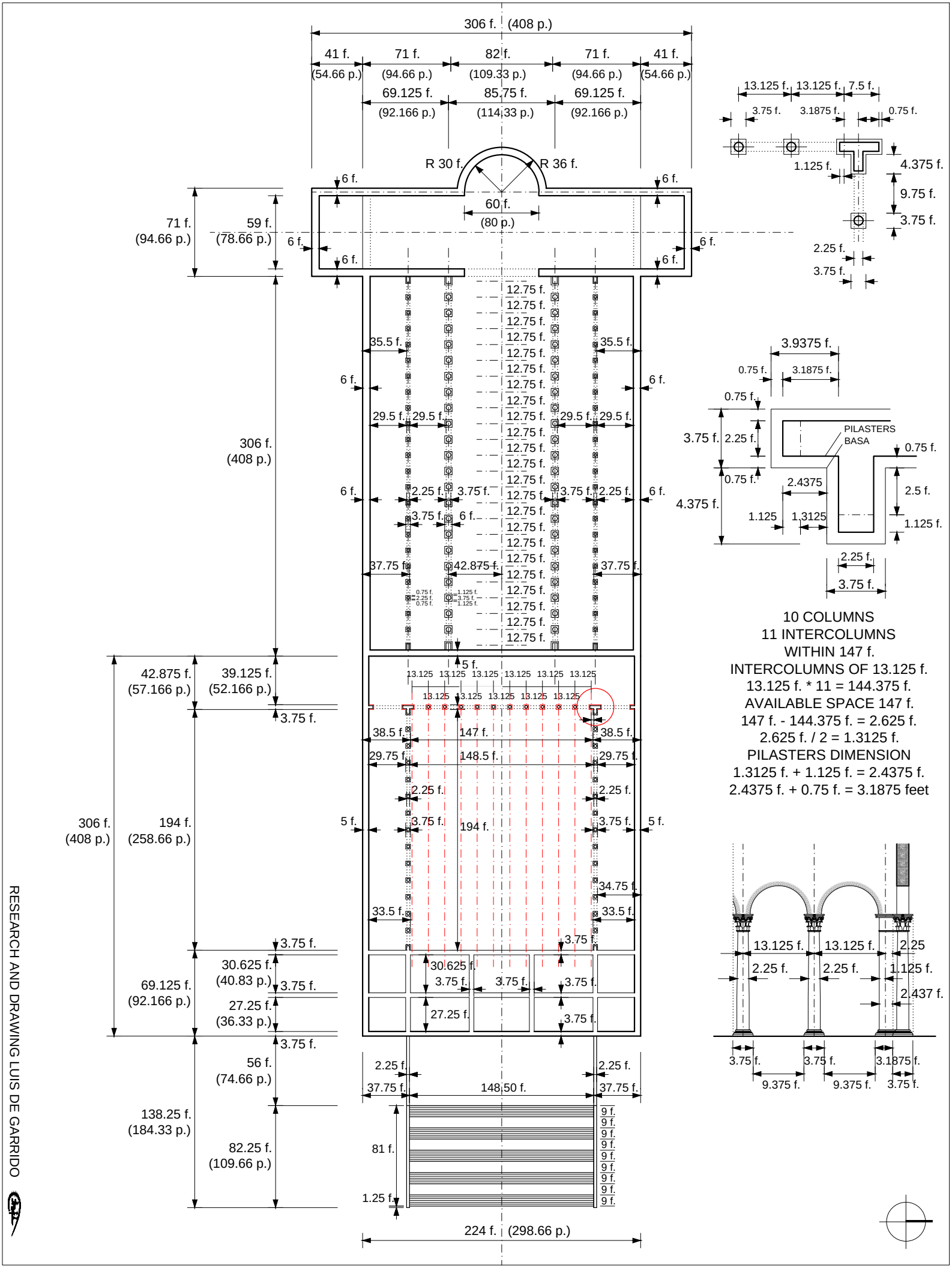


RESEARCH AND DRAWING LUIS DE GARRIDO



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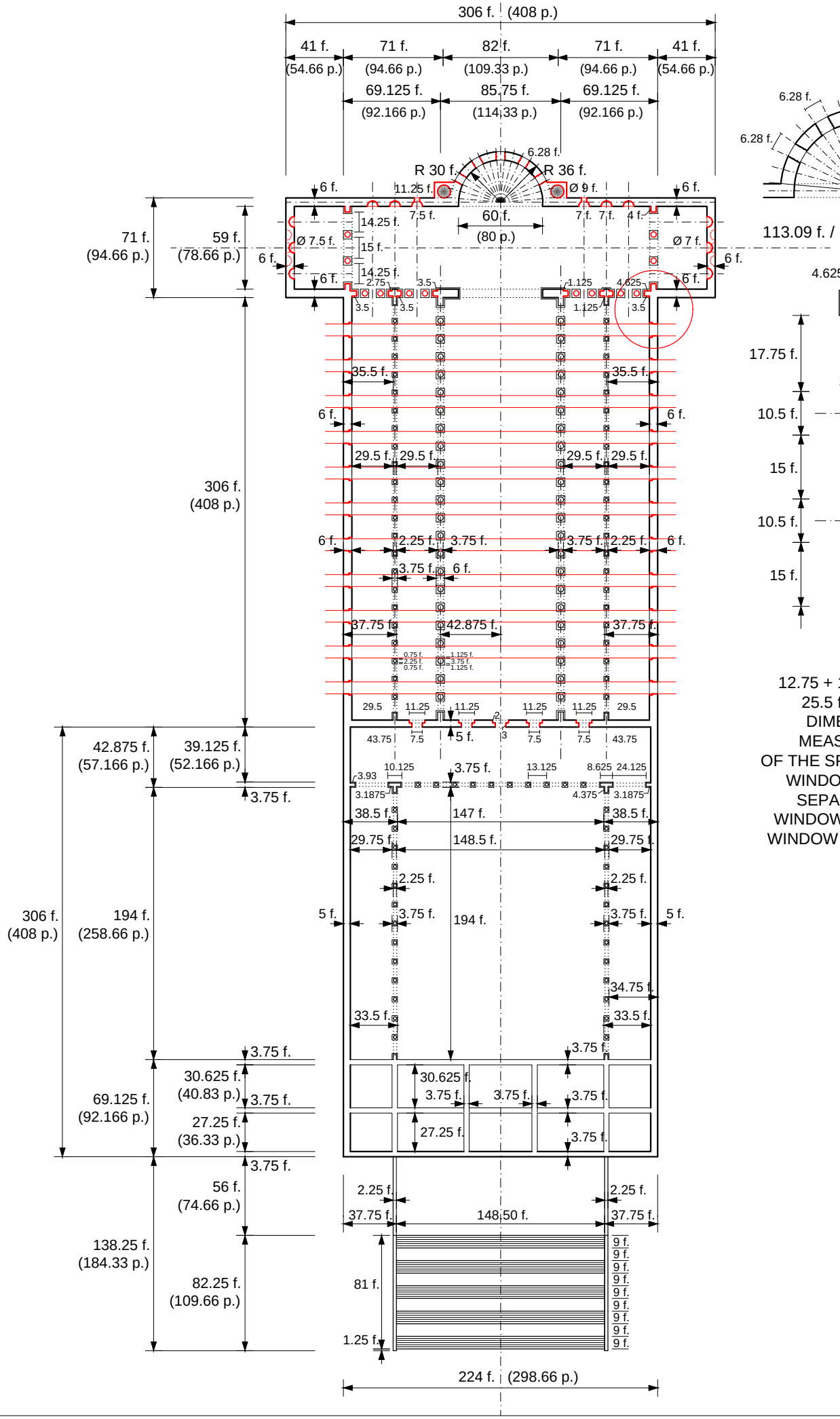
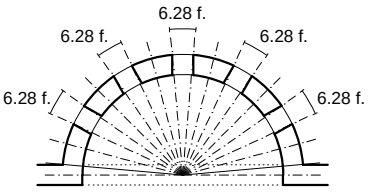
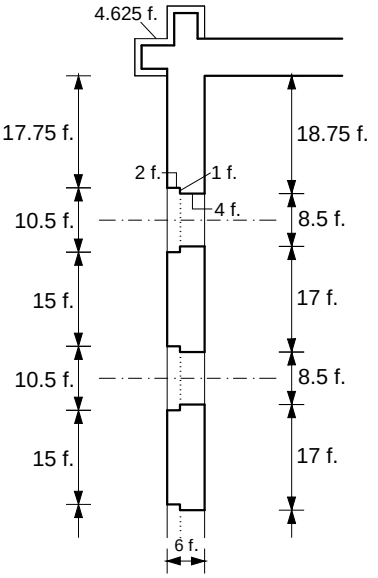


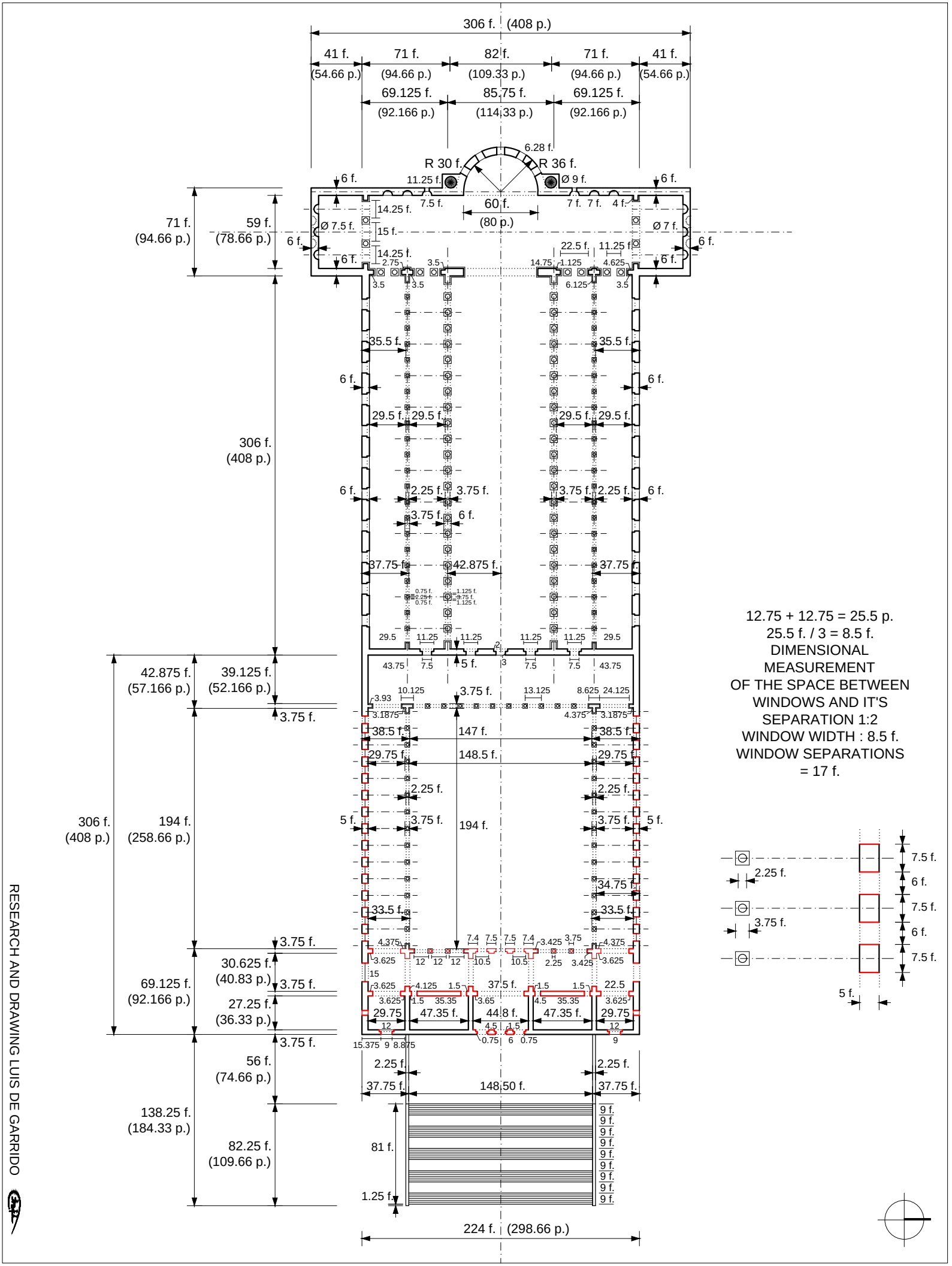


ARC :
113.09 f. / 18 parts = 6.28 f.



12.75 + 12.75 = 25.5 p.
25.5 f. / 3 = 8.5 f.
DIMENSIONAL MEASUREMENT OF THE SPACE BETWEEN WINDOWS AND IT'S SEPARATION 1:2
WINDOW WIDTH : 8.5 f.
WINDOW SEPARATIONS = 17 f.

RESEARCH AND DRAWING LUIS DE GARRIDO


306 f. (408 p.)
41 f. (54.66 p.)
71 f. (94.66 p.)
82 f. (109.33 p.)
71 f. (94.66 p.)
41 f. (54.66 p.)
69.125 f. (92.166 p.)
85.75 f. (114.33 p.)
69.125 f. (92.166 p.)
6.28 f.
R 30 f.
R 36 f.
Ø 9 f.
Ø 7.5 f.
Ø 7 f.
60 f. (80 p.)
71 f. (94.66 p.)
59 f. (78.66 p.)
306 f. (408 p.)
42.875 f. (57.166 p.)
39.125 f. (52.166 p.)
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194 f. (258.66 p.)
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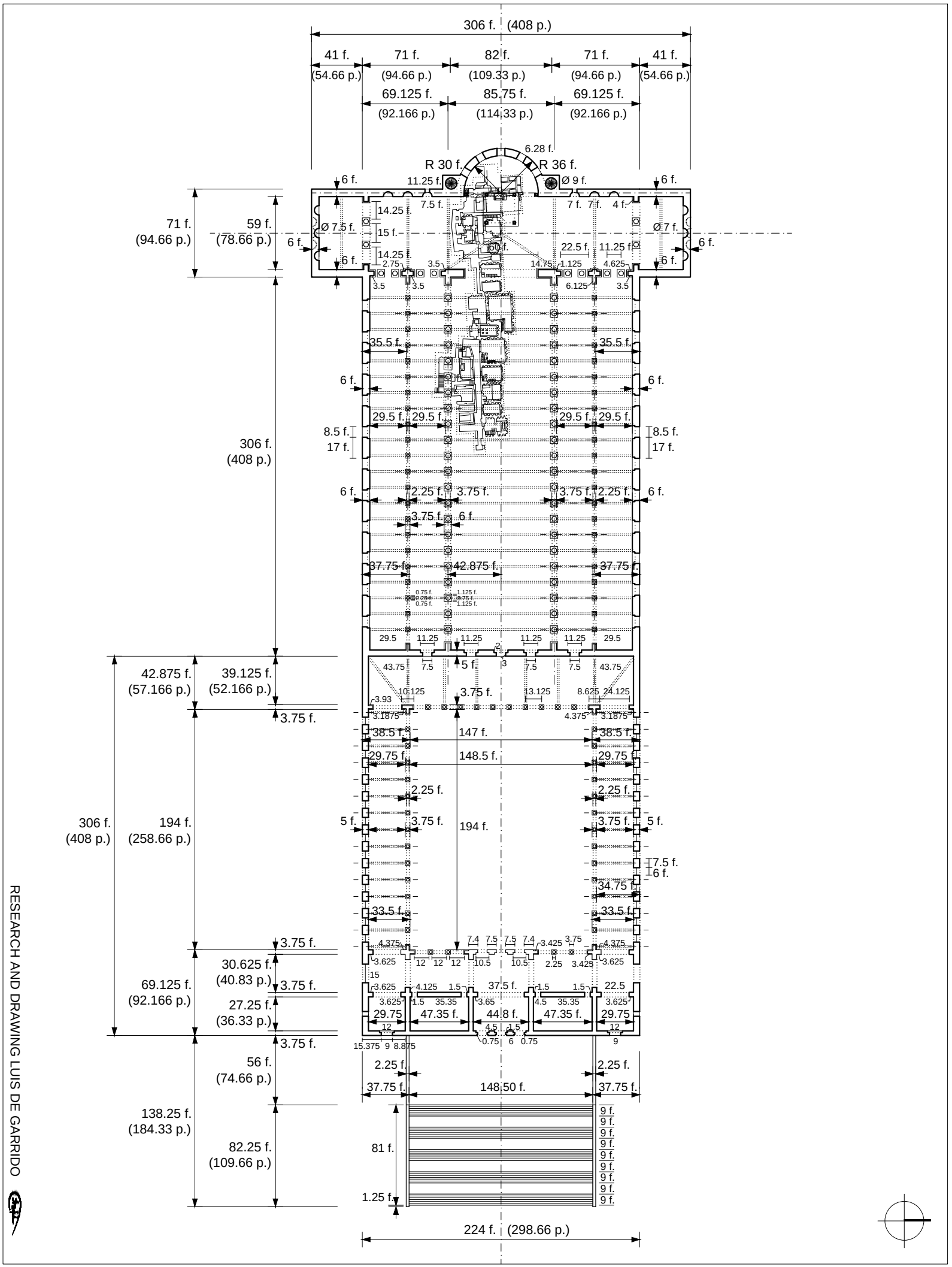
56 f. (74.66 p.)
138.25 f. (184.33 p.)
82.25 f. (109.66 p.)
147 f.
148.5 f.
194 f.
148.50 f.
224 f. (298.66 p.)
81 f.
1.25 f.
12.75 + 12.75 = 25.5 p.
25.5 f. / 3 = 8.5 f.
DIMENSIONAL MEASUREMENT OF THE SPACE BETWEEN WINDOWS AND IT'S SEPARATION 1:2
WINDOW WIDTH : 8.5 f.
WINDOW SEPARATIONS = 17 f.
RESEARCH AND DRAWING LUIS DE GARRIDO



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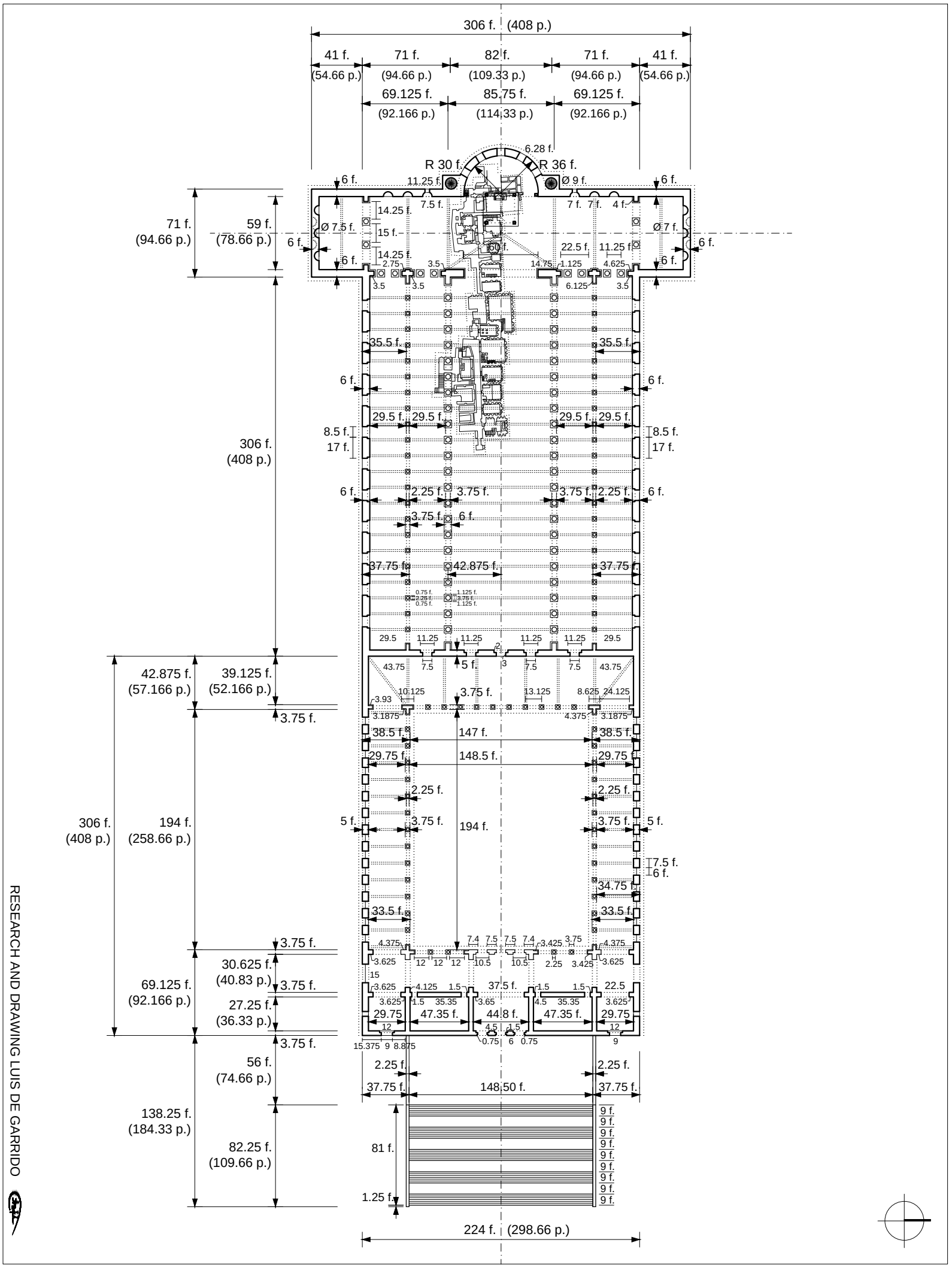

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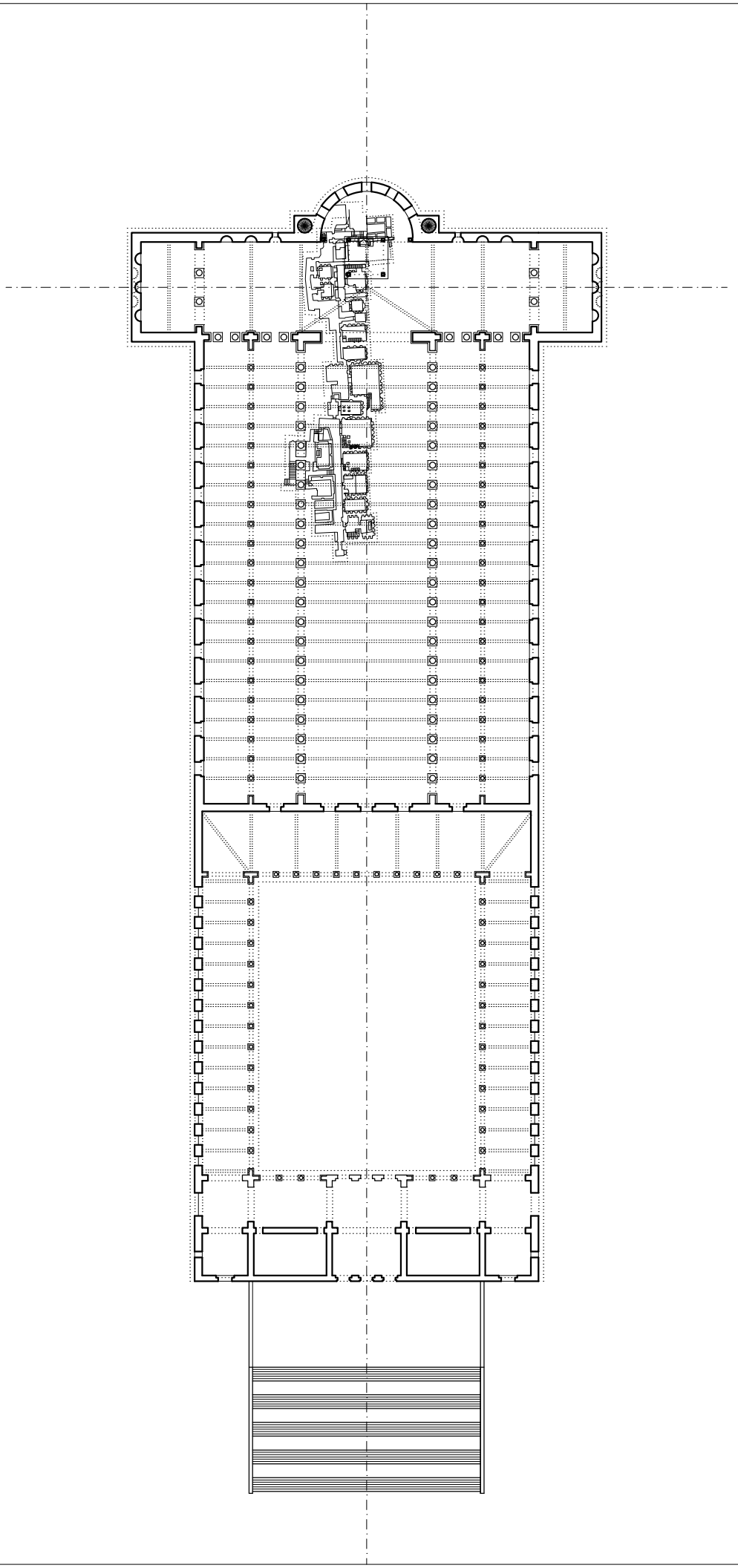

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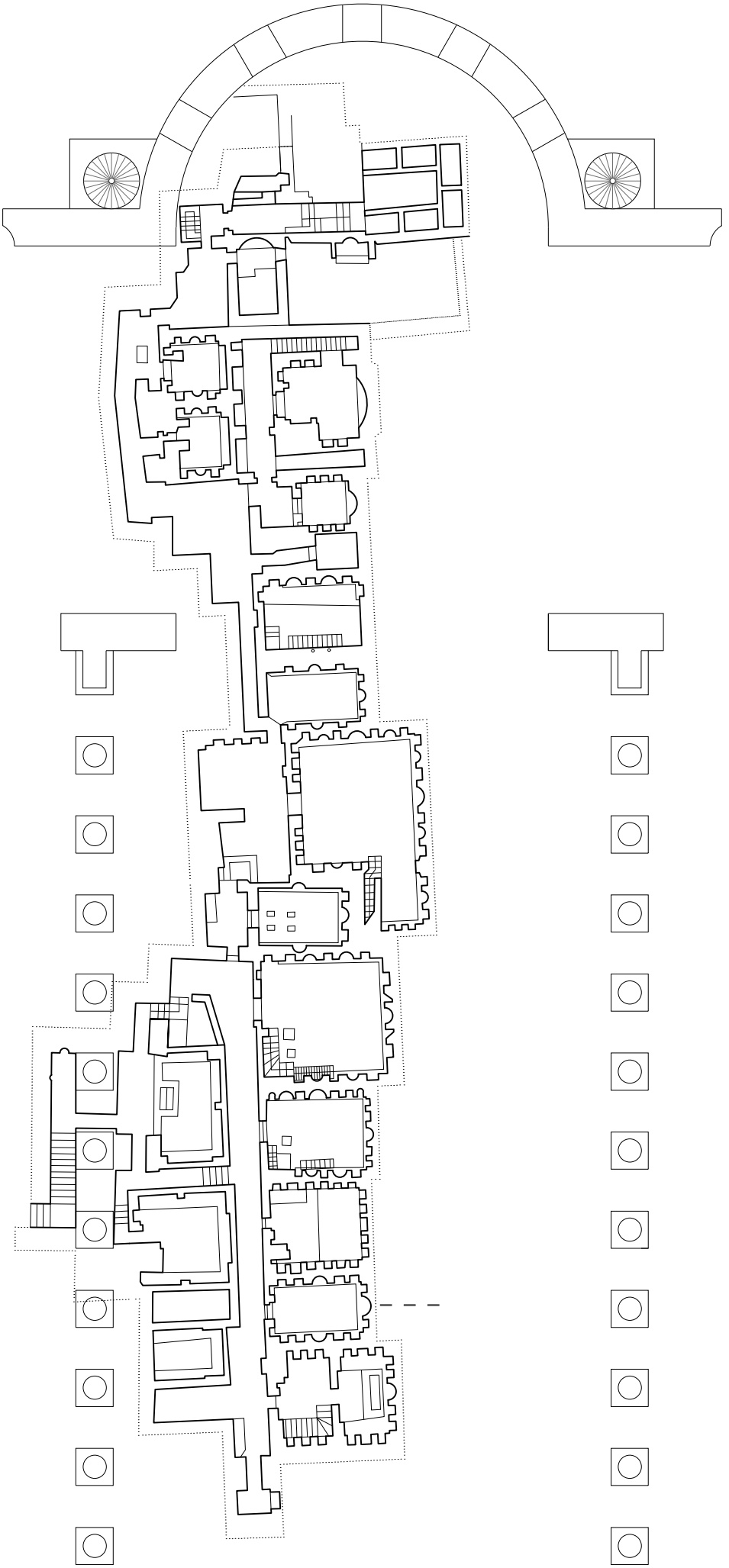

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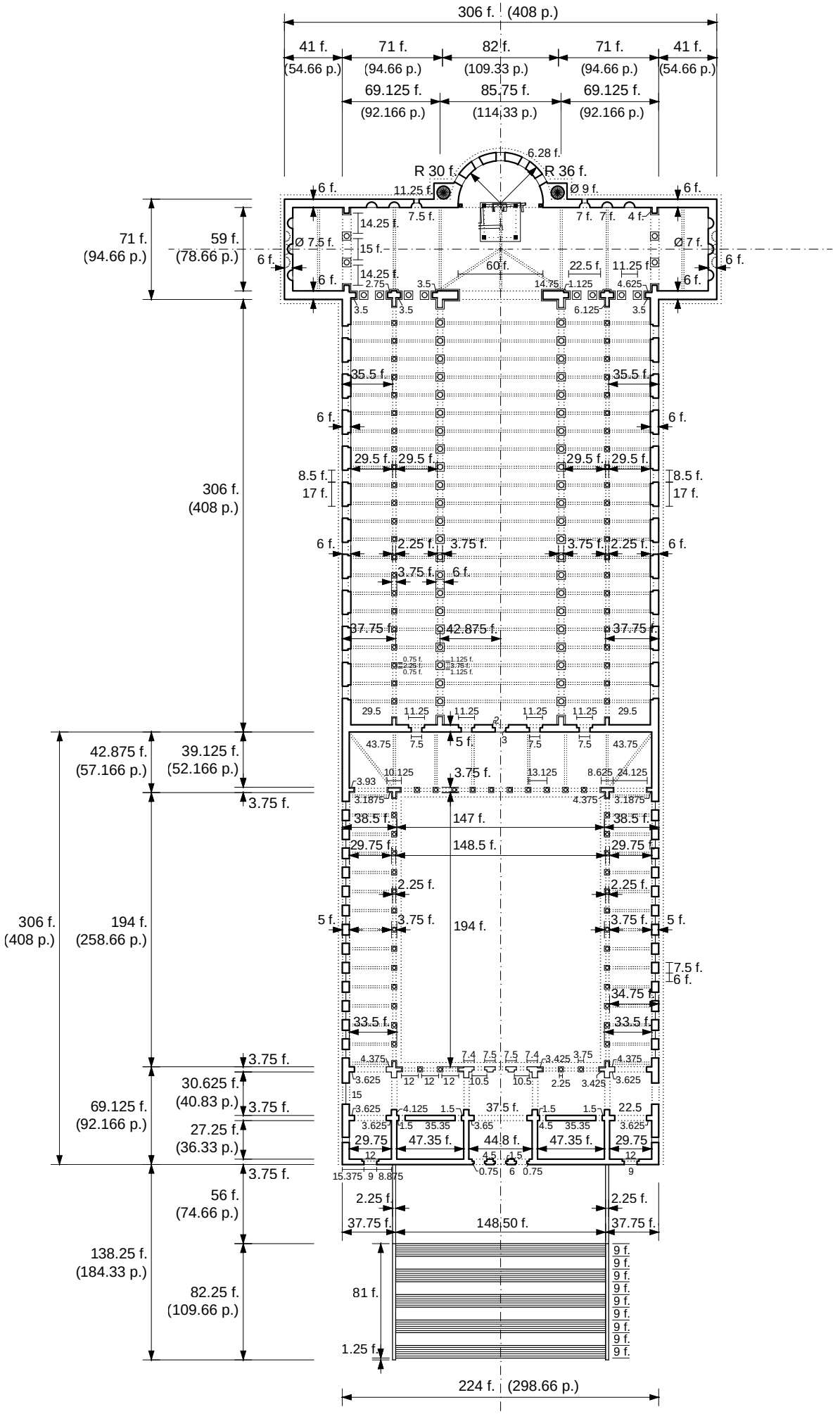

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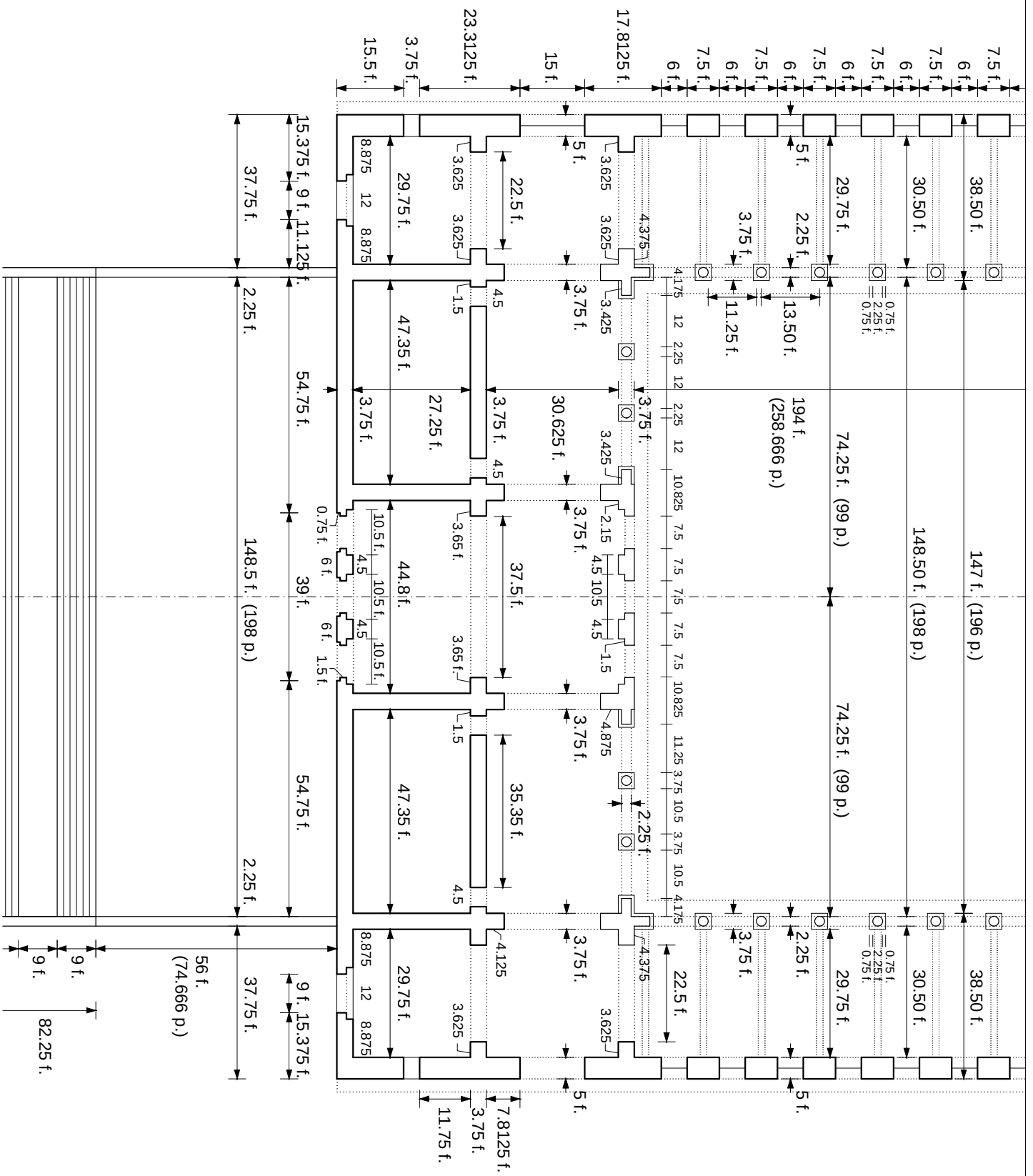

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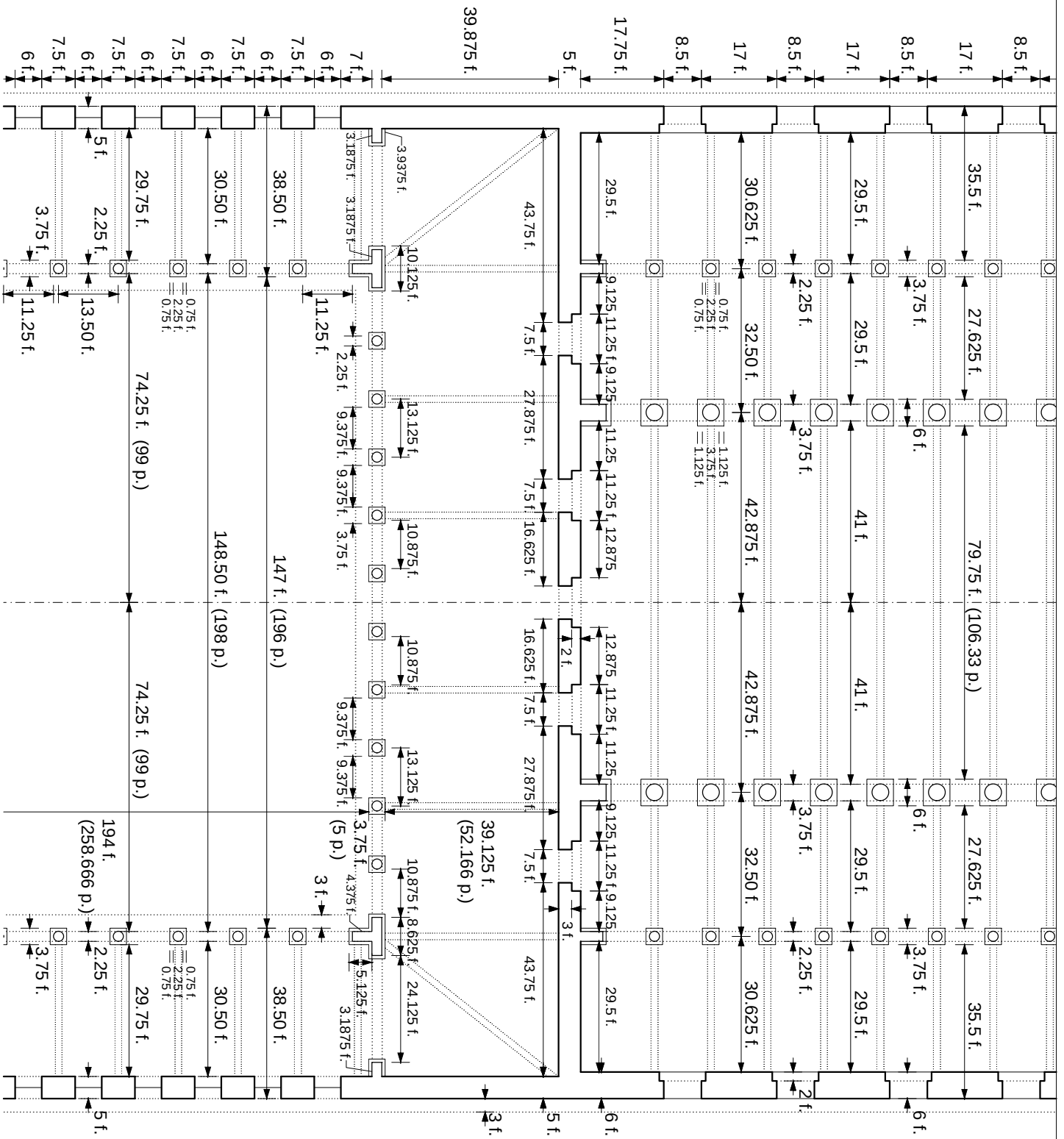

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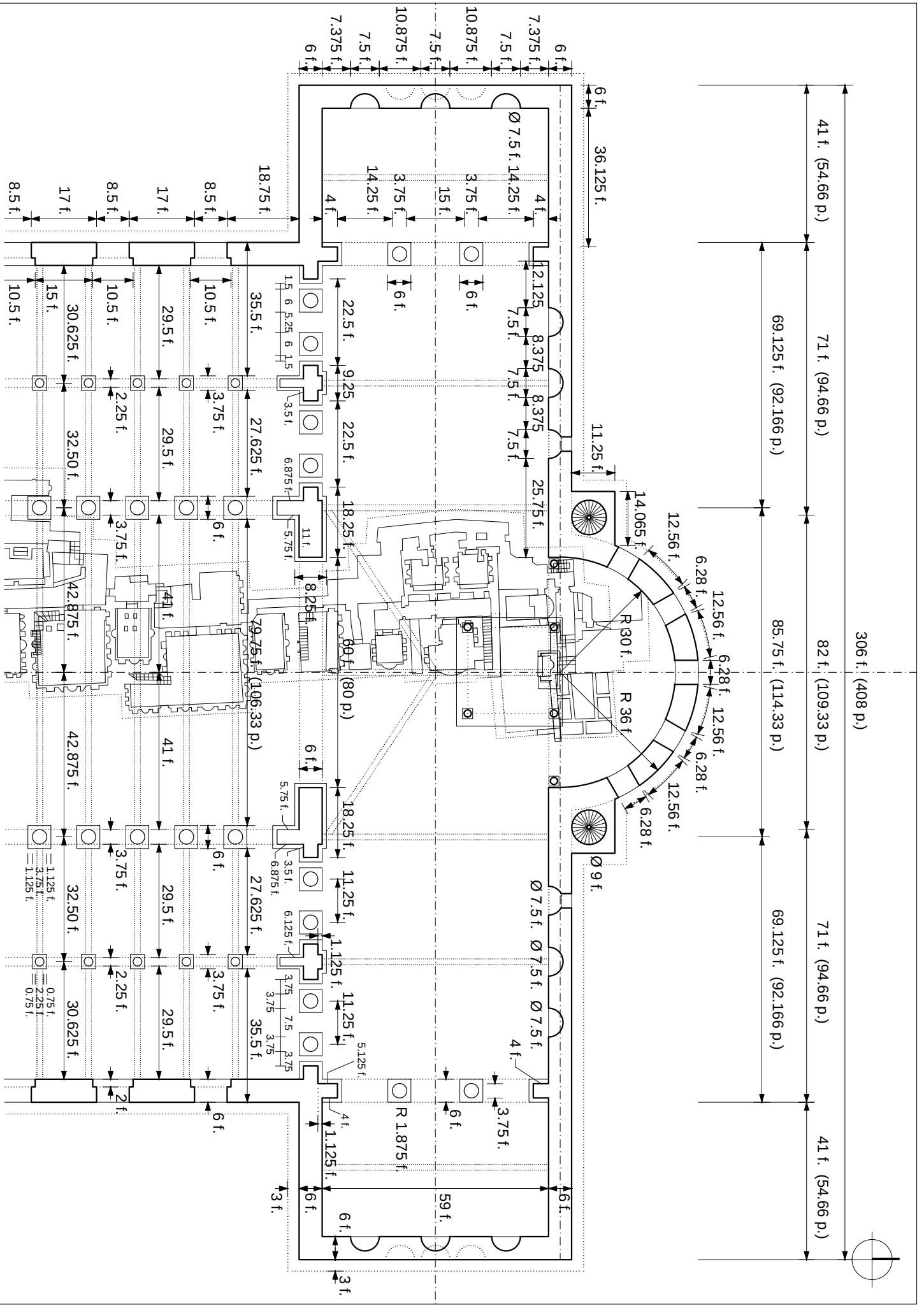

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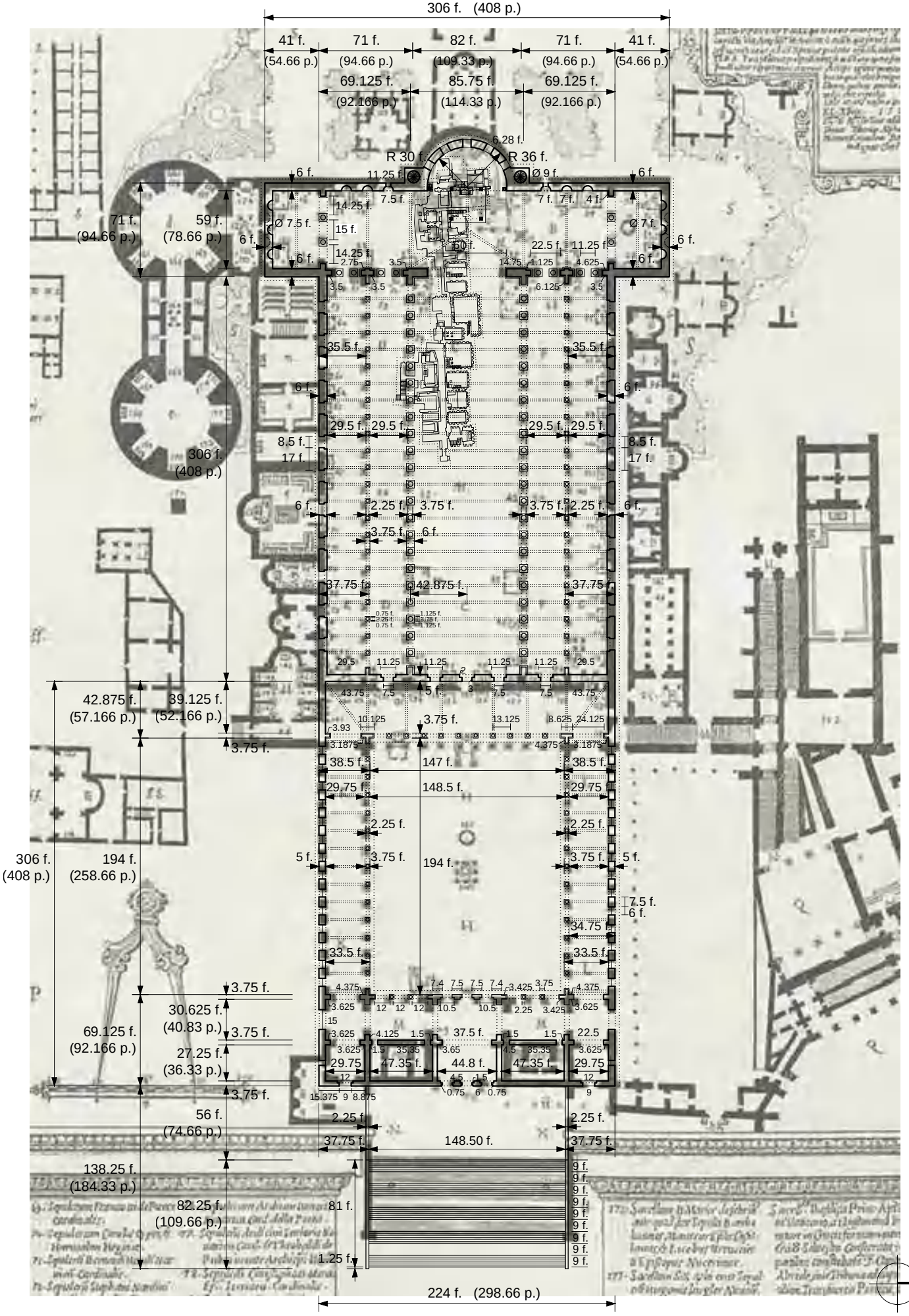
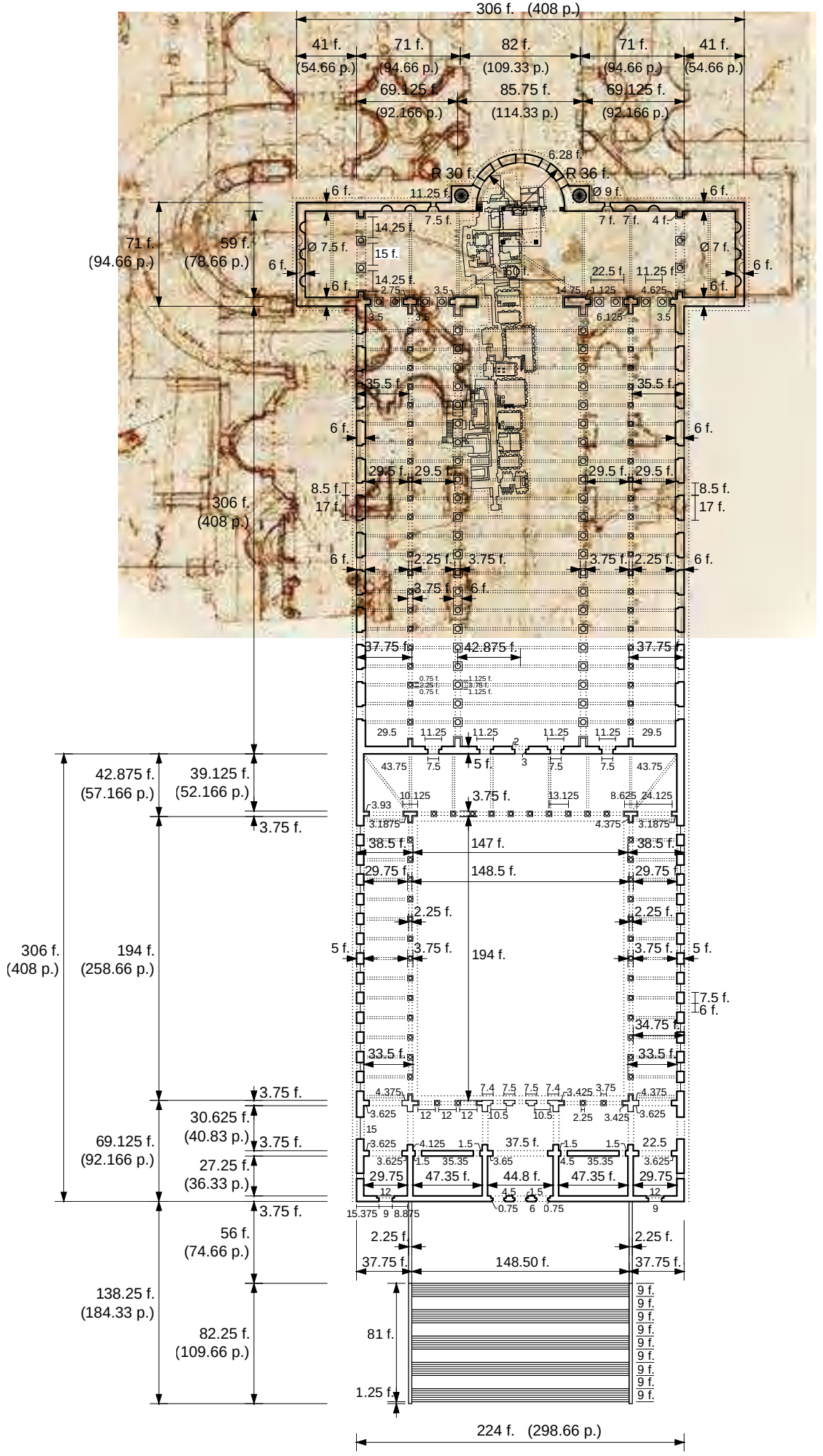


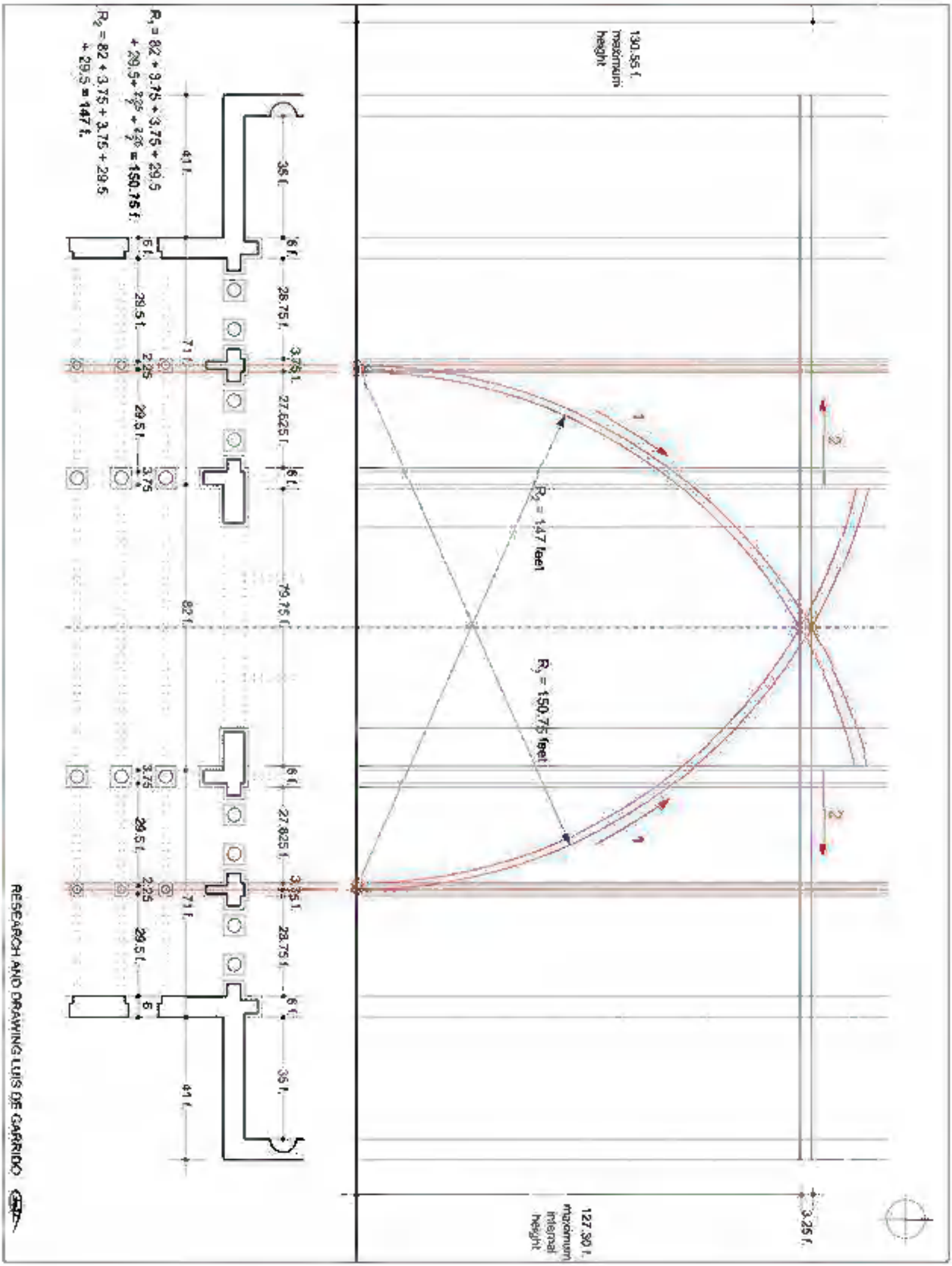
RESEARCH AND DRAWING LUIS DE GARRIDO

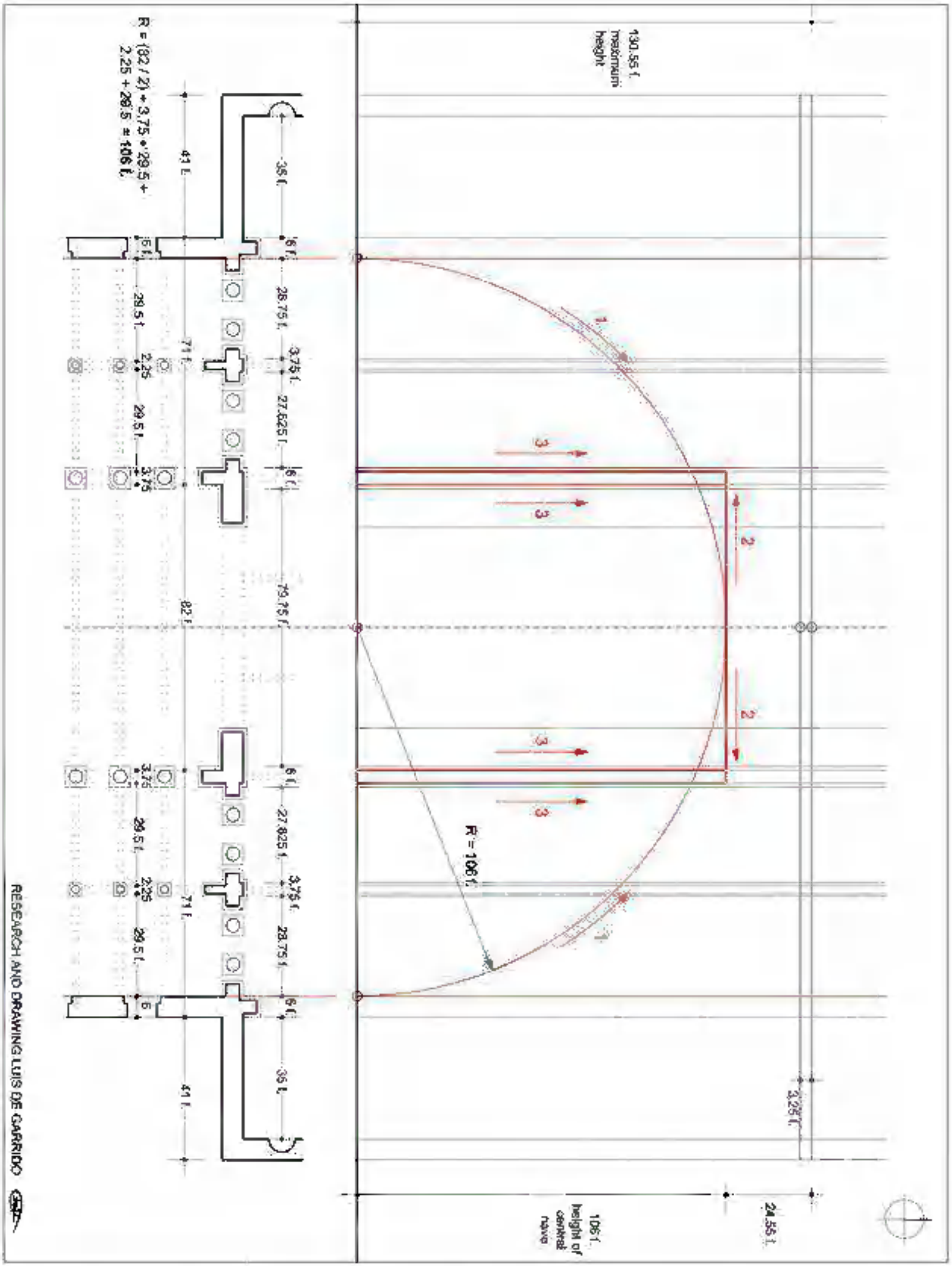


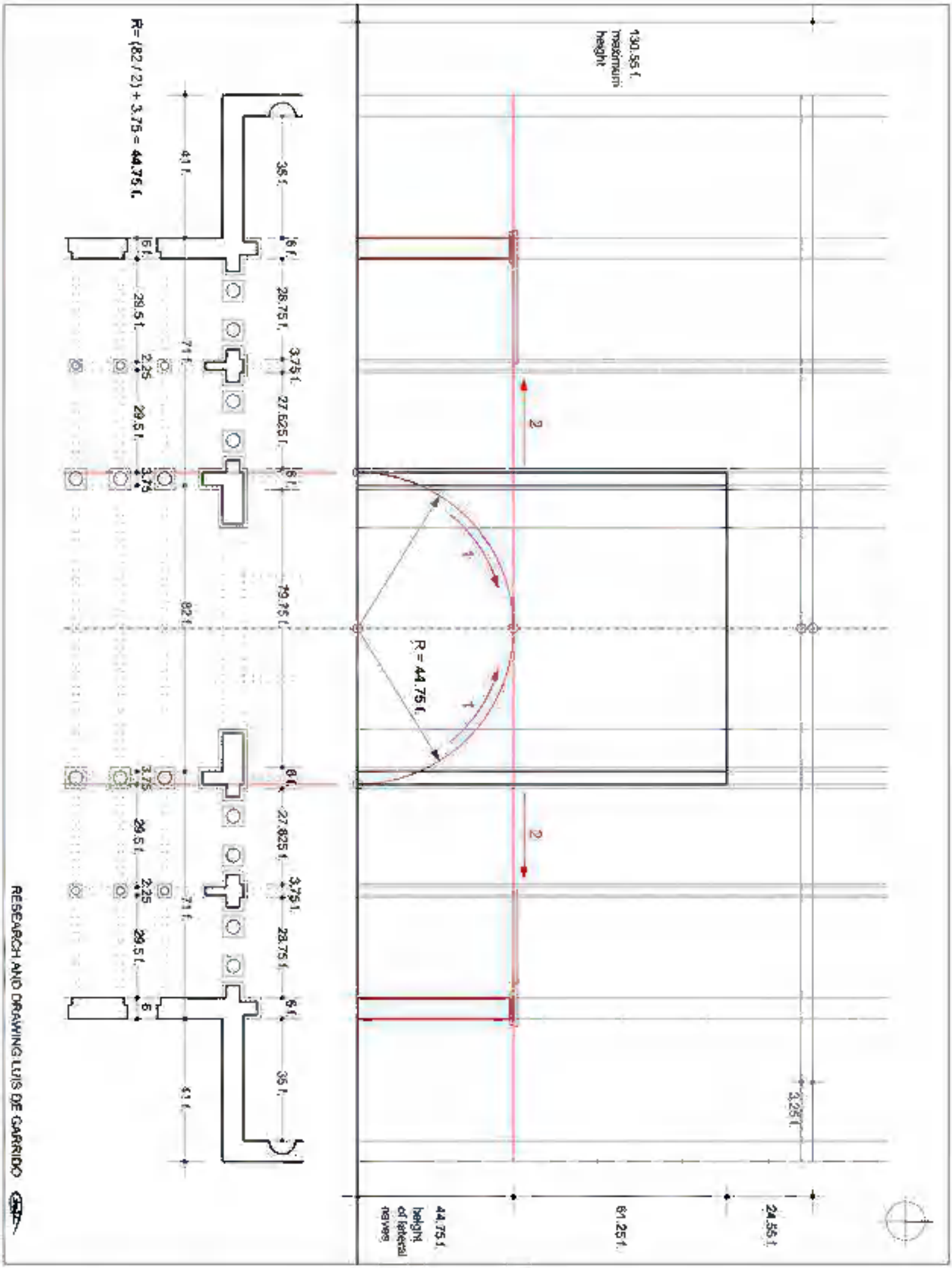
RESEARCH AND DRAWING LUIS DE GARRIDO

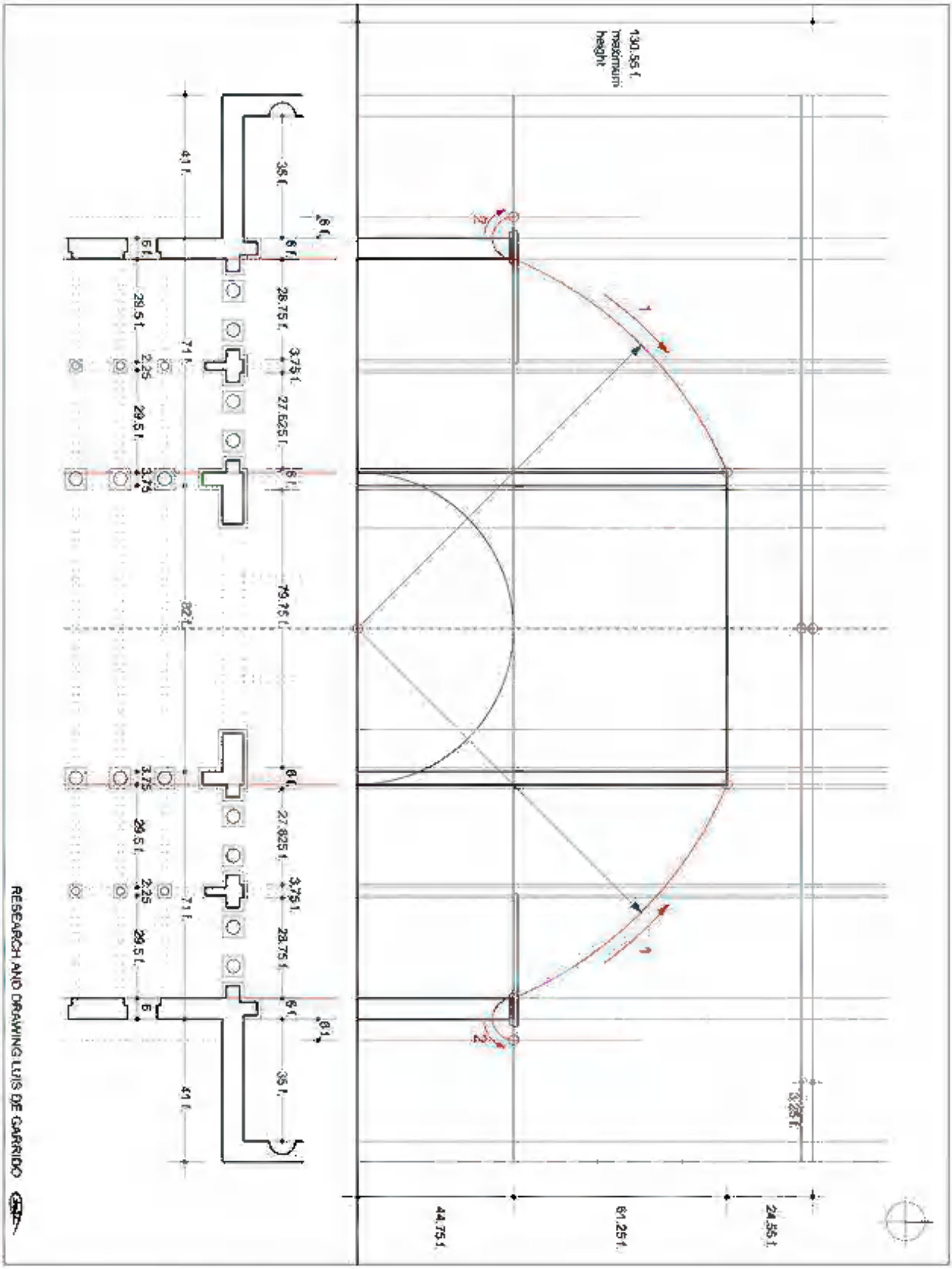
ANALYSIS OF THE CROSS SECTION OF THE OLD BASILICA OF S. PETER IN VATICAN 324 A.C IDENTIFICATION OF ALL DESIGN STAGES UP TO THE FINAL RESULT

RESEARCH AND DRAWING LUIS DE GARRIDO


130.55 f.
maximum
height
R1 = 82 + 3.75 + 3.75 + 29.5
+ 29.5 + 2.25 + 2.25 = 150.75 f.
R2 = 82 + 3.75 + 3.75 + 29.5
+ 29.5 = 147 f.
R2 = 147 feet
R1 = 150.75 feet
127.30 f.
maximum
internal
height
RESEARCH AND DRAWING LUIS DE GARRIDO


130.55 f.
maximum
height
R = (82 / 2) + 3.75 + 29.5 +
2.25 + 28.5 = 106 f.
R = 106 f.
106 f.
height of
central
nave
24.55 f.
3.25 f.
35 f.
6 f.
28.75 f.
3.75 f.
27.625 f.
29.5 f.
2.25
41 f.
71 f.
82 f.
79.75 f.
RESEARCH AND DRAWING LUIS DE GARRIDO


130.55 f.
maximum
height
R = (82 / 2) + 3.75 = 44.75 f.
R = 44.75 f.
44.75 f.
height
of lateral
naves
61.25 f.
24.55 f.
3.25 f.
35 f.
41 f.
6 f.
28.75 f.
3.75 f.
27.625 f.
79.75 f.
82 f.
71 f.
29.5 f.
2.25
5
RESEARCH AND DRAWING LUIS DE GARRIDO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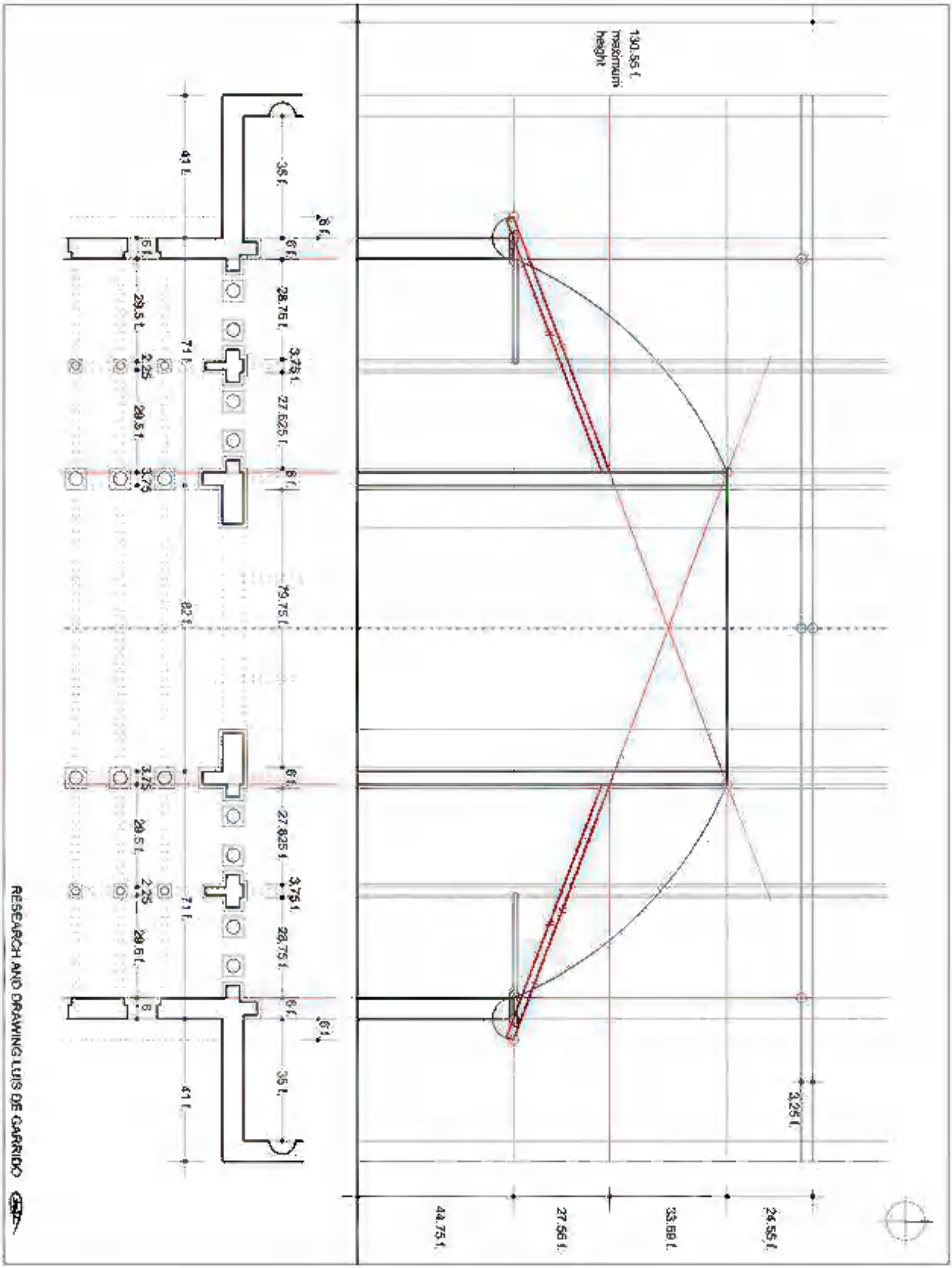
RESEARCH AND DRAWING LUIS DE GARRIDO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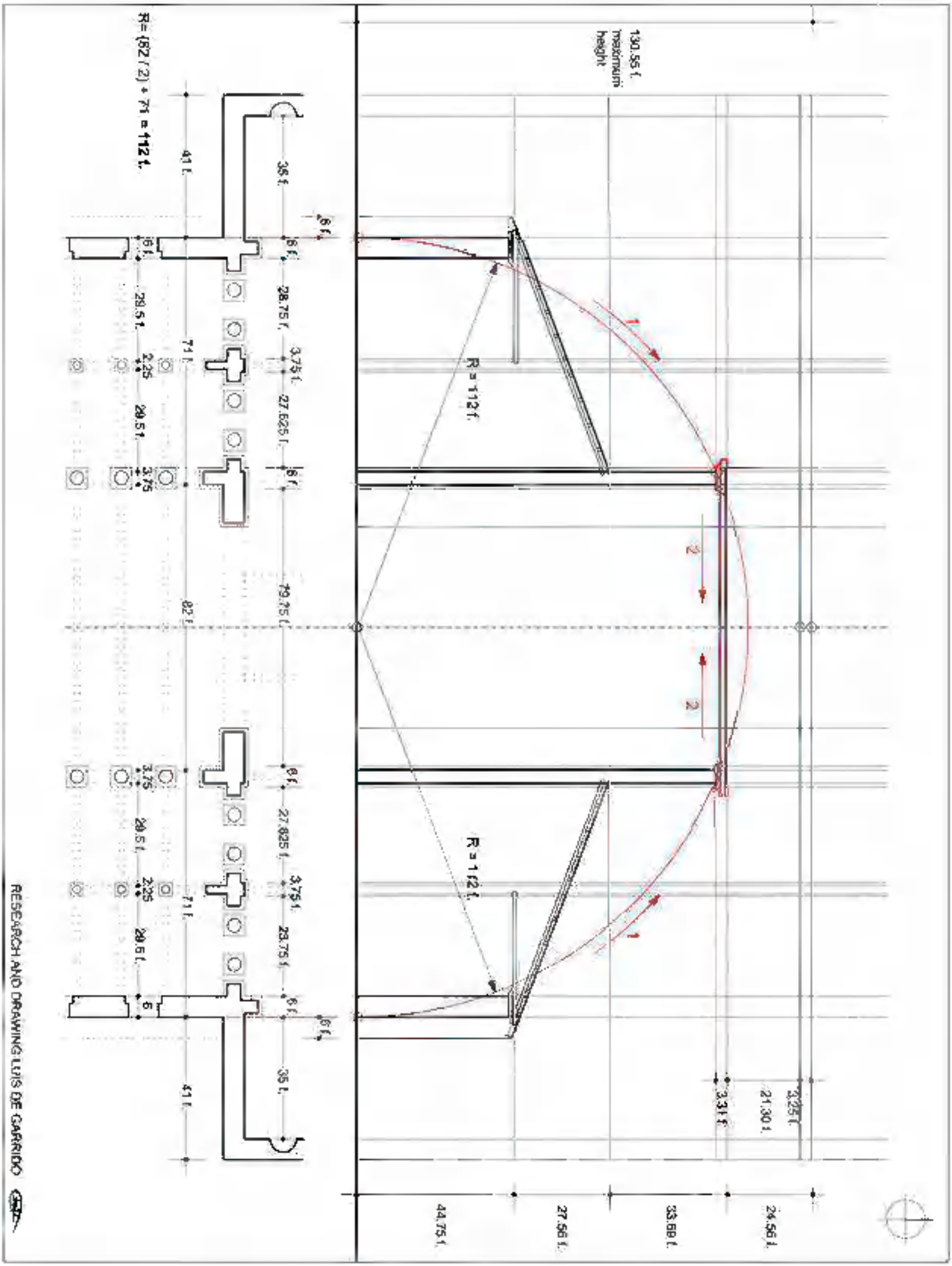
RESEARCH AND DRAWING LUIS DE GARRIDO



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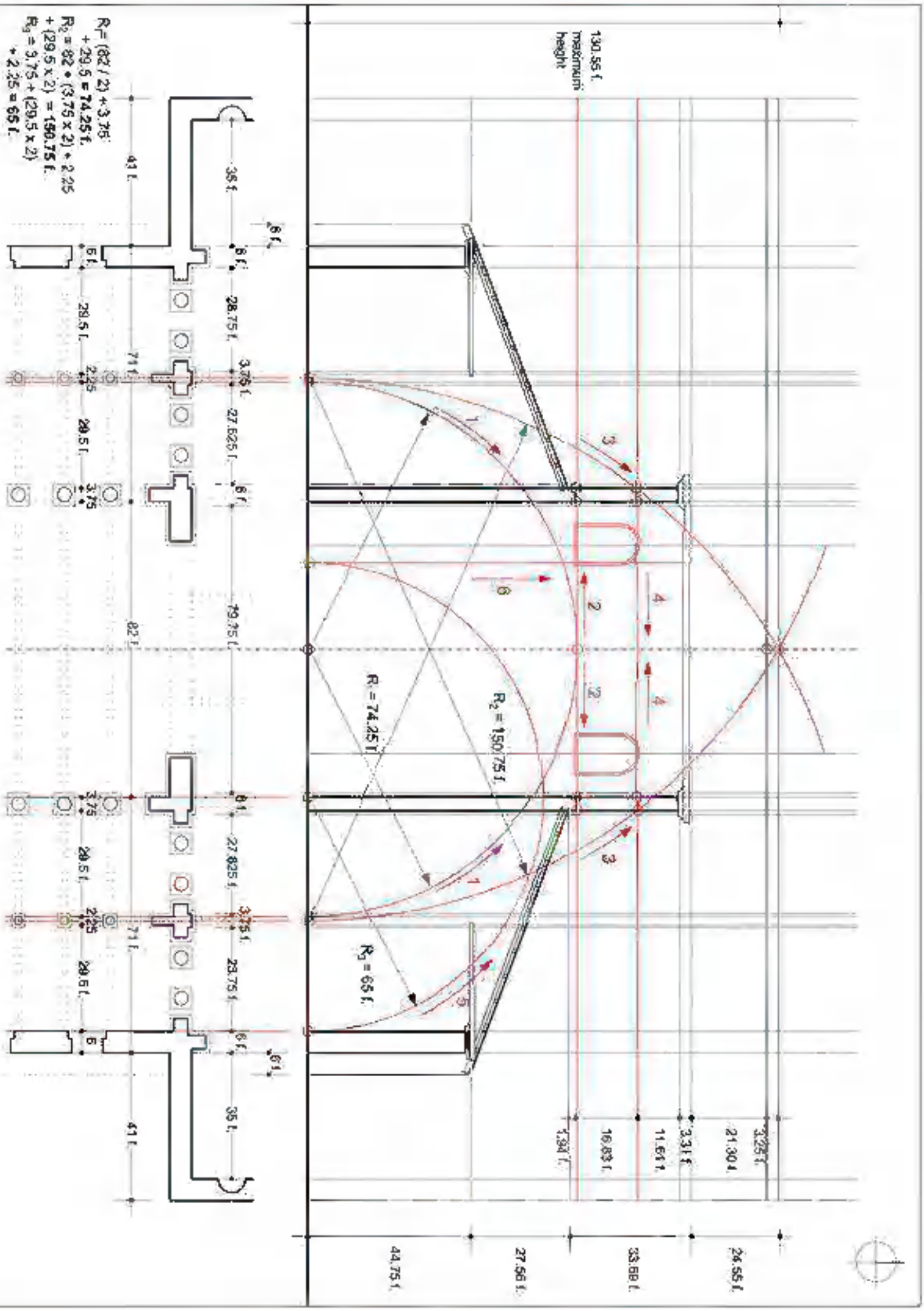

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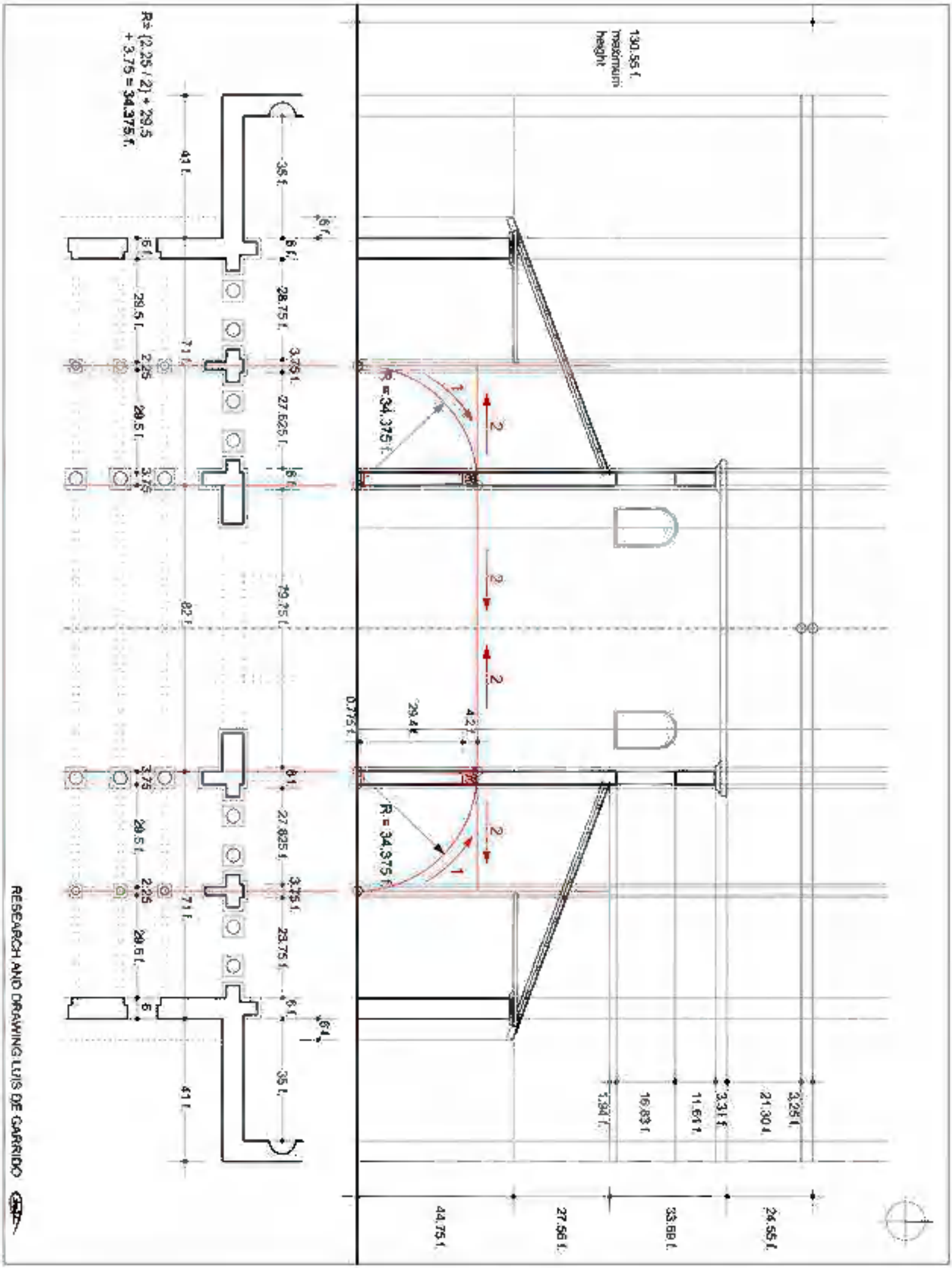

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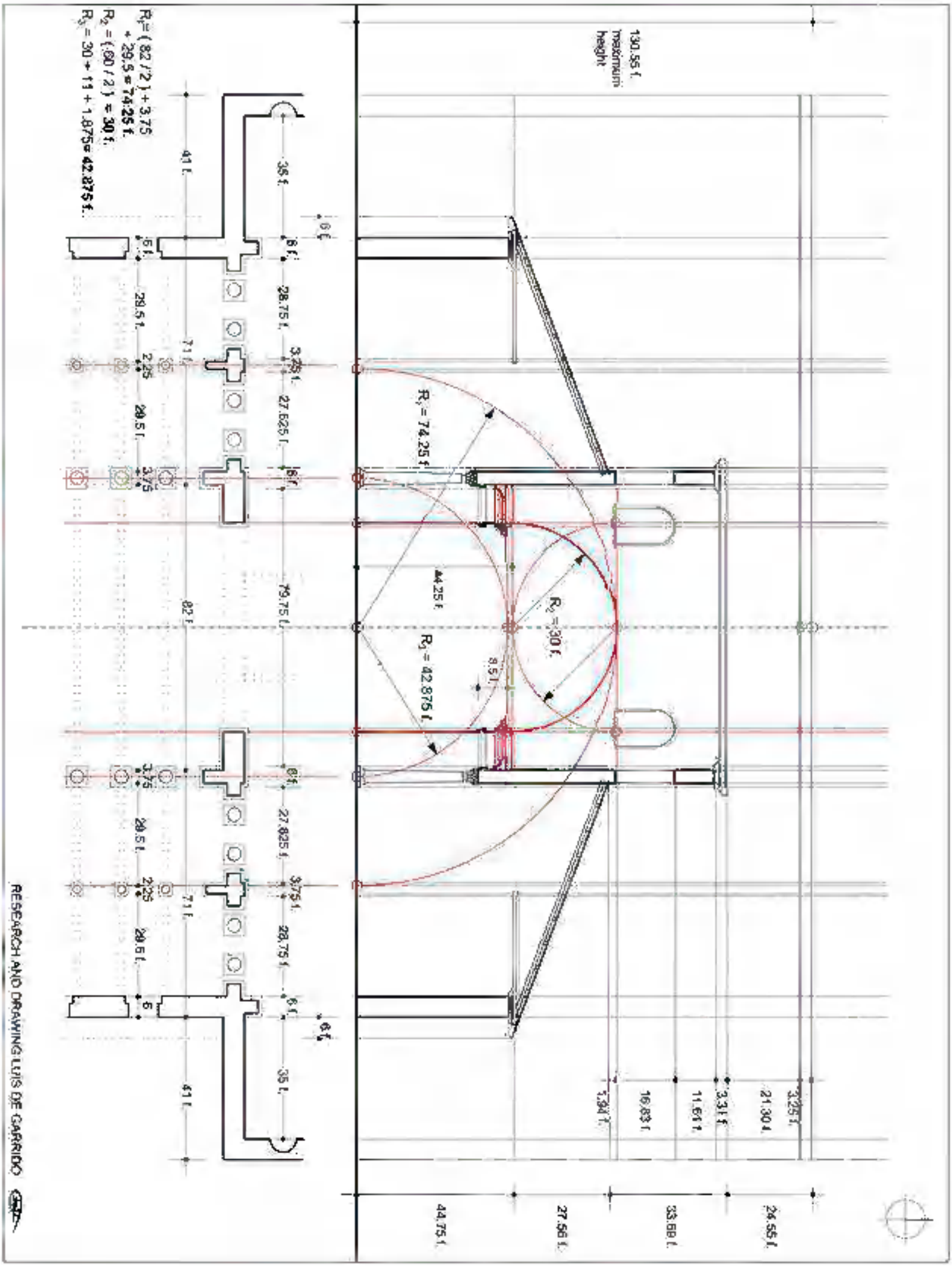
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R2 = 30 f.
R3 = 42.875 f.
44.25 f.
8.5 f.
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82 f.
41 f.
35 f.
6 f.
28.75 f.
3.25 f.
27.625 f.
2.25
29.5 f.
3.75
5 f.
71 f.
R1 = (82 / 2) + 3.75 + 29.5 = 74.25 f.
R2 = (60 / 2) = 30 f.
R3 = 30 + 11 + 1.875 = 42.875 f.
3.25 f.
21.30 f.
3.31 f.
11.66 f.
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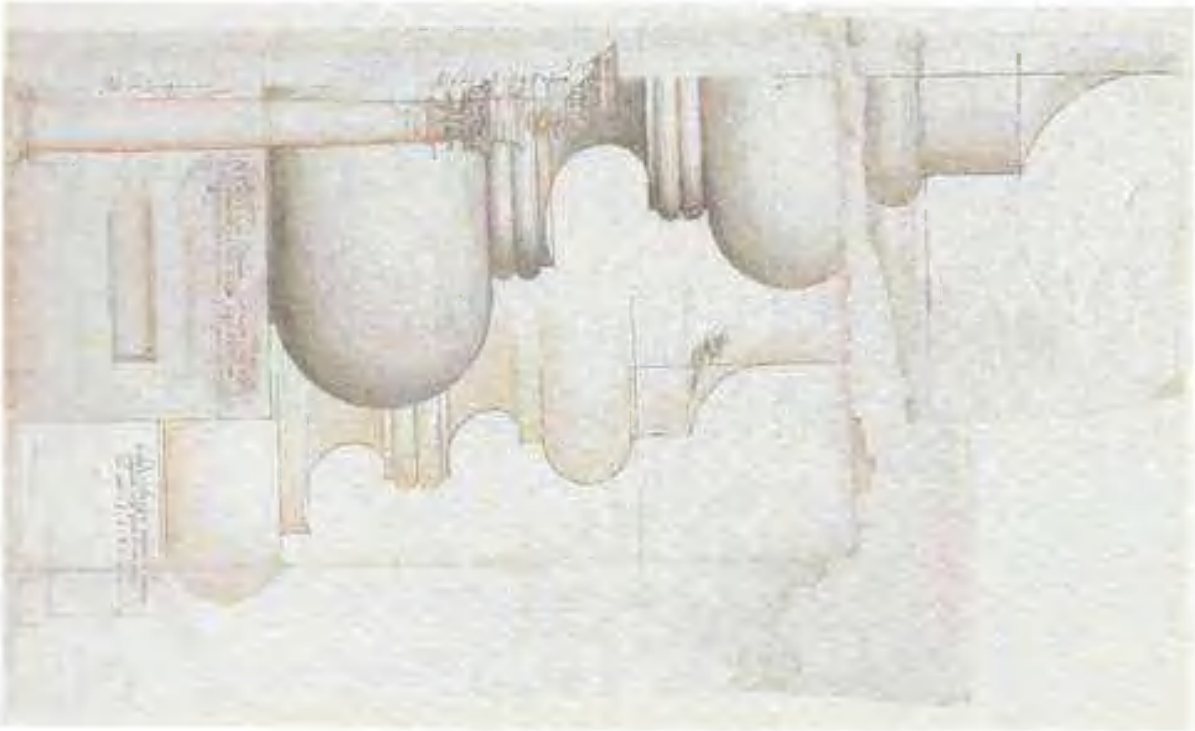
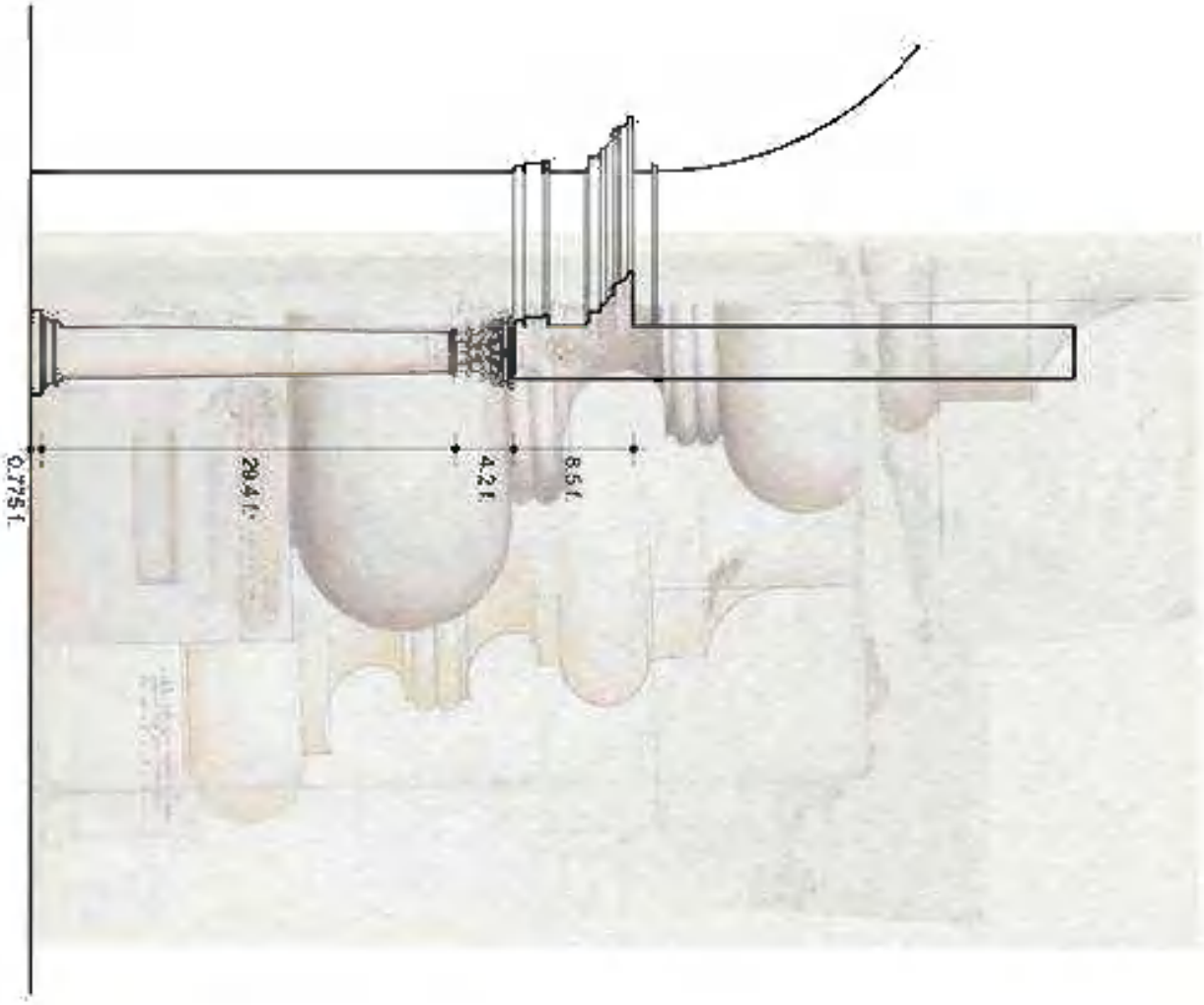
RESEARCH AND DRAWING LUIS DE GARRIDO





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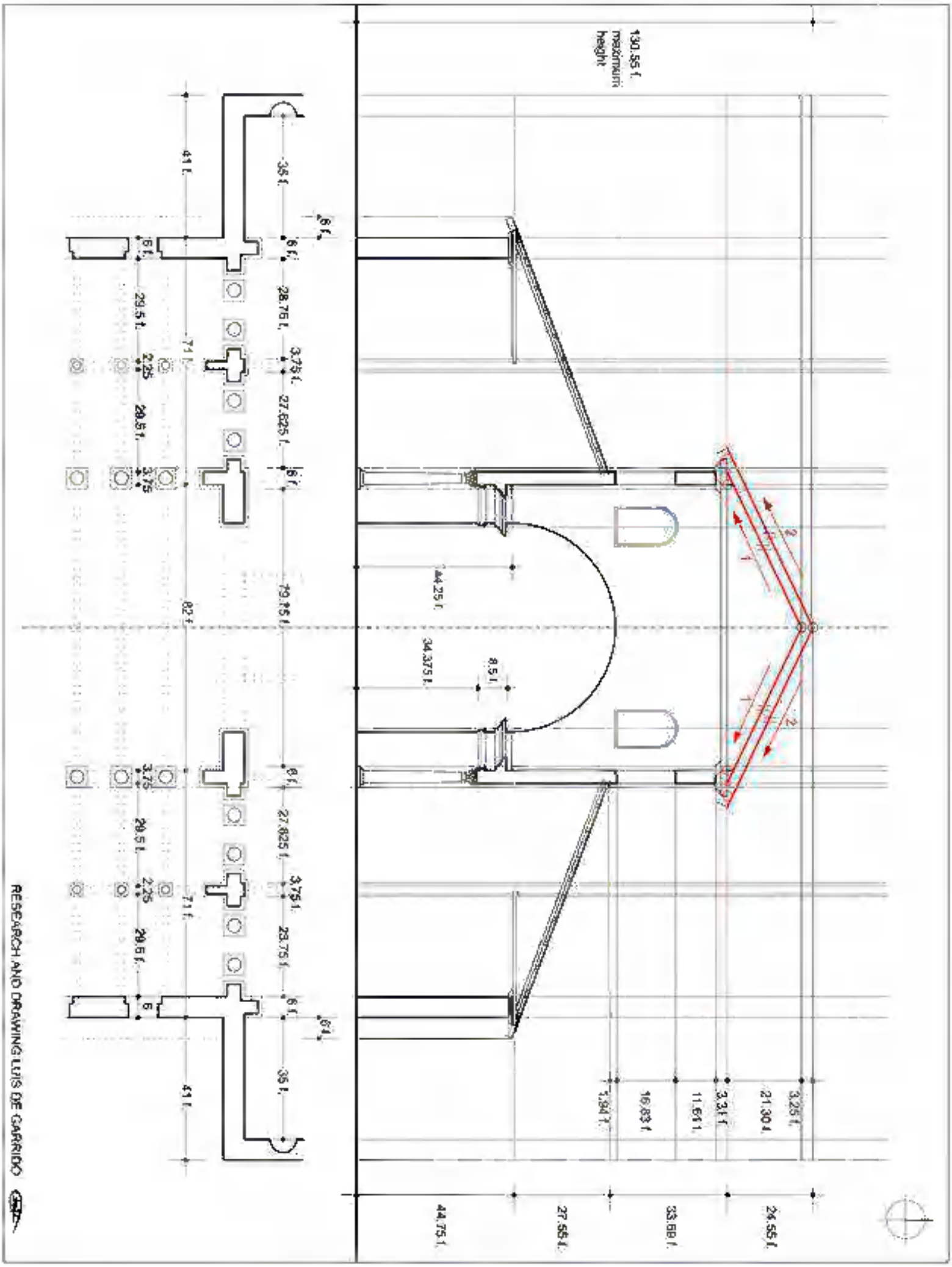
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8.5 f.
79.15 f.
82 f.
41 f.
35 f.
6 f.
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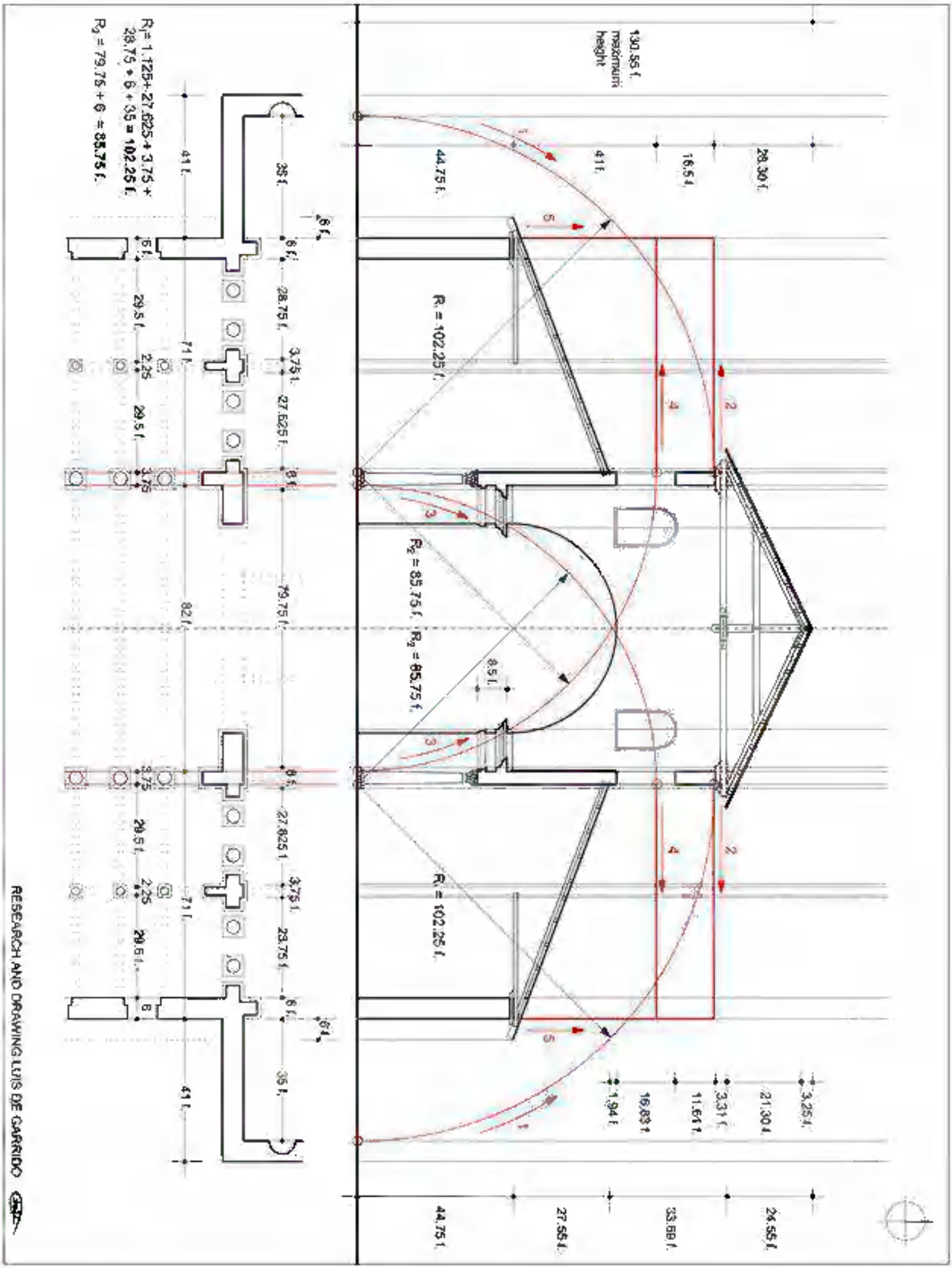
RESEARCH AND DRAWING LUIS DE GARRIDO



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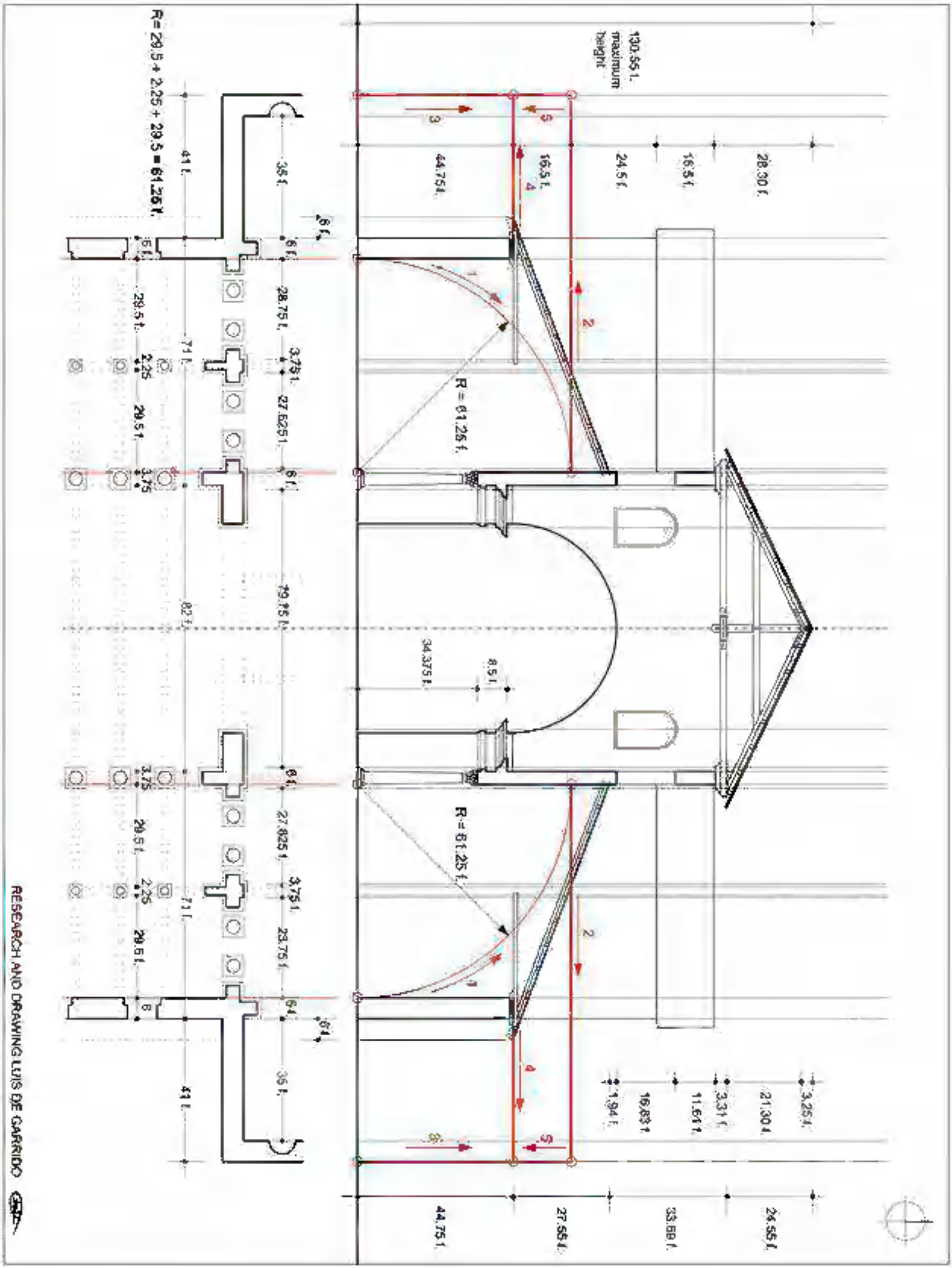
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height
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R = 61.25 f.
R = 61.25 f.
R= 29.5 + 2.25 + 29.5 = 61.25 f.
41 f.
35 f.
28.75 f.
3.75 f.
27.625 f.
29.5 f.
2.25
29.5 f.
71 f.
82 f.
79.75 f.
34.375 f.
8.5 f.
23.75 f.
3.254.
21.304.
3.31 f.
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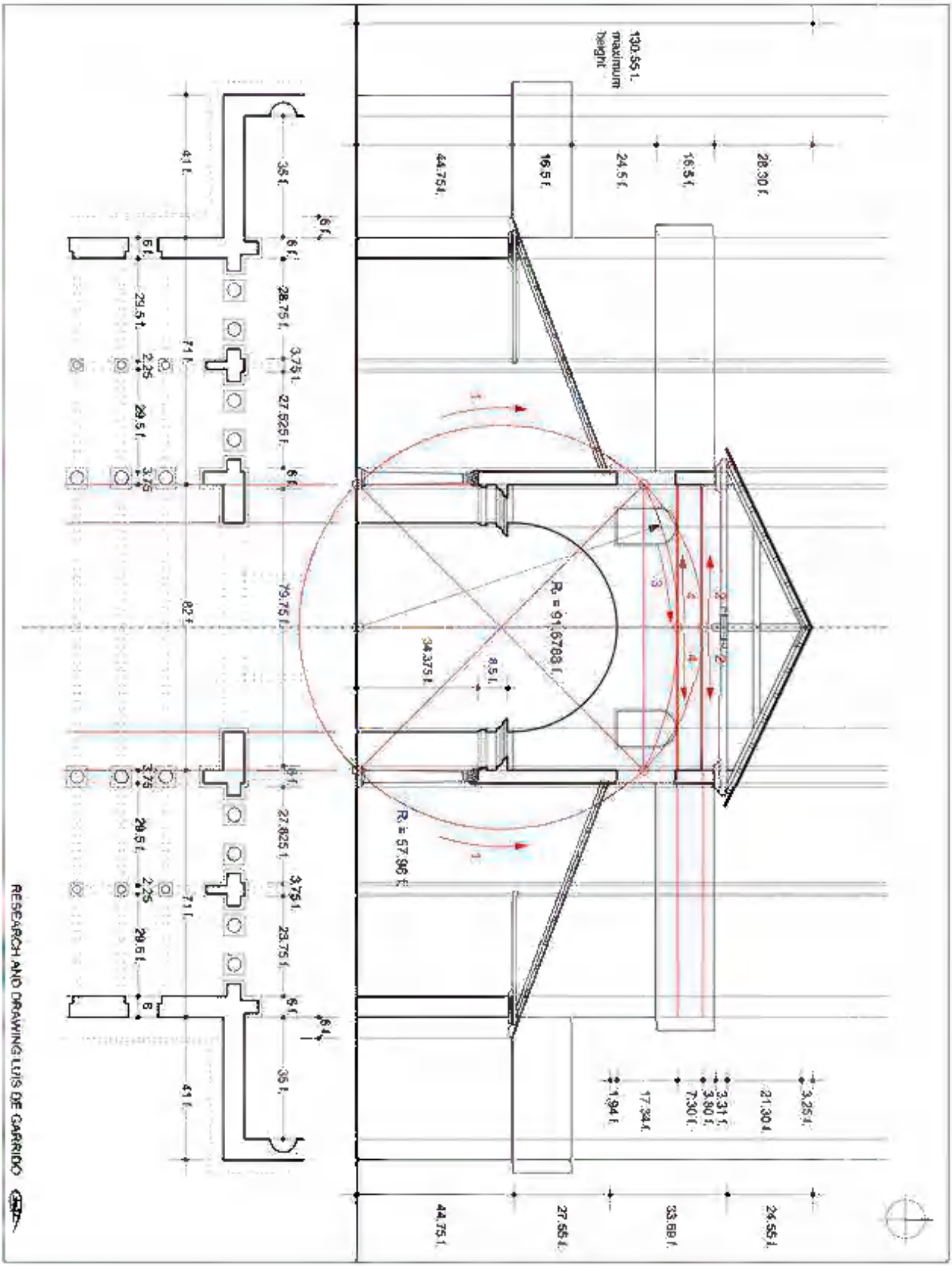
RESEARCH AND DRAWING LUIS DE GARRIDO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1.94 f.
24.55 f.
33.68 f.
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44.75 f.
R₁ = 91.6788 f.
R₂ = 57.96 f.
34.375 f.
8.5 f.
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82 f.
71 f.
41 f.
35 f.
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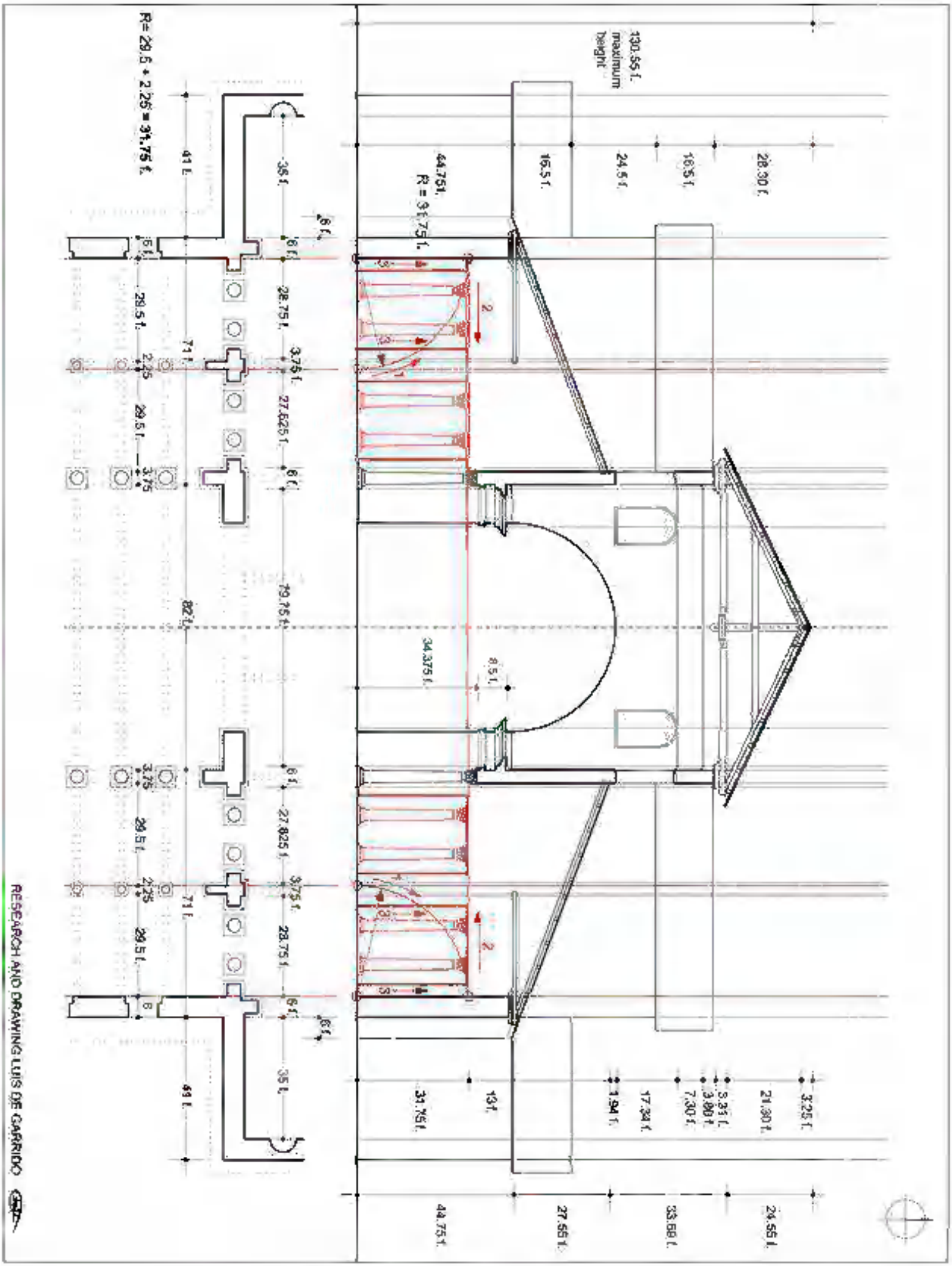
B
RESEARCH AND DRAWING LUIS DE GARRIDO



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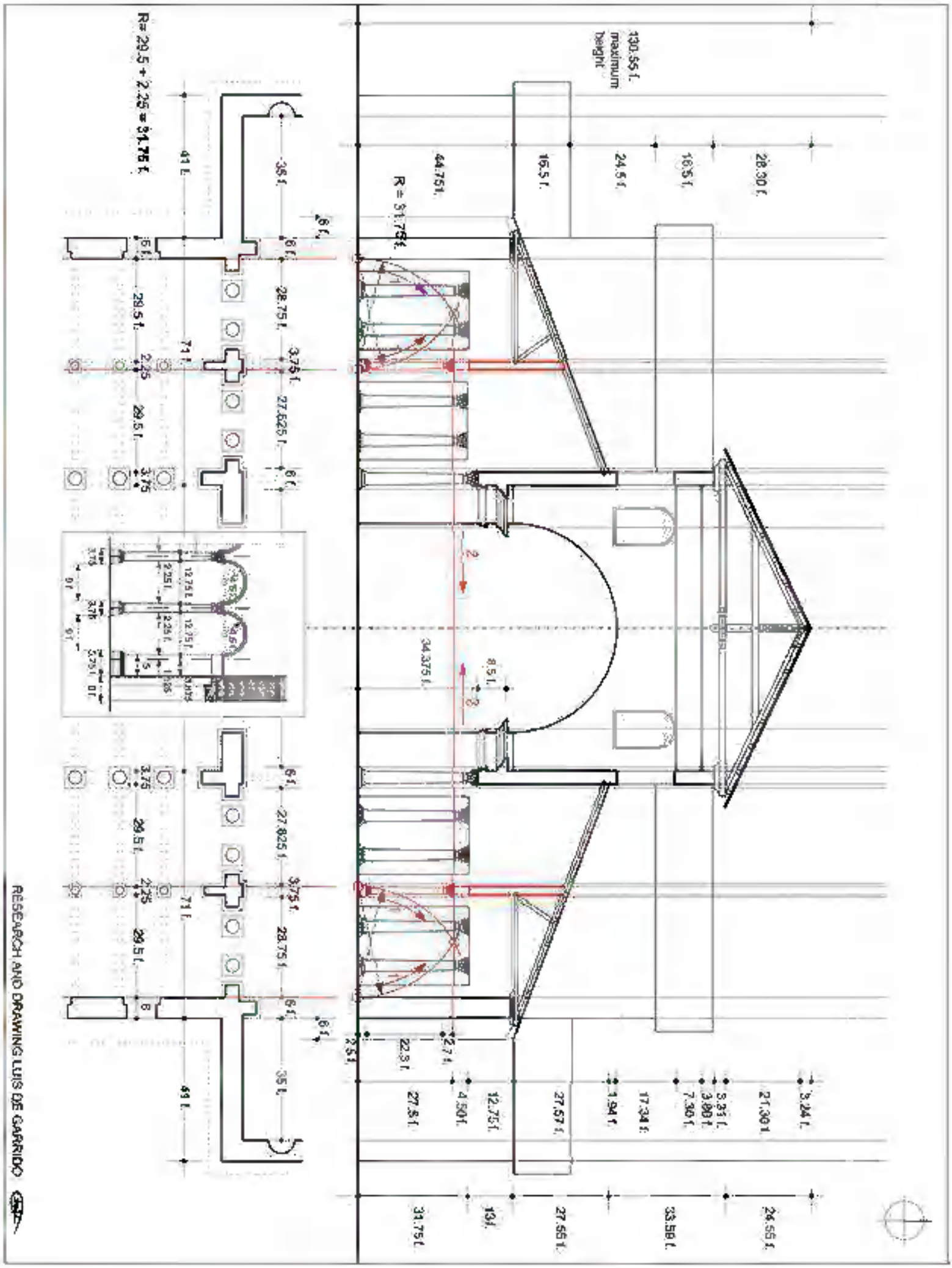
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R = 31.75 f.
R= 29.5 + 2.25 = 31.75 f.
41 f.
35 f.
6 f.
28.75 f.
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27.625 f.
29.5 f.
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71 f.
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8.5 f.
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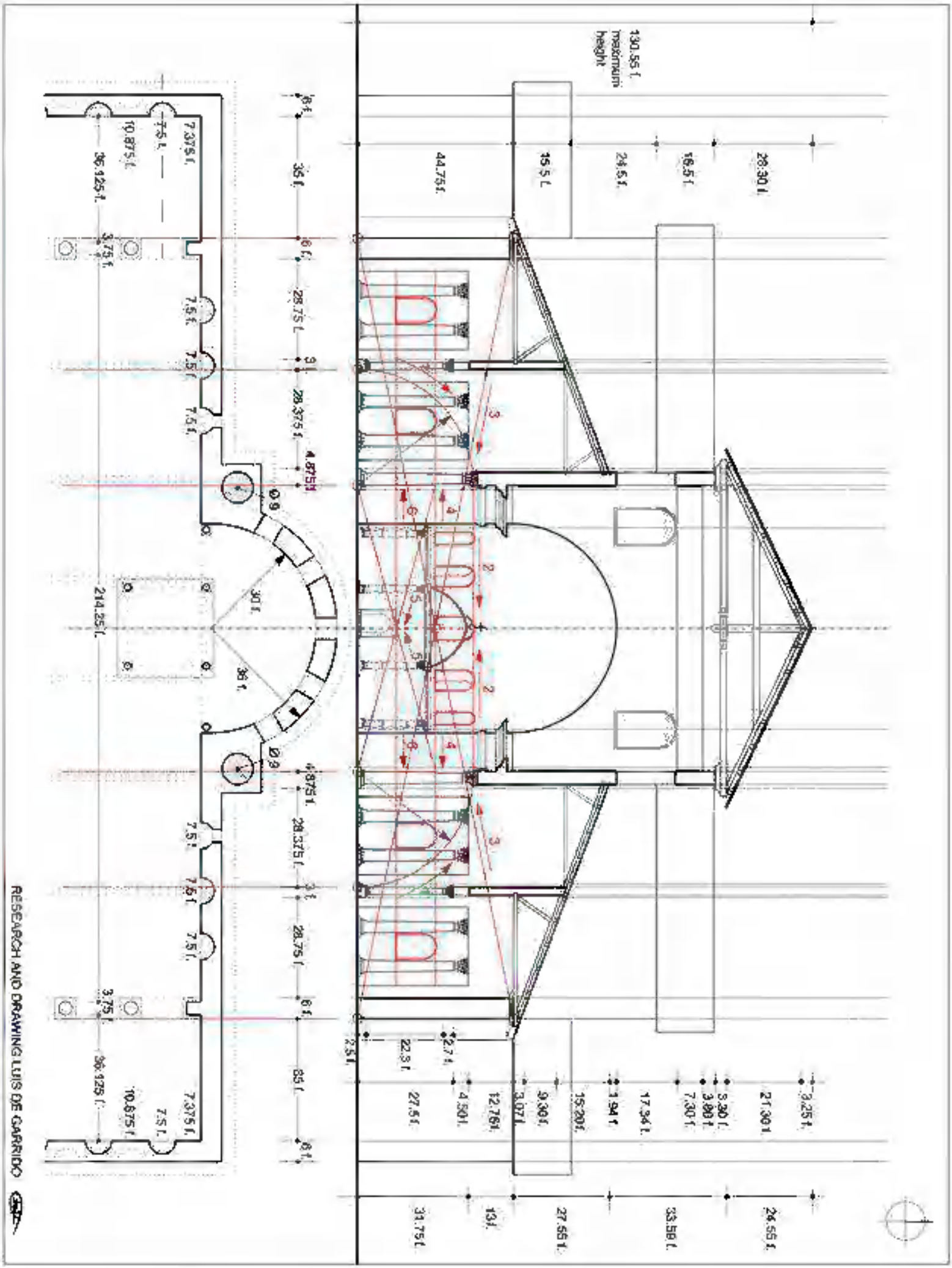
RESEARCH AND DRAWING LUIS DE GARRIDO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15.20 f.
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3.07 f.
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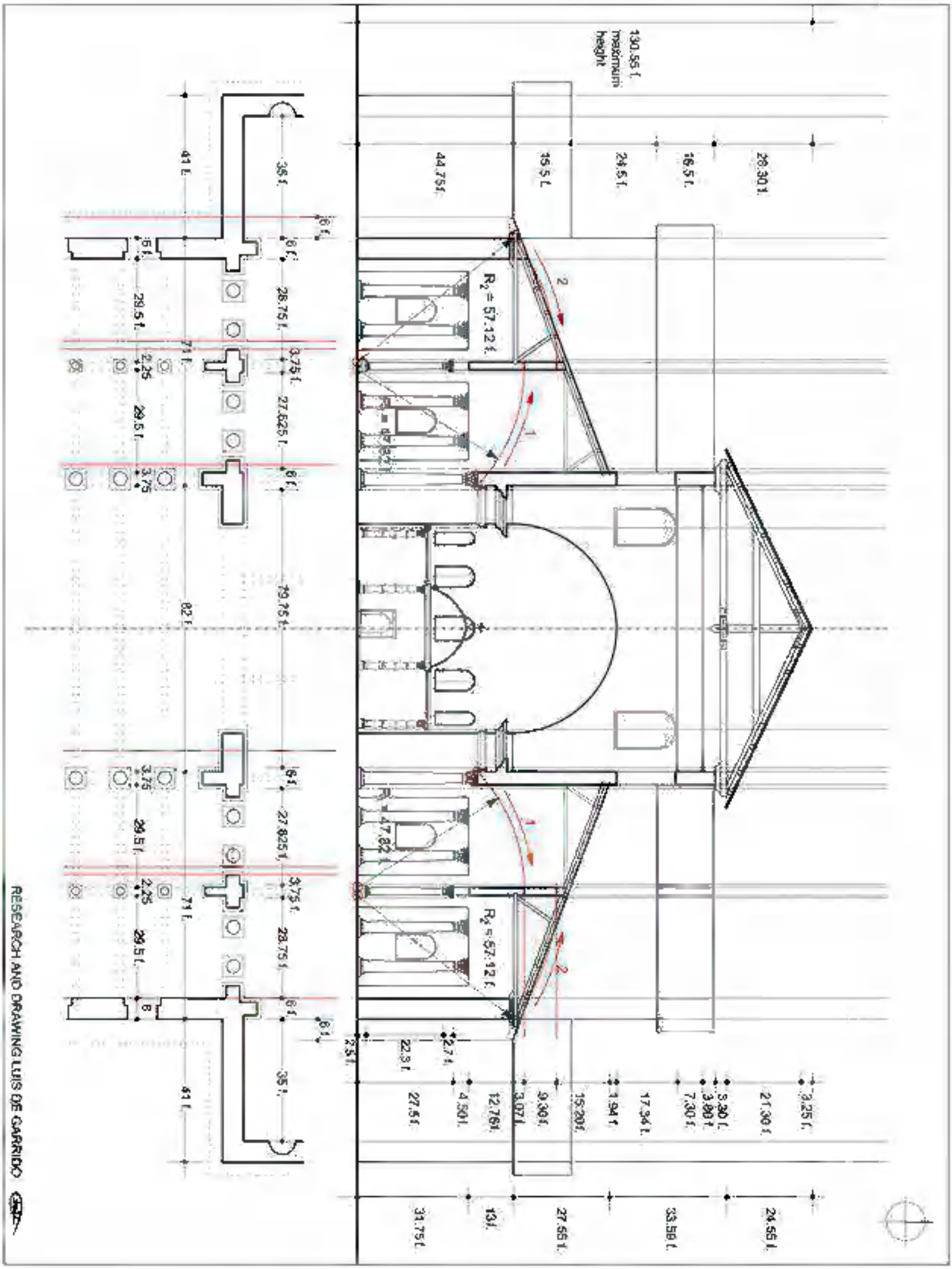

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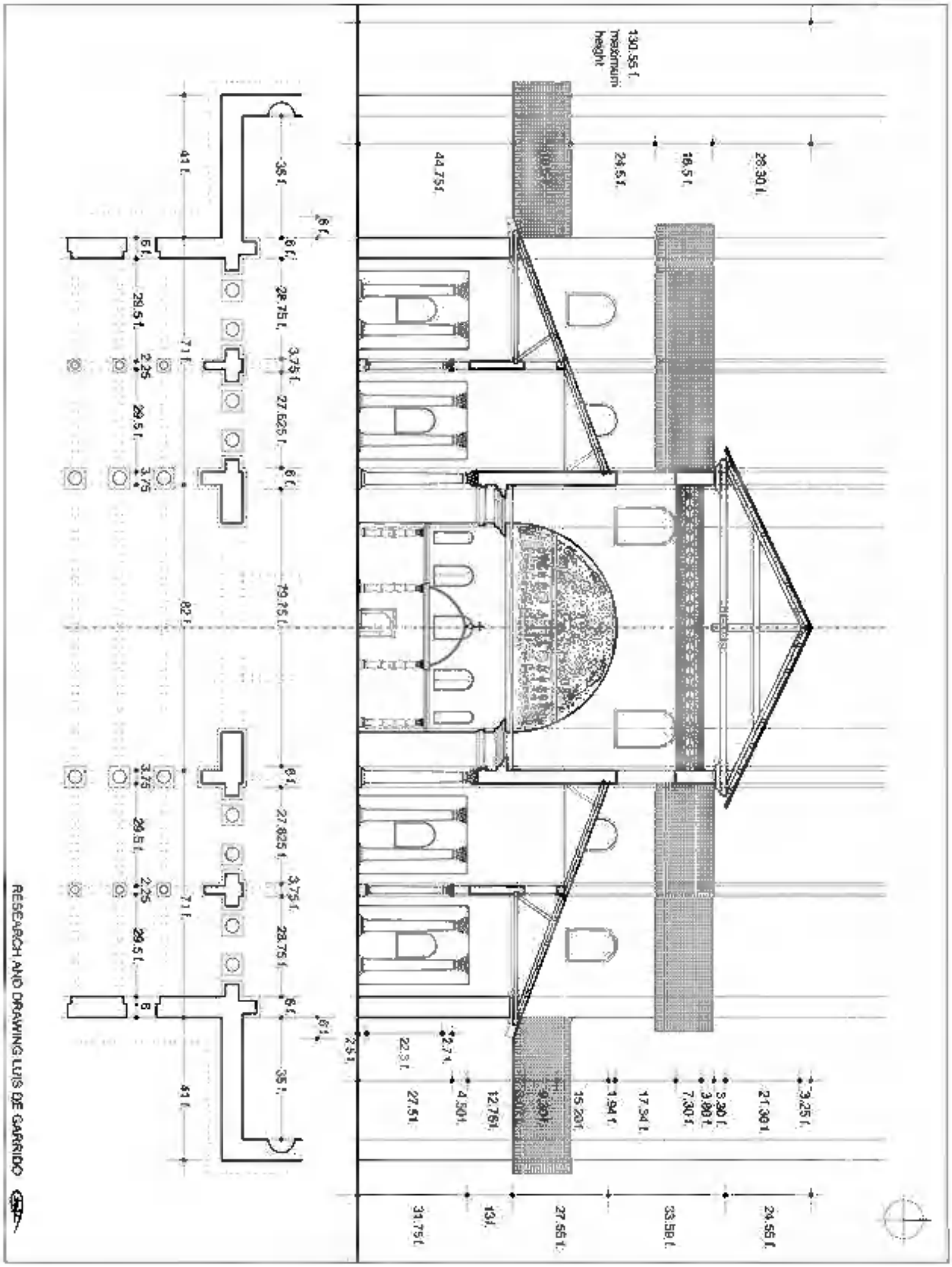
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27.51.
22.3 f.
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2.3 f.
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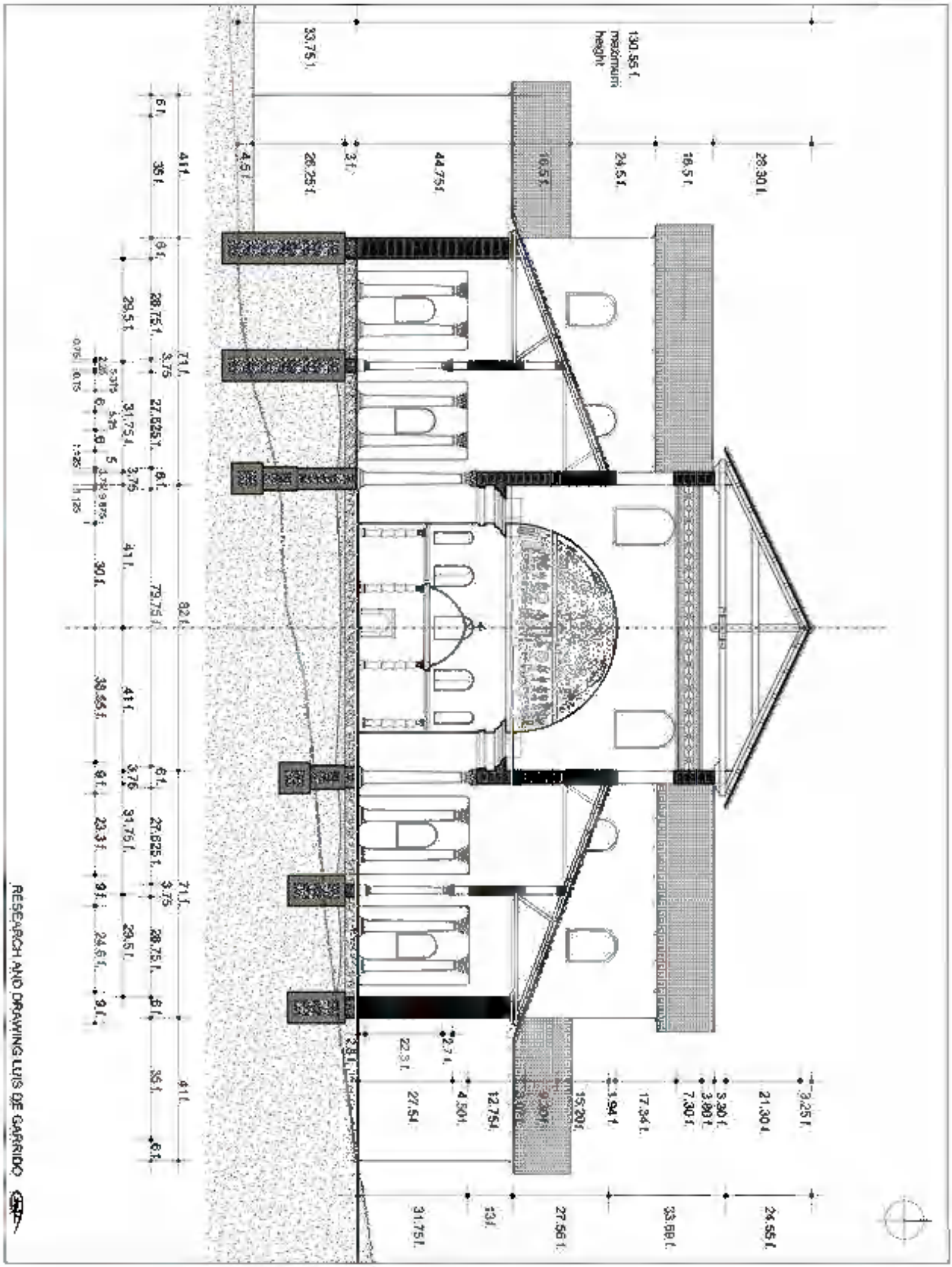
RESEARCH AND DRAWING LUIS DE GARRIDO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12.75 f.
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2.7 f.
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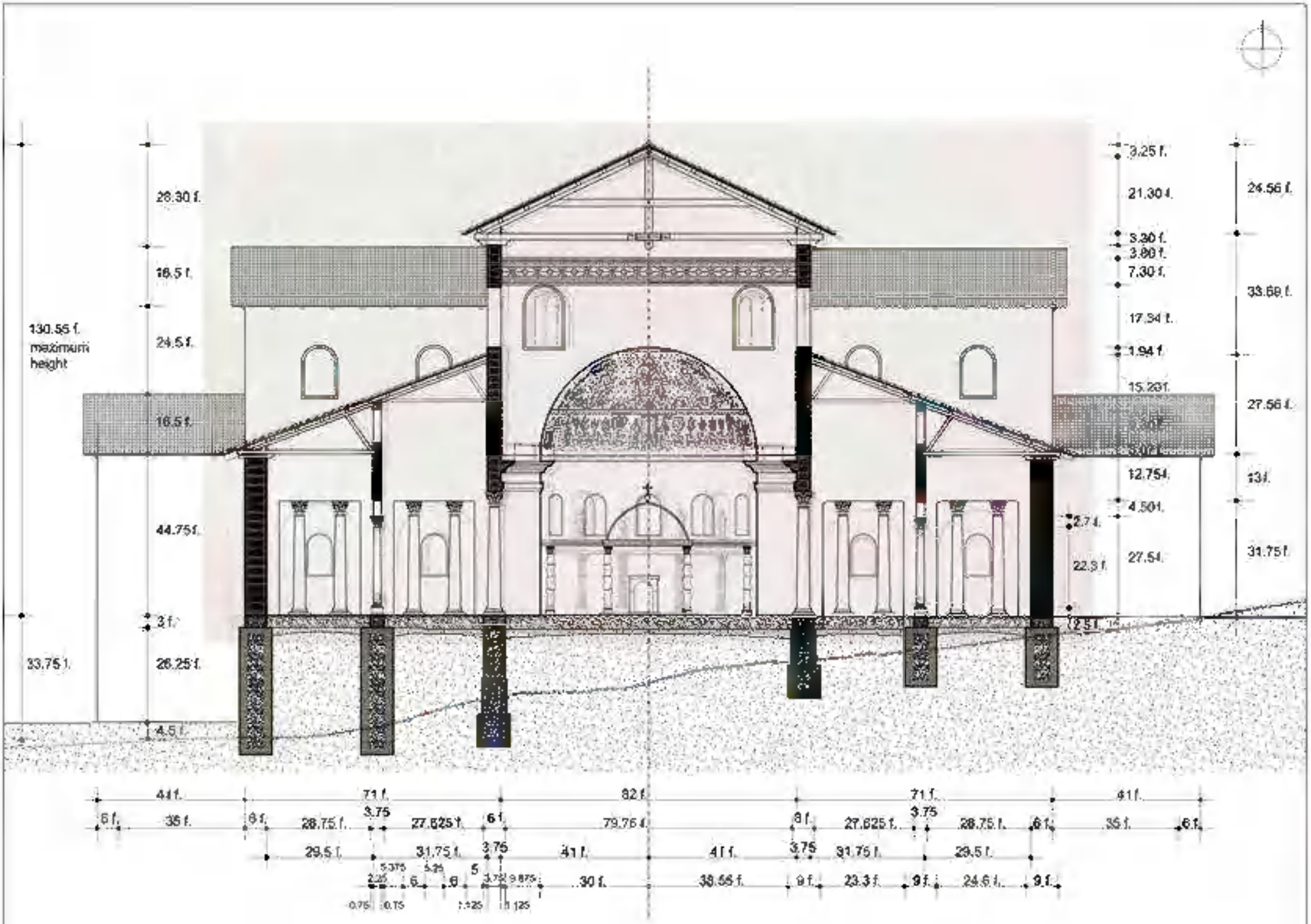
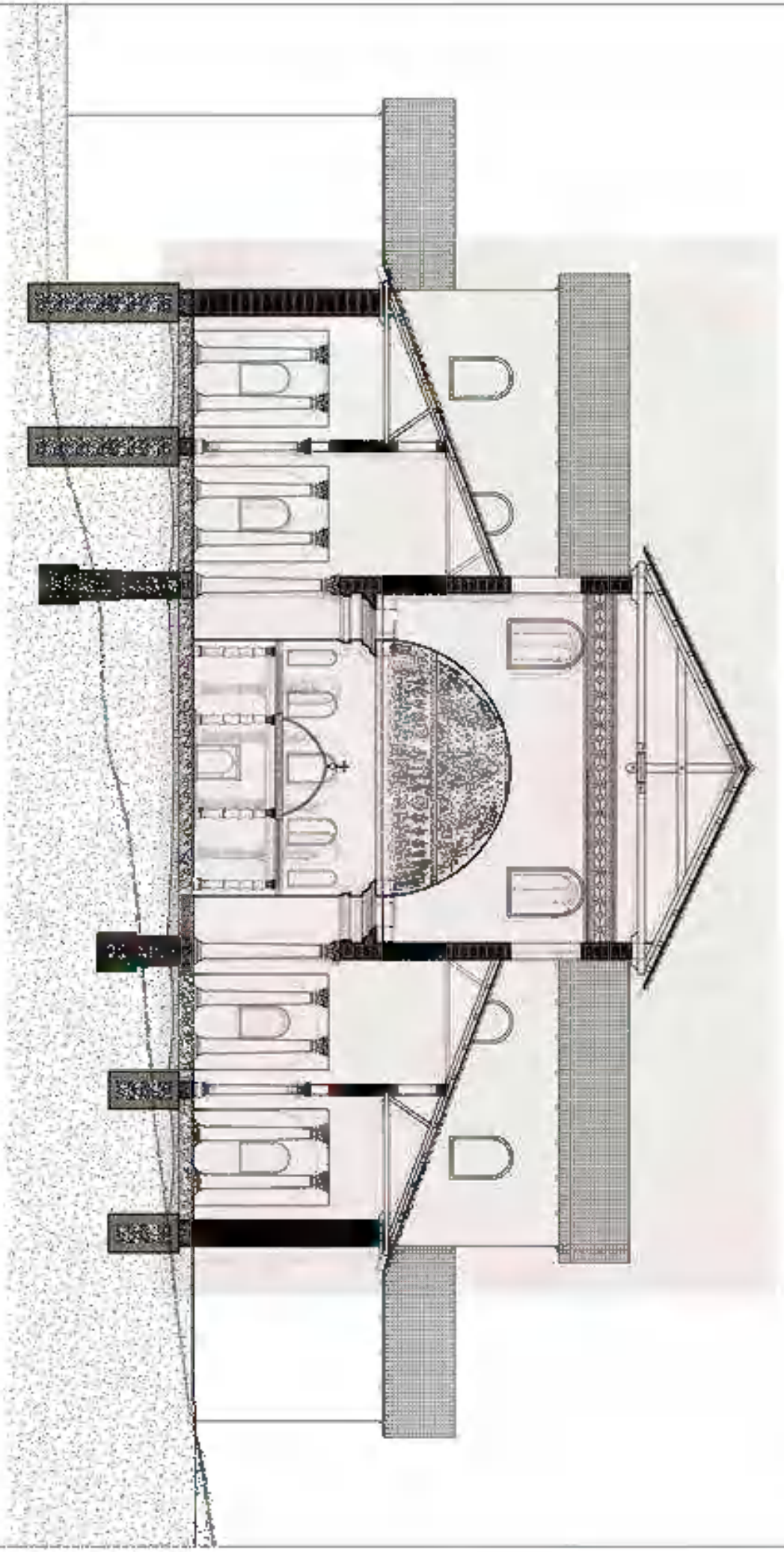
RESEARCH AND DRAWING LUIS DE GARRIDO

RESEARCH AND DRAWING LUIS DE GARRIDO

COMPLETE CROSS SECTION AND SUPERPOSITION WITH LETAROUILLY'S DRAWING (WM)



RESEARCH AND DRAWING LUIS DE GARRIDO



RESEARCH AND DRAWING LUIS DE GARRIDO

COMPLETE CROSS SECTION AND SUPERPOSITION WITH LETAROUILLY'S DRAWING

OLD S. PETER

OSP-S20

CHAPTER 5

"*Quello a cui corrispondono, in modo che nulla possa essere aggiunto, o ridotto, o cambiato, senza che sia meno approvato*"

Leon Battista Alberti

Chapter 5. Graphic reconstruction of the most significant stages of the construction process and evolution of the *old basilica of S. Peter* (324-1503)

5.1. Objectives

This chapter has two objectives. On the one hand, the most significant stages of the construction process of the old basilica of S. Peter are reconstructed, from the beginning to the end of its construction. On the other hand, the most significant stages of the evolution of the architectural structure of the old basilica are reconstructed, from the completion of its construction to the beginning of its demolition. The reconstruction is carried out graphically, using floor plans to scale and in full detail, and describing the most important architectural actions carried out at each stage.

- In the first part of this chapter the most significant stages of the construction process of the old basilica of S. Peter are reconstructed since the beginning of the construction of the founding platform in the year 324, in the time of Pope Sylvester I (314-335), until it can be given as completed in the year 514, in the time of Pope Symmachus (498-514). However, to correctly understand the construction process of the old basilica, it is advisable to go back in time, so in this chapter the most important stages of the state of the existing constructions in the area occupied by the old basilica, since 100 BC, have also been reconstructed. In the previous chapter, the initial project of the old basilica has been reconstructed, both in floor plan and in section, based on the identification of all the architectural decisions made in the different stages of its design process. In the same way, it has been possible to demonstrate that the construction process essentially respected all the guidelines of the initial design project, since the dimensions of the different architectural elements that have been generated in the reconstruction of the design process stages coincide with the available historical references, as seen in the previous chapter. Based on these previous investigations, and taking into account the available historical information, the status of the construction process can also be identified with enough precision in the most significant stages of the construction process of the old basilica of S. Peter.

- In the second part of this chapter the most significant stages of the evolution of the architectural structure of the old basilica are reconstructed, from the completion of its construction (514), until shortly before the start of its demolition (1503). It is possible that the old basilica was completed prior to the year 514, but in any case this year it was already finished, since there is news that in the time of Pope Symmachus (498-514) the

rooms adjacent to the gate house were completed, including the Episcopal Palace and the papal residential building. Therefore, it can be considered that the old basilica was completely finished, as it appears in the floor plan layout made by Alfarano, in the year 514. In the previous chapter the design process of the old one has been reconstructed basilica, and in the first part of this chapter the plan structure that it could have in the year 514 is reconstructed. Therefore, and based on existing historical information, it is possible to rebuild the appearance that the old basilica could have had, throughout the most characteristic stages of its historical evolution.

5.2. Graphic reconstruction, description and justification, of the most significant stages of the construction process of the *old basilica of S. Peter* (324-514)

The state of the old Basilica of S. Peter in the most significant stages of its construction process is shown below. At each stage, the most important actions carried out have been justified and documented, as well as the most relevant historical events related to them. In the first place, each of the stages has been identified, coinciding with the most relevant historical dates, taking into account the most important historical references [1]. Second, each stage has been defined by collecting, classifying, ordering and evaluating a large number of references. Finally, the status of the works in each of these stages has been graphically represented.

Both the description of each stage, and especially its graphic representation, constitutes information of great historical value, since it allows researchers and historians to know the appearance of the old basilica of S. Peter at each stage of its construction process. On the other hand, this information constitutes a conceptual and graphic framework of great value that facilitates specialized research related to specific details of each of the defined stages.

Stage 1 (Layout OSP-CP1)

100 B.C. Etruscan necropolis

The old basilica of S. Peter was built on the side of a hill called *Mons Vaticanus* long before the beginning of Christianity.

There is no unanimity on the origin of the name *Vaticanus*. Some researchers are of the opinion that the name comes from the Etruscan goddess *Vatica*, to whom a temple was

erected in the area. Other researchers think that the name comes from a hallucinogenic herb that grew on the slope of *Mons Vaticanus* [2]. A third theory is that the Etruscan people who occupied the area were called *Vatucum* (Fig. 5.1).

This hill, located to the west of the Tiber river and outside the city limits, has housed a necropolis since Etruscan times. There are hardly any remains of this necropolis, but as it is known, in an approximate way, the route of the path that connected the Etruscan necropolis with the city of Rome, and as there is certain information on the structure of other Etruscan necropolis whose remains have reached our days, it is possible to suggest what this necropolis looked like.

On the other hand, it is known that near the necropolis, there was a temple dedicated to the goddess Cybele (*Phrygianum*) [3] built around 191 BC, which had to be demolished in the construction of the great foundational platform of the ancient basilica, in the year 324 [4]. The location of this temple is known, located at point 51 of the archaeological plan of Paolo Liberani [5] (Fig. 2.2). Undoubtedly the path that led to the temple was the same that passed through the necrópolis, so this path became the first urban landmark in the Vatican area.

Stage 2 (Layout OSP-CP2)

37 A.D. S. Peter (37-53). Construction of the Calígula circus

The land of the *Mons Vaticanus* was used basically for the cultivation of vineyards and as a funeral area, so there were hardly any small buildings for agricultural use. As these lands were barely built, at the beginning of the 1st century they were chosen to build a circus, although this had to compact and flatten the soil, and excavate part of the hill in the western part of the circus (Fig. 5.2).

At the end of the construction of the circus, in AD 37, the Emperor Caligula transported the obelisk from Alexandria to Rome, as described by Pliny the Elder in his *Natural History* (16.76.201), and later it was installed in the *spina* of the circus, where it would remain until 1586 [6], therefore the circus must have started to be built a few years before. The original site is now marked by a stone situated in the pavement of the Piazza dei Protomartiri Romani, where excavations in 1958-1959 revealed remains of its marble base [7].

The circus was built longitudinally along an east-west axis, with the entrance on the east side (since the west side was partially carved into the hill) (Fig. 5.3). The dimensions and

the specific position of the circus are not known exactly, but it can be deduced based on the archaeological plan of Liberani [8] (see chapter 2).

Obviously the location of the circus had to be chosen correctly, but due to its large dimensions, significant earthworks had to be carried out, the ground had to be compacted and the Vatican hill had to be slightly excavated. In this way the circus was slightly embedded in the hill on its west side, while the main entrance was at ground level, on the east side.

Based on Liberani's excavation plan, and taking into account all available historical references, it has been possible to reconstruct the architectural structure of the circus, and even make virtual images (Figs. 5.4, 5.5, 5.6, 5.7 and 5.8).

Christian tradition assures that Apostle Peter arrived in Rome between the years 64 and 68, under the mandate of Nero, and that he was martyred in the circus and buried near it and the imperial villa. Although these facts have been continuously refuted and doubted by scholars and historians, Christians began to assure that the remains of the Apostle Peter lay in a small tomb in the Vatican Necropolis, "*iuxta Palatium Neronieanum, in Vaticano*" [9] and from the time of his death many Christians began a continuous pilgrimage activity to that place.

In the 2nd century, while the circus was still standing, a series of small funerary buildings began to be built along its north side. These funerary buildings were built in a somewhat disorderly way, gradually consolidating a small necropolis that stretched from east to west along the way. At a certain point, the slope of the hill began to grow and this put a limit to the growth of the necropolis. In fact, in order to make the most of the land, a small earthwork was carried out at the western end of the necropolis to create flat ground, so it was necessary to build a retaining wall so that the land would not collapse (*muro rosso*). According to Christian tradition, the remains of Peter rest in a small tomb located on this wall [10].

Stage 3 (Layout OSP-CP3)

138 A.D. Hyginus (136-142). Road consolidation

By the end of the second century the Caligula circus had almost completely disappeared, and there were hardly any ruins left. Some of its materials were reused in other constructions and the useless rubble remained piled up, mixed with the undergrowth. As a consequence the ground level of the circus began to rise.

The ancient Etruscan necropolis had already completely disappeared, although the roads in the area continued to be used and consolidated over time.

Stage 4 (Layout OSP-CP4)

217 A.D. Zephyrinus (199-217). Vatican necropolis and Severan mausoleum

Between the years 212 and 217 the *Severan Mausoleum* [11] was built precisely centered on the old *spina* of the circus. Some seals found inside indicate that it was initially built in the time of Emperor Caracalla, of the Severan dynasty (193-235), which suggests that the Vatican circus had already fallen into disuse at the end of the 2nd century [12], and the Vatican area began to have a funerary character. The mausoleum was circular in shape and built with thick laterizio walls, and had an outside diameter of about 116 *feet* (154.66 *palmi*), and an inside diameter of about 90 *feet* (120 *palmi*), so the perimeter wall had a thickness of 13 *feet* (17.33 *palmi*). The height of the perimeter walls should presumably be about 90 *feet* (120 *palmi*), equal to the internal diameter, and would be crowned with a large dome [13]. The enormous thickness of the perimetral wall and its great height are not necessary for a simple mausoleum, and cast doubt on its original functionality.

The entrance to the mausoleum must have been on the north side, adjacent to the only path that was created on the north street of the circus, more or less parallel to the *spina*. It does not make sense that the entrance was on the west or south side, in the opposite direction to the access, and also not on the east side, since it would be a few *feet* from the obelisk, and would impede access. Undoubtedly the entrance was on its north side and had a few steps, so that the level of the interior floor was slightly elevated with respect to the level of the circus esplanade.

To build the circus, the land was first cleared until it reached solid ground. Afterwards the ground filled with firm stone was leveled, on which the foundations of the obelisk were raised. Afterwards, a compacted earth filling was made, about 9.75-10 *feet* thick (13-13.33 *palmi*), which would constitute the floor of the circus streets, and therefore would completely cover the foundation of the obelisk (see chapter 6).

The Vatican necropolis had been consolidated and was made up of a succession of small buildings lined up on both sides of the access road [14] (Figs. 5.9, 5.10, 5.11, 5.12 and 5.13). Eusebius, in his *Historia Ecclesiastica* [15], in 313, affirms that the earthly remains of S. Peter were buried in the Vatican, in a place marked by a *Tropaion*, a monument of victory. It also narrates that the apostle was offered *prosresis* (greetings) in the necropolis. A few

years later, in 325, Eusebius narrates in his Theophany that large crowds flocked to the tomb of S. Peter on the outskirts of the city, like a great sanctuary [16].

At the end of the necropolis, this *Tropaion*, located in a small rectangular courtyard to the west, was already known since the 2nd century, and was considered the tomb of the Apostle Peter (Figs 5.14). The *Tropaion*, a monument barely one meter high, was located on the west wall of the courtyard (*muro rosso*), which was thick enough to contain the lands on the west slope. In order for the final part of the necropolis (where the courtyard is located) to have a horizontal floor, the Vatican hill had to be slightly excavated. In addition, a retaining wall had to be built, which at the same time served to channel and divert the rainwater coming from hill [17].

Some pieces of brick date the monument to the year 160 [18], probably raised by the Christian community of Rome, it was constantly maintained, preserved from the erosion and adorned by columns, a simple mosaic and some marble slabs (Fig. 5.15).

Stage 5 (Layout OSP-CP5)

296 A.D. Caius (283-296). Tropaion reform

At the end of the 3rd century the appearance of the final courtyard of the Vatican necropolis was improved, covering the floor with mosaic and embellishing the *Tropaion* and it continued to be used for burials until the beginning of the 4th century [19] (Fig. 5.16). At this time, in the northern area of the circus and near the necropolis, there was a temple dedicated to the mystery cult of the goddess Cybele (*Phrygianum*) in full use [20], and it had to be demolished due to the construction of the great horizontal platform that it would serve to flatten the ground and as a foundation for the gigantic basilica that would begin to be built in 324 [21].

The Caligula circus, which had fallen into disrepair at the end of the 2nd century, gradually collapsed throughout the 3rd century. It is logical to think that the debris accumulated in the western part of the circus, in the area embedded in the hill and less accessible. It is also logical to think that the eastern part of the circus, which was shown above ground level, was gradually being dismantled and spoiled, in order to reuse its valuable materials in other constructions (*spolia*). In other words, the eastern part of the circus was gradually dismantled, while the western part was filled with its own rubble, and it was compacted due to the discharge of other rubble, earth and weeds. In this way, little by little, the shape and unevenness of the original soil of the hill was recovered.

Stage 6 (Layout OSP-CP6)

324 A.D. Sylvester I (314-335). Construction of platform

In the times of Pope Sylvester I, and Emperor Constantine, perhaps in 323 or early 324, in any case immediately before the beginning of the construction of the great horizontal foundational platform, the *Tropaion* was isolated over the tomb of the Apostle Peter and a protective casing was built [22] (Fig. 5.17). For this, the immediately surrounding structures were demolished and the remaining masonry was transformed into a marble-covered monument, with an open niche on its eastern side (Fig. 5.18). Immediately afterwards, a new marble-paved podium was placed around the monument, and pedestals were placed on that podium to place the *colonne vitinee* decorated with creepers, to hold a thrush that covered the monument. The podium on the west, north, and south sides occupied the same area as the pre-existing courtyard, but extended further east in front of the monument. It is evident that what was intended with this design was to preserve the memory of the design of the patio, in such a way that the podium became a metaphor for it [23] (Fig. 5.19).

The new level around the monument would be the reference to calculate the upper part of the platform as a foundation for the basilica to be built. During its construction, the monument was isolated, and the tombs in the surrounding area were beheaded, their covers being removed, so that the platform covered them in a unified upper part. In this way the platform became the new common roof of the tombs, and the funerary monument of Peter would emerge on it.

Liber Pontificalis provides a list of donations from Constantine for the maintenance of the Church and worship [24], but it should be noted that Constantine was not in a position to make such donations until after his victory over Licinius at the Battle of Chrysopolis in September of the year 324. And it is reasonable to assume that it was this same year that the construction works began.

In 324 the horizontal platform was built, on which the enormous building of the Constantinian basilica was to be built. Several alternatives have been suggested on the possible dimensions of this platform [25], although, based on the investigations carried out in the previous chapter, slightly different and more exact dimensions are deduced. The platform's perimeter load-bearing walls had a dimension of about 9 *roman feet*, that is, they would be about 3 *feet* thicker than the perimeter load-bearing walls of the old basilica (which had a thickness of about 6 *roman feet*), in order to reduce the transmission of loads

to firm ground. Therefore, the foundation platform would protrude perimeter from the building of the old basilica by a dimension of about 1.5 *feet* (2 *palmi*) around its perimeter. For this reason, it can be deduced that the platform had an approximate length of 686 *roman feet* (1.5 + 71 + 306 + 306 + 1.5), that is, 914.66 *palmi*; and a width of approximately 227 *roman feet* (1.5 + 224 + 1.5), that is, 302.66 *palmi.*

The height of the platform at its highest midpoint (on the east side) was approximately 26.25 *roman feet* (35 *palmi*), given that the access ladder had 30 steps grouped into 5 flights [26], that is, 35 risers of 0.75 *foot* (one *palmo*) each riser.

Regarding the number of steps and their dimensions, Alfarano indicates that the staircase had 5 flights of 7 steps each flight [27]. This information contrasts with the information provided by an English traveler, John Capgrave -after 1447- stated that the staircase had 29 steps [28], and Nicolaus Muffel, in 1452, recalls 28 steps [29]. Undoubtedly John Capgrave and Nicolaus Muffel were referring to the "treads" of the steps, and Alfarano was referring to the "risers". The dimensions of the staircase were deduced in the previous chapter, based on available historical references.

The foundational platform was built on the basis of perimeter walls, and internal longitudinal walls, with an enormous thickness (between 6 *feet* and 9 *feet*) and with a variable height. The foundation platform was built on the basis of perimeter walls, and internal longitudinal walls of great thickness and with a variable depth until reaching the ground level. The lowest wall, along the north side of the platform, was at least about 12 *feet* high, and 9 *feet* wide, and would be almost entirely underground. The tallest wall, located along the south side of the platform, was at least 30.75 *feet* high (41 *palmi*), and was buried at least about 4.5 *feet* (6 *palmi*) below the ground level of the circus [30]. The walls under the lateral colonnades were about 9 *feet* wide, and the walls under the central colonnades had a complex structure, and with various thicknesses, since the lower part was approximately 9 *feet* wide, the central portion approximately 6.75 *feet* wide, and finally the highest portion approximately 6 *feet* wide. This was undoubtedly done because these walls barely had to withstand lateral thrusts, thus saving material (Layout OSP-S21).

When the circus was built it had to be excavating on the hill and in some places earth fillings had to be raised on the rock level of the land in order to create a completely horizontal platform. At the height of the obelisk, the thickness of the fill with compacted earth was about 9.75-10 *feet* (13-13.33 *palmi*), so when building the south wall, this layer of earth had to be excavated until reaching a firm level, and in this way the south wall

emerged about 26.25 *feet* (35 *palmi*) on the level of the ground of the circus. The set of walls of the foundational platform would become the foundations for the walls and colonnades of the basilica that would be built on them [31].

The primary longitudinal walls were made in *opus listatum* and *opus testaceum* [32]. These walls were interlocked by other transverse walls, with the same construction technique, creating compartments, many of which were filled with earth and rubble to increase the robustness and stability of the complex. Some of the secondary walls were made in *opus caementicium*. The set of foundation walls created a grid, so some foundation walls crossed the existing tombs. There is the case of one of the tombs, "tomb T", which was incorporated into the foundations in this way, was still in use immediately before the works. In fact, the cremation urn of Trebellena Flacilla was placed in it, which included a coin in the Arles mint c. 317/18, which provides an idea about the dating of the works [33]. The longitudinal foundation walls (on which the north and south perimeter walls would rest, and the four interior colonnades) were built on the floor of the Vatican hill in *opus listatum* (using tuffs and brick bands) and in *opus testaceum* (using only bricks). Using these same techniques, the transverse walls were built in such a way that interlocked the main walls and served to make a stabilizing and retention lattice structure of the fill within the foundation platform. However, and what is still unknown, some foundation walls were built using a completely different technique, *opus caementicium* (using irregular fragments of marble, tuff and travertine in mortar, using formwork [34] (Fig. 5.20). Undoubtedly the existence of various types of walls was due to a chronological sequence in the construction, but also to the testing of the best construction technique and the achievement of specific structural objectives, as the work progressed (Fig. 5.21).

The foundation platform should logically have been rectangular, but three additions were made when it was about to be completed: two rectangular-shaped additions, to support the north and south exedras, and a semicircular-shaped addition, to support the apse. These additions would be works to the perimeter walls of the platform and on top of them a continuous superstructure was built, as observed in the excavations, which joined the exedras with the west wall of the transept, and the screen walls with columns between the transept and exedras [35].

On these walls, barrel vaults were built with the same level that when filled in from the top would form the huge platform.

Initially this platform had a single perforation, through which the podium built just above the tomb of the Apostle Peter protruded, and probably two perforations in the west

perimeter wall to access the ancient necropolis under the platform, which was buried under it. There must have been two accesses to the lower part of the platform, since the *GDSU 20 A* drawing by Bramante clearly shows two staircases. These western stairs must have been made when the apse was built, and they would undoubtedly also serve to reinforce and stabilize the union between the apse and the west perimeter wall. The platform would not constitute the ground level of the basilica, and as Grimaldi points out (who observed in 1608 the dismantling of the basilica's atrium) it would have a simple finish using a filling of stones and mortar (on the barrel vaults made brick-based), a layer of impermeable clay and finally a layer of lithostratum. It is therefore possible that as the basilica was being built, the final floor was made based on a leveling filling of stones with mortar and marble slabs. The clergyman also provides some specific references: a layer of clay on which the lithostratum rests, and finally a filling and the marble slabs [36]. Grimaldi thought that the lithostratum was from the time of Constantine, and therefore belonged to the upper finish of the platform. On the other hand, other authors think that they probably belonged to the works of beautification of the atrium by Pope Symmachus (498-514) [37]. Alfarano in his writings also observes that under the marble slabs there were padding "a few *palmi* thick", and under which a modest layer of original white stones from platform [38].

Based on this description, it can be estimated that the infill layer and the marble slabs together would have a thickness of approximately 3 *feet*, so that the floor of the basilica would be approximately 3 *feet* above the platform. Therefore, when the building of the basilica was completed (around year 352) and the narthex still did not exist, the basilica had to be accessed by means of three steps (that is, 4 risers of 0.75 *foot* each riser).

The narthex was built in the time of Pope Siricius (384-399), its floor was still at the level of the atrium. In the times of Pope Donus (676-678) there are historical references that the narthex was paved with large marble slabs [39], so the steps were moved and were located between the narthex and the atrium, leaving the narthex at a higher level than the pavement of the atrium and the lateral wings of the anterior body of the old basilica [40]. There is also information that until the pontificate of Pope Hadrian I (772-795) the narthex was accessed through some steps [41].

In the times of Symmachus (498-514) the rooms adjacent to the gate house were completed (including the Episcopal Palace and the Papal Residential Building), so the floor of these rooms would be raised above the entrance platform and most likely some steps are needed to access them. Between the times of Pope Stephen II (752-757) and

Hadrian I (772-795), two bell towers were built in the rooms adjacent to the gate house, so later repairs to the pavement would be needed. Hadrian I also restored the main access ramp for the first time. Perhaps in the times of Pope Leo III (795-816) a complete paving of the atrium and the access body was made, so the narthex, the atrium, the lateral arms and the access body were leveled and the three steps were moved staggered to the gate house. Finally, already in the Renaissance, Pope Pius II (1458-1464) raised the paving of the platform of the entrance staircase to the complex and reformed the entrance staircase by adding new stone slabs on the steps and landings. As a consequence, the entrance platform (between the last step to facade) went from having 56 *feet* (74.66 *palmi*) (*Stage 13*, chapter 4), as it was in the initial project, to having 77 2/3 *palmi*, as *Peruzzi* clearly specifies in its *GDSU 11 Ar* drawing. By covering all the steps with thick marble slabs received with mortar, the steps necessarily had to be moved away from the facade, and a dimension of 2 2/3 *palmi* is reasonable.

Stage 7 (Layout OSP-CP7)

325 A.D. Sylvester I (314-335). Construction of Constantine Arch

The Arch of Constantine was the first structure to be built on the foundation platform, although it was probably not fully completed in 325.

The foundation discovered in the excavations of the Arc of Triumph is essentially a dormant foundation, made by means of a sleeper, or chain, built between the two piers of the arch. It was built in *opus caementicium* of marble and travertine, while in its lower part the section had an *opus incertum* cladding (using pieces of tuff) [42]. Krautheimer suggested that the reason why the construction technique was varied in the realization of this foundation is because the decision to link the foundations of the north and south arms of the east wall of the transept was taken on the fly, once construction had begun [43].

The existence of this type of sleeper foundation has implications for establishing the initial intended relationship between the naves and the transept of the basilica. If no foundations were laid in this part at first (it is highly unlikely that the excavated foundations were a replacement for the previous foundations), it is because a closing wall was most likely never designed in this place, and from the beginning it was planned that there would be an important opening between the nave and the transept. Therefore, the Arc of Triumph had to be planned at the time when the first phase of the foundations was made. However, since the arch piers must have been on some kind of foundation, and if

the sleeper wall in an anomalous technique is secondary, there must be other primary foundations for the piers. In fact, the excavated line from the base of the sleeper does not reach the point where the piers were located, so it can be assumed that the piers were initially built on independent foundations. In this case, the sleeper would have been inserted later to lock and strengthen the independent foundations of the piers.

It is logical to assume, in the absence of any indication, that the Arc of Triumph initially did not have columns adjacent to the piers, and that these were introduced, as has been customarily suggested, in the time of Leo I (440-461) as part of a consolidation of the arch after damage caused by an earthquake or lightning [44], although this interpretation has been questioned, and it is thought that the Arc of Triumph had columns from the beginning of its construction [45].

It should be clarified that Nicholas V (1447-1455) arranged some large columns (possibly larger than the original ones) facing the piers of the arch, as a result of his project to reform the basilica, which includes a transept of the same dimensions as the central nave, and a square transept of 110 * 100 *palmi* [46]. But this fact has nothing to do with the existence of columns, perhaps smaller in size, in the piers of the arch, either from the beginning of its construction (as Brandenburg thinks), or from the time of Leo I (440-461), when there is news of the existence of columns in the piers of the arch.

Finally, it should be noted that an inscription on the arch unequivocally refers to Constantine as the founder of S. Peter, and relates the founding of the basilica to the fulfillment of a vow, in relation to the battle of Chrysopolis [47].

Stage 8 (Layout OSP-CP8)

326 A.D. Sylvester I (314-335). Construction of apse

There are two probable and alternative dates for the construction of the apse. For some historians, the apse would be built around the year 337 [48], coinciding with the rise to power of Constans, the son of Constantine, whereas for other historians it was built more or less around the year 326, in the time of Constantine [49].

In the times of Pope Julius I, around the year 337, on the occasion of the ascent to the lathe of Constans, the son of Constantine, a semicircular apse began to be built. During the demolition of the apse walls in 1594, a series of stamped sesquipedal bricks were discovered, containing an incomplete inscription. Caesare Baronio, at that time, attributed this incomplete inscription to an abbreviation of "*Constantine*" [50]. However, in

excavations of 1940 two tiles with the inscription "*Constantis AV*" were recovered, which seems to imply a complete inscription of "*D. N. Constantis AVG*" which could be the name of Emperor Constans in genitive. These two tiles therefore raise a more than reasonable doubt about the interpretation of the incomplete inscription of Baronio, and the bricks in the apse could belong to Constans, and not to Constantine. It is very likely that Baronio expanded the incomplete name of the bricks to correspond with the then universally accepted belief that Constantine was the founder of S. Peter's Basilica, although everything indicates that it was actually his son Constans. An inscription in the apse discovered in the 15th century said: "*Constantini… expiata hostili incvrsione…*", clearly indicates that the visible name is in the genitive and therefore refers to the father of the person actually commemorated, and therefore must have been a son of Constantine [51].

However, other historians do not believe that these inscriptions indicate that the apse was built by Constans, and they think that it was built by Constantine [52].

The apse could therefore have been built by Constans, and it is also likely that it was modified as soon as the work began, since there is evidence that the foundations were reinforced [53]. In the original project, perhaps the apse was less important and designed with a light roof, based on concentric wooden beams. However, and given that the apse would remain isolated for a few years (in which one would like to take advantage of it to carry out some type of Christian cult) it was decided that its design should be more robust to stand on its own, until the western wall of the transept was built.In this way an apse with a hemispherical vault was designed, and with a considerable thickness so that it could remain upright, and thus be able to wrap and protect the *Tropaion* podium. Two spiral staircases were probably built on both sides of the apse to access the necropolis, which was buried under the huge flat platform built in 324.

The foundation wall of the apse was built in its upper part in *opus incertum* (using pieces of tuff), and in its lower part almost exclusively in *opus caementicia* (using marble and travertine) in a similar way to the foundation walls of the Arch of Constantine and the clear contrast with the foundations of the west wall of the transept on both sides of the apse, which was made of a correct brickwork [54].

For this reason, and as with the Arch of Constantine, it seems that the foundations of the apse in its present form indicate a change at some point after the foundations of the west wall had been made. In this case, however, the change appears to be due to quite a different situation. The main foundation of the west wall of the transept was aligned with

the monument of the Apostle's tomb and was interrupted to avoid impacting the monument. This fact suggests that the existence of some kind of apse or exedra was always foreseen behind the tomb of the apostle, and most probably it was always intended to have a semicircular shape. But this raises new questions about why and when the initial foundation of the primary apse was replaced by the secondary foundation. Krautheimer thought that this was due to a decision on the fly to reinforce the critical point at the foot of the arch to the apse. Another explanation would be that initially it was planned to make a less heavy apse, with a roof made of wooden trusses, and finally it was decided to make a heavier apse, based on a hemispherical vault [55].

In any case, the apse was finished soon, since there is news that the mosaic of the apse could have been completed in the year 340 as a *piaculum* on the occasion of the war waged against Constans by his brother Constantine II [56].

Stage 9 (Layout OSP-CP9)

327 A.D. Sylvester I (314-335). Construction of transept

The transept should have been completed after the year 326 [57], although Brandenburg points out that that same year it was already completed, to make it coincide with the donation of the golden cross by Constantine and his mother Elena [58]. However, and due to the large number of technical difficulties involved in the construction of the apse (since it had to be built outside of the foundational platform, but at the same time perfectly integrated with it), it is not likely that the transept could be completed that same year, and it is much more accurate to think that the transept could have been completed between the year 327 and the year 330 (not including exedras). The exedras necessarily had to be completed much later than the transept, due to the enormous technical difficulties involved in building, again, outside the founding platform, and at the same time that they remain perfectly integrated into it. In any case, it is reasonable to assume that the transept was completely completed around 330.

During the construction of the transept, several alternative proposals would undoubtedly be formulated on how to integrate the tomb of the Apostle Peter with the central space of the basilica, and how to access it. When the original project was drawn up, the exact functionality of the transept was not known, since it would surely not have the same use as it had in the pre-existing Roman civil basilicas. Initially the building would have two main functions: as a *martyrium* of the apostle, and as a covered cemetery, but with the

passage of time a huge number of liturgical activities would take place in the building. For this reason, very soon the transept would turn out to be very narrow since there was no way to locate the altar, since access to the Apostle's tomb left very little space available in the central space.

The transept was built on the basis of load-bearing walls 6 *feet* thick, and integrated the Arch of Constantine and the apse into the same architectural element. For this reason, previously, several types of special linear foundations had to be made, with different materials, and these different foundations had to be unified on the basis of continuous foundation strips. When making the transept, both the access porticoes to the lateral naves were made, as well as the lateral porticoes that later they should connect with the two lateral exedras.

There are some doubts between the junction between the apse and the west wall of the transept at superstructure level [59]. The lower part of the apse wall survives in the caves below the basilica, enclosed in the wall between the 6th century annular crypt of Gregory I (590-604) and the 16th century ring corridor of Clement VIII (1592-1605), where it can be seen that it is built with a well-built brick cladding, but the real point of union between the apse wall and the west wall of the transept was crossed by the “Clementine corridor”. Therefore, it was only the "shoulders" of the face brick-based transept wall that rested on the apse and that could be observed during the excavations of the 1940s. It is still uncertain whether the superstructure of the apse and the west wall of the transept were built in the same phase, or in two different phases corresponding to the two phases of their respective foundations [60]. However, the semicircular apse can remain upright without any special need for shoring, so it seems logical to think that The apse was initially built, followed by the west wall of the transept, and later the east wall of the transept, joining the existing Triumphal Arch.

The transept was lower than the height of the main body and had 16 windows, according to Alfarano [61]. These windows could be distributed in two groups of three on the sides of the apse and a pair on each of the eastern walls. No doubt the unusual abundance of windows in a basilica building was due to the need to provide as much natural lighting as possible around the tomb of Aposte Peter [62].

On the tomb of Peter, covered with precious marble, porphyry and *pavonazzetto*, Constantine had previously built a canopy that would enhance the tomb as an object of devotion included in the great transept [63]. The canopy was raised on marble slabs and consisted of four Solomonic columns whose axes are separated by 22.5 *feet* (30 *palmi*),

and with a diameter of approximately 2.25 *feet* (3 *palmi*) at their widest part (Fig. 5.22). An entablature based on two cross arches rested on the columns, and at their intersection hung a large lamp [64] (Fig. 5.23). It is conceivable that the pilgrims of the early years would access the transept through the aisles and could even access the canopy from the sides [65]. Just in front of the canopy was a silver altar weighing 750 pounds [66] to celebrate the worship. The area enclosed in the canopy undoubtedly offered little space for the celebration of the Eucharist, so it should have been located outside the Canopy and the most suitable area would be right in front of it in an easterly direction [67].

Stage 10 (Layout OSP-CP10)

330 A.D. Sylvester I (314-335). Construction of exedras

There are references that in the year 350 liturgical functions were already carried out with the complete transept, including the two north and south lateral exedras [68], which is why the exedras had to have been built long enough. It is reasonable to assume that if the transept was completed in the year 327, the exedras were completed around the year 330. Therefore, the transept, the apse and the exedras would be completed within a more than reasonable period of five years from the beginning of the construction.

Liber Pontificalis indicates that Constantine had the dome of the apse covered with gold [69], and such a sumptuous decoration only made sense that it should be done when the entire transept and the exedras had already been completed [70]. Furthermore, the work necessarily had to begin before the death of Constantine, in the year 337. It is very likely that this mosaic showed the image of Christ sitting on the throne, as shown in a watercolor ("Drawing of the mosaic of the apse of the old basilica of S. Peter decorated by Innocent III", Biblioteca Apostolica Vaticana, Barb. Lat. 2733, fols. 158v and 159r) by Grimaldi from 1594 [71], and without a doubt the mosaic reform under Pope Innocent III (1198-1216) essentially kept the original design.

The construction of the exedras necessarily had to take some time since they had to be built outside the initial horizontal platform, and at the same time they had to be built perfectly integrated into the transept. This was a constructive challenge, and a different foundation had to be used and also tie bands with the already built walls of the transept. Despite this, it is to be assumed that Constantine urged that the complete construction of the transept and lateral exedras be completed as soon as possible, due to his advanced age

(Constantine died in 337). In fact, in Brandenburg's opinion the transept was consecrated immediately after its construction, and immediately destined for worship [72].

With respect to the nature of the foundations of the execution of the cruise terminal there are some doubts. Only the northern exedra has been examined archaeologically, and here the evidence is complicated by the subsequent construction of a vault over a 16th century lime pit, which according to the excavation report concealed the 4th century walls. Krautheimer noted that although the west side was hidden by the vault, part of the north wall and its foundations were visible, but did not comment on the nature of the foundations [73]. However, Carpiceci stated that the foundations could be inspected on three sides of the lime pit, and that they were of a very similar type to those below the apse. He further compared the well-built foundations on the south and west sides of the exedra with the foundations on the north side, and suggested that the latter were reinforced and propped up when the cal pit was built [74]. Without further investigation, no safe conclusions can be drawn. However, it seems clear that the exedras were built after the transept.

As indicated above, the entire basilica building was built on a foundation platform that, as a whole, forms a uniform rectangular block. The exedras collateral to the transept in the north and in the south, were left of the rectangular platform. This was a constructive challenge to unify and integrate its foundation walls with the walls of the platform. Some researchers suggest that the fact that the exedras protrude from the rectangular platform implies a change in the original idea of the project, perhaps without exedras [75]. However, it makes no sense to build a foundation platform with a complex shape and two additions for the exedra, since the additions can be built later. It is much easier, faster and cheaper to make a rectangular platform and later add the apse and the two additions for the exedras. Furthermore, and as seen in the previous chapter, the set formed by the transept (with exedras) and the naves, constitute a harmonic set, in which the dimensions of all its components are geometrically related to each other. For this reason, the exedras were designed from the beginning, although they were built outside the rectangular foundational structure.

Another point that must be taken into account is that, above their respective foundations, it has been observed in the excavations that the superstructure of the exedras and the superstructure of the west wall of the transept constitute a single structure, together with the walls with columns between the transept and exedras [76]. Logically, then, if the foundations of the exedras are secondary, the uniformity of the superstructure suggests

that before building the walls of the transept the foundations of the exedras were built. After the common superstructure was built, then the transept walls were built, and finally the exedras.

Alfarano points out that there were 16 windows in the transept, so they were undoubtedly distributed in two groups of three windows on each side of the apse and a pair on each of the side walls of exedras [77].

Stage 11 (Layout OSP-CP11)

352 A.D. Liberius (352-366). Construction of main body of naves

The main body (including transept, exedras, apse and five naves) was already built before the papacy of Liberius (352-366), and the complete decoration was completed in the time of the emperor Honorius (393-423) [78]. The main body of the basilica was higher than the transept (reason why they seemed separate buildings) and consisted of five naves, such as the Basilica Ulpia of the Trajan's Forum, from the beginning of the second century, whose architectural structure seemed adequate for the Basilica of Constantine, conveniently adapted to the few initial requirements of the Christian liturgy [79].

According to information from Alfarano, the facade of the basilica had two rows of three windows, one above the other, and a round window at the top [80]. The 22 large windows of the classroom's clerestory illuminated the central nave, as if it were a ceremonial hall. In contrast, the aisles were darker and had 11 windows of a smaller size. The clerestory of the central nave was supported by two architrave colonnades of 22 columns each. In the same way, the aisles were also separated by colonnades of 22 columns each, but smaller in size. In this case the columns were joined by means of arches (and they were not architrave as in the main nave) due to technical needs, and to reduce the high weight that an entablature would suppose.

The entablatures of the central nave were built from blocks of various shapes and sizes, which suggests that they had not been specifically made for this building, and probably came from imperial marble deposits [81]. One of the blocks had remains of a Trajan's inscription, indicating that it had been used in another building and reused in the basilica. It was common for architectural components, previously used in other buildings, to be stored in marble warehouses, to be used again in the construction of new public buildings. It was also common to store half-made elements in imperial warehouses, and that these were just made once they had been taken to a certain building (*spolia*). The entablatures

of the central nave had a considerable height (8.5 *feet*, that is 11.33 *palmi*), and were equipped with an architrave of about 3 *feet* wide (4 *palmi*) wide that had a railing, as can be seen in the drawing by Alberto Alberti (Roma, Istituto Nazionale della Grafica, n.2402 fol. 9r.). The architrave was designed with a great width so that it could be walked on, and thus be able to maintain the numerous lamps that illuminated the central nave [82].

The columns of the colonnades of the main nave, the aisles and the transept were of different varieties of granite and marble from Greece, Asia Minor and Egypt [83]. We have a fairly precise description of the column shafts in Baldassarre Peruzzi's drawings (*GDSU 108 Ar*, *GDSU 108 Av*, and *GDSU 120 Ar*), and by Giovan Battista da Sangallo il Gobbo (*GDSU 1079 Ar* and *GDSU 1079 Av*), in which it can be seen that they all had slightly different dimensions from each other. The shafts, made with red and gray granite, and with marbles of different qualities and colors, were arranged in consecutive pairs along the central nave [84]. The smaller columns of the lateral naves were arranged in a less orderly, almost chaotic manner, and were made of red granite and gray marble. The size of the small columns in the aisles varied more than the large columns in the central nave, and this was undoubtedly due to the lack of adequate and more homogeneous pieces of the imperial warehouses [85], and for this reason their bases had a variable height, so that all the capitals reached the same height.

Grimaldi also points out that both the capitals and the columns used finished and unfinished pieces, which indicates the speed with which the works were executed and the low level of demand in their construction [86]. In general pieces in different stages of processing from the imperial warehouses were used. Another proof is the base of the eleventh column that is conserved today, which has a rough and unfinished appearance, and is barely sketched possibly because they came from warehouses in which partially processed pieces were stored, to waiting for a specific and detailed later processing, depending on the order. The same can be said of some blocks used in the architrave of the central nave, made from raw blocks and processed in situ, and placed together with older pieces. All this indicates that the construction of the old basilica of S. Peter had to compete with other important public buildings of the empire, for which reason it had to make use of existing pieces, and sometimes half-elaborated [87].

At this time, the basilica had to be accessed by means of three steps according to previously made estimates (that is, 4 risers of 0.75 *foot* (1 *palmo*) each riser), since the level of the basilica was approximately 3 *feet* above the level of the foundation platform.

During these years the Severan Mausoleum was reformed, although it is not known who could have been the owner who resided in a privileged position next to the basilica, although it is known that he was no successor to Constantine [88]. Over time, due to the accumulation of rubble from the circus and natural compaction over the years, the ground level was recovering the natural slope that it had before the construction of the circus. For this reason, the Severan Mausoleum was gradually remaining below ground level, so it stopped being functional and had to be reformed. The thick walls that remained under the ground (116 *feet* in diameter, that is 154.66 *palmi*) were preserved, cutting them to the level of the ground (at this time the level of the ground, at the height of the mausoleum, would be about 15 feet below the level of the foundation platform), and the rest were demolished. Its interior was filled in, and a new mausoleum was built on this platform, based on a circular wall with an outer diameter of 102 *feet* (136 *palmi*), therefore a dimension of 7 *feet* ((116 - 102) / 2 = 7) was set back on the old base wall.This new mausoleum was formed by a circular wall of variable section, since it was formed by a sequence of niches and low walls, and had an internal diameter of 86 *feet* (114.66 *palmi*) (from the bottom of the niches), and a free inner diameter of 57 *feet* (76 *palmi*). The circular wall was raised about 25.5 *feet* (34 *palmi*) above the level of the basilica, that is, about 28.5 *feet* (38 *palmi*) (57 / 2 = 28.5) above the level of the foundation platform [89]. On this wall a circular clerestory was built and, in this way, the building adopted a typology frequently used in Constantinian times for imperial mausoleums, such as the Mausoleum of Elena (Tor Pignatara) in Rome [90].

Years later, the mausoleum was called the Church of Sant'Andrea, in the time of Pope Symmachus (498-514) [91].

Stage 12 (Layout OSP-CP12)

399 A.D. Siricius (384-399). Construction of narthex and perimeter wall

As the poet Prudentius points out in his visit to Rome in the year 402 [92], in the time of Pope Damasus I (366-384) several hydraulic works were carried out to collect rainwater from the hill through marble channels in a cistern (*colymbus*) inside a cave with a mosaic ceiling. It is possible that Damasus I, within his hydraulic works, built the *cantharus* in the middle of the atrium, since when Paulinus of Nola visited the basilica at the end of the 4th century the *cantharus* was already in use [93]. This *cantharus* was a fountain made in a kind of bronze, called *spoglio*, which gave it a very attractive beauty and rarity.

There is also news that a baptistery [94] was built in these times, possibly in the form of an isolated construction located outside, near the north exedra, although to date it is not known where it was located for sure, and only has the complementary information provided by Alfarano. However, the baptistery of S. Peter remains an open matter and an important topic of debate, since the steep slope of the terrain on the northwest side of the basilica must be taken into account [95]. Therefore, it is most likely that the baptistery was inside the north exedra.

A few years later, in 391 Theodosius outlawed pagan worship, Christianity was consolidated in the Roman Empire, and this probably was a final impetus for the completion of the basilica [96].

The narthex and the perimeter wall of the previous body were built in the time of Pope Siricius (384-399), as narrated by Paulinus of Nola about Paulina's funeral in 395-396 [97]. The floor level of the narthex remained a little lower than the level of the basilica, so to access it some steps should be climbed [98]. Based on Grimaldi's description of the structure and materials of the basilica's floor, and Krautheimer's investigations [99], it can be estimated that the unevenness was about 3 *feet*, therefore to access the basilica, 4 steps would have to be climbed (that is, four risers of 0.75 *foot* each riser).

The ground level of the narthex was the same as the ground level of the atrium, although it is known that in the days of Pope Donus (676-678) the narthex was paved so the steps were moved and were located between the narthex and the atrium [100]. There is no clear evidence on whether initially the foundation platform was already built with several levels (the highest level for the main body of the basilica and the narthex, and the lowest level for the atrium, side wings and vestibule), or if it was made with the same level and later it was raised when building the basilica. But the most likely thing is that the platform was flat, and that the ground was being completed (and raised) as the works progressed.

The perimeter wall was not a continuous wall, but the north and south faces were made up of a wall perforated by a sequence of arches on quadrangular pilasters, as can be seen in the floor plan of Alfarano [101], instead the north face could have been initially a wall. In any case, the north and south porticoed walls were already perfectly defined in the times of Simplicius (468-483) [102].

Before the year 393, the Anicii Probi mausoleum was built in the west exterior part (attached to the apse), by consul Sexto Petronio Probo, who died in that same year [103]. The mausoleum had a privileged location since it was attached just behind apse of the basilica, demonstrating the desire of members of the ruling class to be buried near the

tomb of the Apostle Peter. It had an unusual structure since it was quadrangular and had three naves. The dimensions of the mausoleum were 62 *feet* long, by 45 *feet* wide. Brandenburg points out that it had approximate dimensions of 18.5 m. long by 11.5 m. wide (that is, 62.1 *feet* * 38.6 *feet*), although in Alfarano's plan it is clearly observed that the mausoleum had approximate dimensions of 82.66 *palmi* long (62 *feet*), by 60 *palmi* wide (45 feet), and the central nave had a width of 20 *palmi* (15 *feet*). It was demolished in the year 1450 due to the works carried out by Nicholas V for the extension of the basilica, although shortly before its demolition the humanist Matteo Vegio was able to describe it in some detail [104].

Some years later, around 400, Honorius (384-423), son of Theodosius I, built the Mausoleum of Honorius, a dynastic mausoleum for the Theodosian section of the western imperial family [105]. It is a political event of the utmost importance, which confers on S. Peter the rank of principal sanctuary of the Western Empire, extolling Rome as the spiritual and religious capital of the empire. Here the first two wives of the emperor were initially buried, in 407 and 415, and Honorius himself in 423.

The mausoleum was connected by a small portico to the southern exedra of the basilica; it had the same ground level as the basilica, and was almost aligned to the west with the new Severan Mausoleum, so it had a privileged access to the sanctuary and the tomb of Apostle Peter. The Mausoleum of Honorius was demolished in 1514 [106]. At this time therefore the two mausoleums located to the south of the basilica were separated, and had no connection. The Mausoleum of Honorius apparently only had access from the inside of the basilica, while the new Severan Mausoleum still had the entrance on its north side, adjacent to the access road. Averaging between the ground level in the western part of the basilica (presumably at an elevation similar to that of the basilica floor, and therefore 3 *feet* above the platform elevation), and the ground level in the eastern part (26.25 *feet* below the level of the platform), at the height of the renovated Severan Mausoleum, the level of the land was about 15 *feet* below the level of the platform. For this reason, at this time the renovated Severan Mausoleum had to have a staircase with about 20 risers of 0.75 *foot* each.

Stage 13 (Layout OSP-CP13)

483 A.D. Simplicius (468-483). Construction of lateral wings of the atrium

Pope Leo I (440-461) restored the mosaic of the triumphal arch that was already deteriorated [107], and it is known that he already gave sermons in the basilica that was almost finished, developing the ideology of "Peter and Paul" replacing "Romulus and Remus" as guardians of the city of Rome [108], thereby exalting Christianity, putting it at the height of classical Roman times [109]. Leo I established the first monastery in the place, and the need for a papal residence. He also built the *secretarium* on the outside of the basilica and attached to the south face of the narthex, a kind of sacristy in which the bishop prepared to access the basilica. Pope Leo I was buried in this *secretarium*, where later Simplicius (468-483), Gelasius I (492-496), Symmachus (498-514), Benedict I (575-579), Gregory I (590-604) were also buried, and possibly other 5th and 6th century popes [110].

The lateral wings of the atrium, and the access body, which includes the gate house (equipped with lateral columns) was completed in the times of Simplicius (468-483) [111], as attributed by an inscription in the old basilica of S. Peter [112]. The *Liber Pontificalis*, when referring to the biography of Pope Simplicius, also mentions the existence of a baptistery [113], made in the time of Pope Damasus I (366-384).

Stage 14 (Layout OSP-CP14)

514 A.D. Symmachus (498-514). Old basilica of S. Peter finished

In the time of Symmachus (498-514) the rooms adjacent of the gate house were completed, including the Episcopal Palace and the papal residential building (called *Episcopia* in the *Liber Pontificalis*) "*nello stesso luogo a destra ea sinistra*" of the main entrance [114], as well as a equipment to attend to the pilgrims, a fountain in front of the access stairs and some latrines [115]. The gate house also had two floors, the ground floor was an open space behind the three access arches, and the upper floor was an oratory (oratory of S. Maria in Turri) [116].

The atrium is called at this time for the first time "*quadriporticus*", a term that authorizes to imagine it as "*uno spazio sub divo coelo*", delimited on its four sides by means of columns [117]. It can therefore be said that the basilica was already completely completed

in the year 514 (although it would have continuous extensions and reforms, for a thousand years until it began to be demolished in the 16th century).

Alfarano provides in his plan layout an idea of how the walls of the lateral arms of the atrium could have been, perhaps made by thick pilasters with arches in their upper part. The same is evident in the watercolors by Tasselli of the “altarista's house” (in the south arm) where three arches are clearly evident (Domenico Tasselli da Lugo (plate 10, Biblioteca Apostolica Vaticana, Arch. Cap. S. Pietro A. 64 ter.).

Symmachus showed great commitment to the completion of the basilica and its decoration, as he had a strong need to live there. His term as pope coincided with a painful period for the city caused by the *Cisma Laurenziano*. For many years the clergy and aristocracy were divided in their support for Symmachus, or his antagonist Lorenzo. The need to reside in the basilica was induced by the occupation, in 502, of the episcopio de Letran by his opponents [118].

Within his actions, and as indicated in an inscription on the southern side of the atrium, he improved the atrium with an *opus sectile* decoration on the pendentives of the arches, and ordered *compaginare* the pavement of the atrium -*ad cantharum*- and the adjacent rooms, as is narrated in the *Liber Pontificalis* [119]. Symmachus also carried out a reorganization of the entrances to the basilica complex, structuring the first residential buildings (called *Episcopia* in the *Liber Pontificalis*), which could be considered as the oldest nucleus of the Palazzi Pontifici (also called Palazzi Apostolici, or Palazzi Papali, or Palazzi Vaticano) in the Vatican [120]. In addition to the expansion of the main stairs, he built two side staircases, protected with wooden roofs [121], next to *secretarium* built by Leo I, and which, historically, is said to have some relationship with the papal residential building, perhaps to facilitate access to the monasteries and buildings that since the pontificate of Leo I, 50 years ago, were being built in the southern part of the basilica [122]. Krautheimer and Frazer think that the two access stairs correspond to those indicated by Alfarano: "*l’una che da sud saliva alla piattaforma che precedeva l’atrio, l’altra che proseguiva da li verso nord e sulla collina*" [123].

According to Liverani [123b], and making an average between the ground level on the east side and the east side of the platform, it can be estimated that the ground level at the narthex was about 16.5 *roman feet* (22 *palmi*) below the level of the platform. At this time the narthex had the same level as the atrium, and coincided with the level of the founding platform. Therefore, the lateral staircase made by Symmachus had to have about 20 steps. Later, in the times of Pope Donus (676-678) the narthex was paved, so the steps were

moved, and they were located between the narthex and the atrium. For this reason, the floor level of the narthex was raised and without a doubt, during this time, the staircase built in the days of Pope Symmachus had to be extended by about 4 steps (4 risers of 0.75 *foot*), leaving approximately 24 risers (in the year 1000 the level of the ground of the street rose about 4 *palmi*, so the staircase was left with 20 risers).

Symmachus was also the person in charge of the consecration of the cult of Sant Andrea (the brother of Apostle Peter) of the mausoleum of times of Severus (the oldest, and located to the southeast of the basilica), reason why the building happened to be called Church of Sant'Andrea.

To access the Church of Sant'Andrea, Pope Symmachus built some steps [124], and an access located somewhere in the western area of obelisk [125], and most likely it was in the northern part of it. The level of the Church was the same as the level of the platform, and about 15 *roman feet* (20 *palmi*) above ground level. Therefore, from the beginning, the old imperial mausoleum (now Church of Sant'Andrea) had to have a staircase with 20 risers, probably in the northern part, adjacent to the access road. Therefore, Symmachus had to reform this access, presumably to make it more comfortable for visitors from the access road.

Finally, it is worth mentioning that at this time several colonnaded porticoes were built in the main streets that ran from east to west from the Tiber river (at the north end of the *Pons Aelius*) to the basilica and to the sanctuaries of Paul and Lawrence. The main portico began at the Mausoleum of Hadrian and reached the basilica, by way of Via Triumphalis, to protect the pilgrims from the sun and rain [126]. These porticoes were first referenced by Procopius in the 6th century. There are also later references in the narratives of the Gothic wars of the 6th century, since these covered porticoes were used to hide, in the attack of the Ostrogoths of the year 537 [127].

5.3. Reconstruction, in plan layout, of the most significant stages of the evolution of the *old basilica of S. Peter*, from its construction to the beginning of its demolition (514-1503)

This chapter shows the evolution of the state of the old basilica of S. Peter in different stages throughout its history, represented in plan layout. In the first place, the most representative historical dates have been chosen, and at least one per century, and all

available historical information has been compiled, classified and ordered according to the previously chosen stages.

Next, all the information available in each stage has been evaluated and it has been represented graphically, sequentially modifying the structure of plan layout that the old basilica of S. Peter had in the year 514 (OSP-F21), until reaching the year 1503, shortly before starting to be demolished

Stage 1 (Layout OSP-E1)

604 A.D. Gregory I (590-604). Apse restructuring. Gregorian canopy

Gregory I, or Gregory the Geat (590-604) reorganized the interior of the basilica, and made a semi-annular passage to the crypt, which allowed pilgrims to venerate Apostle Peter without interrupting the services of the upper altar. This structure was copied in the sanctuaries of several later churches built throughout Europe. Until then, a mobile altar was used for the celebration of Mass, which seemed less and less suitable for the performance of rituals increasingly marked by an orderly, hierarchical and noble conception of the liturgical scene, which is why it became essential an intervention in the apse [128].

The architects of the time faced the challenge of maintaining the immobility of historical memory (the vision and access to Peter's tomb) and at the same time providing sufficient space for the normal development of liturgical celebrations [129]. The result was a brilliant and simple idea [130]. The ground was lowered about 2 *feet* (2.66 *palmi*) (it could not be lowered further since the Constantinian platform would be perforated), and a raised podium was built about 5 *feet* (6.66 *palmi*) above the ground, thus creating an intermediate space of about 7 *feet*, enough to walk upright, and in this way the area inscribed in the apse was doubled [131]. The upper part of the historical memory of the apostle continued to emerge on the new floor the transept, a perfect height to place a fixed altar, with approximate dimensions of 8 3/4 *feet* long, 5 *feet* wide, and 4 1/5 *feet* high (aprox. 2.6 * 1.5 * 1.25 m.). The eastern front (towards the transept) of the raised podium was left free and accessible through a *fenestella confessionis* at the height of the old pavement. Under the podium, the front part of the aedicule was accessible thanks to a partial disassembly of the Constantinian canopy, whose *vitinee* columns were aligned in the front part of the podium crowned by a latch (a lectern donated Pelagius II), creating a *pergula* [132]. The word "*pergula*" was not used in the times of Gregory the Great, and even

in the times of Sergius I (687-701) it was called "*trabes ad ingressum confessionis*" [133]. Inside the crypt an altar was built at the foot of Constantinian memory while on the podium, the main altar was immobile and permeated with the tomb of the apostle, protected by a ciborium on four *porfiretiche* columns [134].

Perhaps in the times of Gregory the Great (590-604), or Pelagius II (579-590), the pope's Cathedra, the seats for the clergy, were built concentrically and attached to the inside of the apse [135] (Fig. 5.24).

Stage 2 (Layout OSP-E2)

741 A.D. Gregory III (731-741). Realization of 12-column canopy-presbyter

Pope Honorius I (625-638) ordered that the central access door to the central nave of the basilica be covered with 975 pounds of silver plate and other metals, reason why the door was called *Porta Argentea* [136]. Recent estimates indicate that the surface of that door was 22.5 m^2, and thanks to this information its dimensions have been identified. This pope covered the roofs of the basilica with bronze tiles (*tegulas aereae*) taken from buildings from the imperial era. In fact, with the permission of the Emperor Heraclius, he stripped the Temple of Venus in Rome of its gilt bronze tiles and brought them to cover the roof of the main body of the basilica [137]. In the times of Honorius I, the Chiesa di S. Apollinare was built around the southeast corner of the old basilica.

In the times of Donus (676-678) there is news that the narthex was paved, so the steps were moved and were located between the narthex and the atrium [138]. There is also information that until the pontificate of Hadrian I (772-795) the narthex was accessed by some steps [139]. Based on the descriptions of Grimaldi and Alfarano, it can be deduced that the floor of the narthex was raised by about 3 *feet* (4 *palmi*), so that necessarily about 4 steps had to be added to the lateral access staircase built by Symmachus (498-514). As the staircase built by Symmachus had 20 risers, at this time it ended up having about 24 risers. This staircase would undergo different changes in the following years, and would end up intermingling with the buildings that began to be built throughout the late Middle Ages.

Pope John VII (705-707) built the chapel dedicated to Mary, at the north and east end of the external lateral nave (occupying the space between the three exterior columns and the north perimeter wall). This pope was the first to decide to be buried inside the basilica and was in fact buried in this chapel [140].

During these first years of the 8th century, a new paving was added in the atrium, unifying its level with that of the narthex and with that of the interior of the basilica. The steps between the atrium and the narthex (possibly four risers and three treads) were moved to the gate house to the atrium. Years later, Pius II (1458-1464) raised the pavement of the entrance platform to the complex and reformed the entrance staircase by adding new stone slabs over the steps and landings. In this way, at the entrance of the complex, there was possibly only one step and two risers, facilitating the entrance to the whole complex but protecting it from rising water.

In fact, when the atrium was destroyed in 1608 it looked like a square paved with marble. Grimaldi, during the dismantling work, reported in detail that under a fill a few feet thick there was a modest layer of white stones, which was undoubtedly the original paving of the atrium. The marble used almost in all probability was extracted from the *Meta Romuli* pyramid, perhaps from the east and west sides that were soon embedded in a new medieval urban structure, since the south side protruded from between the buildings, and partially invaded the street. Years later, in 1499, the pyramid was largely demolished by Alexander VI (1492-1503), to widen the access roads to S. Peter in anticipation of the large Jubilee crowds expected for the following year.

At the beginning of the 8th century, or perhaps at the end of the 7th century, the two imperial mausoleums (now called Chiesa di Sant'Andrea and Chiesa di Santa Petronilla), were joined. It is very likely that from the beginning of its construction it was planned to join both mausoleums to the basilica, since they were built in such a way that the ground level of both mausoleums was more or less the same (It is likely that the level of the floor of the Severan mausoleum was the same as the level of the foundation platform, while the level of the floor of the Mausoleum of Honorius was 3 *feet* higher, so possibly there should be 4 steps to go from one to other).

The union of both churches would undoubtedly be carried out to create a new pilgrimage route in order for the pilgrims to observe a greater number of imperial monuments, now included in the Christian “memorial landscape” of the city. The union between the churches therefore took place after the eastern mausoleum was named Church of Sant'Andrea by Symmachus (498-514) [141], and perhaps a little before the western mausoleum became the Church of Santa Petronilla by Stephen II (752-757) [142]. In any case, in the 8th century there are already reports that pilgrims accessed the basilica by passing near the obelisk (since it was considered the tomb of Julius Caesar, possibly for act as a needle -thorn- for Peter's tomb) and through the two churches [143] full of reliquary

altars. The pilgrims then entered the south transept of the basilica, perhaps significantly a space filled with tombs of popes who had paid special attention to S. Peter, before descending the staircase leading to the annular crypt of Gregory I (590-604), and finally they left the basilica through the north corridor to the atrium [144]. In an anonymous drawing by a Florentine draftsman, made around the year 1514, and at the latest, from the second half of the 16th century [145], the two churches joined by middle of some intermediate chapels (Fig. 5.25). It is very possible that in the western part of the Church of Sant'Andrea an access chapel was built to emulate the access chapel that the Chuch of Santa Petronilla had, and that connected it with the old basilica of S. Peter. In addition, in the anonymous drawing, these two chapels appear united by means of a circular space, which undoubtedly must be a vestibule that allows separate access to both one church and another, therefore this space could be the entrance through which the pilgrims from the 8th century to visit the two mausoleums internally, before entering the old basilica, and reaching the *fenestella confessioni* (Fig. 5.26). By making an average between the level of the terrain in the west and in the east of the basilica, it can be deduced that the level of the ground at the height of the eastern part of Santa Petronilla is about 2 *palmi* below the level of the foundational platform, that is to say about 6 *palmi* below the level of the basilica floor. This means that to access the circular vestibule there should be a small staircase of about 6 risers, one *palmo* each riser.

Under the pontificate of Gregory III (731-741) six columns were added, donated by the governor of Ravenna, in front of the six *vitinee* Constantinian columns of the Gregorian baldachin [146]; in the biography of Gregory the Great these columns are called *volutile onychinae*. These new six columns were finished off by means of a beam covered with a silver sheet, thus creating, with this new canopy, a double pergola according to its current conception. In this way, a very special architectural structure was created and it was renamed "*Presbyterium*", meaning a fenced area reserved for the lower choir, or for the lower clergy and singers [147]. This presbytery soon became a true myth, inspiring even Bernini's later Baroque canopy (Figs. 5.27 and 5.28).

In the middle of the 8th century, perhaps in the times of the Popes Gregory III (731-741) or Zacharias (741-752), and in any case before the year 752, the space adjacent to the north of the entrance hall served base to build a bell tower. The construction must have been carried out before the year 752 since, since there is news that Stephen II (752-757) decorated the existing bell tower, and equipped it with bells [148]. In fact, when in 1610 the bell tower of the old basilica (Grimaldi witnessed this demolition) coins from the 7th and

10th centuries were found in the rubble [149]. However, it cannot be ruled out that two towers were actually built, in both rooms lateral to the access body, symmetrically with respect to the axis of the basilica [150]. These bell towers were undoubtedly built improperly since there is news that the north tower was subject of continuous repairs over time, to such an extent that in approximately the 12th century the south bell tower could have fallen [151]. On the other hand, the north bell tower remained standing until 1610, when it was demolished for the construction of the longitudinal body of the new basilica of S. Peter [152].

In the drawing of the Alfarano floor plan, a quadrangular body with large walls is observed in the two collateral rooms to the gate house. The quadrangular body located to the north corresponds to the base of the known bell tower, while the quadrangular body located to the south corresponds to the Casa dell'Arciprete, whose strange design suggests that it was perhaps built taking advantage of the base of an earlier southern bell tower. This suggests two possibilities, either there were two bell towers, and the south bell tower collapsed before the 12th century, and was never rebuilt [153], or the north bell tower was built and the south bell tower was started but never finished (which is less likely).

The biographies of the successors of Gregory I (590-604), in the 7th, 8th and 9th centuries contain numerous references to donations of objects of great value to the basilica, and to the construction of numerous chapels inside it. Since the 8th century the pilgrimage route also passed through the obelisk, since it was considered the tomb of Julius Caesar, possibly to act as a needle (a thorn) for the tomb of Peter [154]. As has been commented, the obelisk was considered as one of the three pre-Christian monuments considered tombs of prominent Romans and formed part together with the old basilica of S. Peter of a "memorial landscape" of the sanctuary. The pilgrimage path of the obelisk continued towards the interior of the basilica through the imperial mausoleum of Honorius, thus forming, from the 8th century, a sacred path for the cult of S. Peter [155].

Stage 3 (Layout OSP-E3)

855 A.D. Leo IV (847-855). Reform of apse podium

Stephen II (752-757) consecrated the Mausoleum of Theodosius (built at the beginning of the 5th century) where he transferred the remains of Petronilla, the supposed daughter of Peter, which is why the building was called the Church of Santa Petronilla, which in times of Paul I (757-767) was also known as Chapel of the King of France [156].

In the days *of Stephen II*, the *cantharus* in atrium was also reformed and embellished [157], a large spoglio bronze pinecone, from which multiple streams of water flowed. The fountain was covered by a fanciful bronze pavilion, about 18 *palmi* high, crowned by a cristogram and supported by 8 porphyry columns, two of which with an imperial bust as relief. Assembled with ancient semicircular grids fixed to the marble entablatures, the pavilion was decorated by leaves, dolphins and a pair of gilt bronze peacocks [158]. The fountain acquired the appearance shown in the drawings by Simone del Poppaiolo detto il Cronaca (*GDSU Santarelli 17v.)* and Francisco d'Olanda and was preserved at over time, until it finally had to be dismantled on the occasion of the construction of the new basilica in 1608 [159] (Fig. 5.29). Stephen II also built several fountains and hostels in the southern area of the basilica, reestablishing the scope of the *acquedotto Sabbatino* (*Aqua Traiana*) from which a secondary derivation fed the hydraulic installations of S. Peter, including the baths for the clergy and the poor, the baptistery of the basilica and the *cantharus*. It also made a new golden access road [160].

In the 8th century, in the eastern and southern areas around the basilica, hospices, hospitals, and houses began to be built on a massive scale by people from the north, from cities whose names ended in "burgh", so this area began to be called "Borgo" [161].

In the time of Hadrian I (772-795) the three arches of the facade, to access the interior of the basilica through the gate house, were closed, *a tutto sesto*, with architrave portals and three bronze doors brought from Perugia were arranged, and which the pope's biographer describes as "*maiores et mire magnitudinis decorates*" [162], and between 774 and 776 the main staircase was restored [163]. Therefore, it is to be assumed that it was at this time that the facade was reformed, probably years after the two bell towers were built [164].

In the times of Leo III (795-816) the podium area was enlarged, possibly in the year 800 on the occasion of Charlemagne's coronation, eliminating the front entrances, building stairs perpendicular to the axis of the confessional [165]. The resulting structure was preserved practically in its entirety throughout the Middle Ages [166]. He also built a *Triclinium* near the obelisk in the urban area located south of the basilica [167].

Over time the basilica continued to be embellished by successive popes, and around it all kinds of buildings began to rise, and not only monasteries, but also hospices, hospitals for the care of the faithful and pilgrims [168].

In the 9th century, after the sack of the basilica by the Saracens in 846, Leo IV (847-855) surrounded the entire area by means of a defensive wall [169], later known as "*mura Leoniane*", which it was the only significant change in the defensive perimeter of Rome,

after the Aurelian walls of the late third century. The interior area was renamed the "*civitas Leoniana*" [170]. Leo IV repaired the central door of the basilica (*porta Argentea*), seriously damaged by the Saracens, as well as the roof of the narthex [171].

Stage 4 (Layout OSP-E4)

1003 A.D. Silvester II (999-1003)

Pope Sergius III (904 - 911) began to dedicate funds to rebuild the Lateran Palace, which had been destroyed by an earthquake in 896, and to rebuild other churches, so that during the 10th century there were hardly any reforms in the Constantinian basilica. This pope inaugurated what in the nineteenth century came to be called "pornocracy" or "government of harlots", a time when women held power in Rome. In these times, for example, Teodora stands out, together with her daughter Mazoria, lover of Sergius III (904-911), and mother of John XI (931 - 935) last pope of the era of "pornocracy".
Sylvester II (999-1003) was a pope of great erudition and was known as "the light of the Church and the hope of his century", and among many things, he used his position as pope to make the decimal system to be used by western clergymen, which greatly enriched the mathematical calculation. He invented an abacus, made a new type of monochord, and came up with a new shorthand language, among many other things. He achieved great renown as a theologian and as a philosopher, and also had knowledge of mathematics, music, astrology and alchemy, among many other disciplines [172]. However, despite his dynamism and erudition, it is not known that he had performed any action on the basilica, for what can be assumed that during this time there were no major changes.
The later popes of this century, embroiled in their own disputes for power, did not carry out any notable activity on the basilica and there is also no record of anything remarkable happening in its immediate architectural surroundings.

Stage 5 (Layout OSP-E5)

1124 A.D. Callixtus II (1119-1124). Reform of Cathedra

In the 11th century there is no news that there was any notable activity on the Constantinian basilica, nor in its close surroundings. These are turbulent times, and the different popes are focused on their struggles for power, leaving aside notable constructive activities in the building (Fig. 5.30). The economy has been stagnant for a

long time, and changes are taking place normally slowly. It is possible that the lack of maintenance of the basilica during the last 4 centuries was the cause that led to the collapse of the southern bell tower (if it was ever built), so the basilica was left with a single tower, until October 1610, when it was demolished to build the eastern body of the new basilica [173].

Among the few interventions on the basilica in these times, those promoted by Callixtus II (1119-1124) stand out and, among other renovation actions of the basilica, modernized the *Cathedra Petri*. In the same way, he covered the floor of the apostle's altar with new tiles, which, being deprived of the valuable late medieval metallic coating, appeared to be battered and "*da indurre il pensiero che fosse stato violato*". Barely larger than the Gregorian altar, it remained framed between porphyry columns of the late medieval ciborio, equipped at that time with metal doors [174]. The renovated altar was re-consecrated on Sunday, the day of the Annunciation, March 25, 1123 [175].

Stage 6 (Layout OSP-E6)

1241 A.D. Gregory IX (1227-1241). Comprehensive reform and decoration

Due to the visible deterioration of the basilica, at the end of the 12th century and the beginning of the 13th century an intense work of reform, updating and new decoration of the basilica was carried out. The reform works began by Innocent III (1198-1216) in the apse area, and continued by his nephew Gregorio IX (1227-1241) in the naves and the facade. During these years the most important and noble parts of the basilica, such as the apse and the facade, were renovated. In the facade to the atrium a pediment with rose window was arranged, and the tympanum was renewed to have a prominent *cavetto* under the frame of the cornice for the protection of the mosaics against the rain [176]. It is also known that in the 13th century, and perhaps in the time of Pope Gregory IX (1227-1241), the bronze doors of the facade were incorporated into the quadriplegic of the basilica, and Pietro Mallio describes that on these doors there was an epigraph listing the donations of Carlo Magno to the Church, in the Umbria and Alto Lazio areas [177]. Above the three doors the facade was decorated with a mosaic of figures, which at the time of Alfarano and Grimaldi, was very deteriorated. The Roman arched windows, both front and side, were completed by Gothic triforiums [178].

It is also possible that, judging by the architectural style of the decoration, during the 13th century, and perhaps by Innocent III (1198-1216) the Church of Sant'Andrea (the

mausoleum from Severan dynasty) was reformed, and that its appearance internal outside like the one seen in the fresco *Veduta della Fabbrica nuova e dell'antico S. Pietro al tempo del trasferimento dell'obelisco*, made by Giovanni Guerra (Vatican Apostolic Palace, Biblioteca Sistina, room II), made in the year 1586) (Fig. 4.26).

Innocent III also intervened in the liturgical furniture of the basilica, providing the papal throne with the typical coronation (inspired by the inheritance of the *Cathedra Petri*), that from then on would symbolically represent the "*pienezza del potere*" of the Roman pontiff [179].

In times of Innocent III, the initial part of the Vatican Palace was also built [180], located on the outskirts of the basilica in the north area at the height of the atrium. The building included a prominent tower (later to be known precisely as “Torre di Innocenzo III”) [181].

Stage 7 (Layout OSP-E7)

1280 A.D. Nicholas III (1277-1280). Apostolic palace ampliation

During this time, and once the old Basilica of S. Peter had been renovated, the interest of the popes focused on the expansion of the Apostolic Palace, initiated by Innocent III. Nicholás III (1277-1280), despite the short duration of his papacy, had a fervent constructive activity, considerably expanding the small building of Innocent III (1198-1216), in a northeast and west direction.

Stage 8 (Layout OSP-E8)

1378 A.D. Gregorius XI (1370-1378). Narthex tabernacle

In the times of Pope Nicholas III (1277-1280) the construction of the Vatican Palace was considerably expanded, specifically the *Cappella Magna* (which was later reformed and became the current Sistine Chapel), the *Aula Prima*, the *Aula Seconda*, the east facade and a tower located in the southeast part of the complex (Tower of Nicholas III).

In the times of Pope Boniface VIII (1294-1303) the *Cappela Parva* (*piccola cappella*) was built next to the *Aula Seconda*, and some rooms in the northern area of the Vatican Palace, including the north tower (Tower of Boniface VIII).

At some point, in the late 13th century or early 14th century, a statue of S. Peter was located in the middle of the narthex. This statue was made using the bust of an ancient philosopher to which and added the head of Apostle Peter. The sculpture occupied an

elevated position in the protyrus of the narthex, aligning itself with the *Porta Argentea*, located in the center of the main facade to the atrium [182]. The protyrus of the narthex would be called by Grimaldi, centuries later, as a "*tabernacle*" since it had a singular structure [183] (fig. 5.31). Two red marble columns supported a cuspidate pavilion that protrudes into the atrium. Inside, between the central white marble columns of the narthex and over an African marble threshold, a portal with jambs and an architrave decorated with interlaced flowers was prepared. Two bronze swing doors were arranged, coming from some old building. The statue of S. Peter was located above the architrave of the portal, and therefore below the middle arch of the narthex. The fact that the protyrus was attached to the armored arch of the bronze swing doors forms a kind of "hut", which could be called a "tabernacle" [184].

During the first decade of the 14th century Giotto made the famous mosaic of the *Navicella* on the west facade of the atrium, replacing an old image of the *Savior*[185]. The mosaic was commissioned in 1298 by Cardinal Jacopo Caetani Stefaneschi, Canon of S. Peter, whose donor portrait was to the right of Christ's feet. Giotto's mosaic belonged to Saint Peter's preparations for the holy year in 1300 [186]. Around the year 1320 the cardinal donated to the basilica a new altarpiece for the main altar, the so-called *polyptych* or *triptych Stefaneschi*, painted by Giotto and his workshop, and creating a double-sided altar.

In the 14th century the Church of Sant'Andrea was renamed Santa Maria delle Febbre. Its name was due to a sacred image invoked as a protector against malaria fever [187].

During the exile of the papacy in Avignon (1304-1374), partially coinciding with the Black Death that swept through Europe in the mid-fourteenth century (it began in 1348), the basilica began to slowly deteriorate again due to lack of proper maintenance, despite the fact that it had recently been renovated, and until then it had withstood earthquakes and passage of time very well [188].

The insurrection of the pontifical dominions, caused by the war with Florence, threatened with the total loss of the pope's power. For this reason, Gregory XI (1370-1378) decided to return to Rome and, convinced by Saint Catherine, decided to re-establish the pontifical see in Rome. In the same way he was the first to permanently reside in the Vatican, thus abandoning the traditional papal residence in the Lateran Palace.

Stage 9 (Layout OSP-E9)

1404 A.D. Boniface IX (1389-1404). Walls of Bonface IX

After the exile of the papacy to Avignon, the Vatican palace was in the sights of the successive popes, since they wanted to create a permanent papal residence with all kinds of equipment. In addition, and as the building was growing, it began to be aware that it should be defended.

The Vatican Palace began to be built in a strategic location on the top of a small adjacent hill in the northern part of the old basilica. The location, shape and strange orientation of the initial buildings of the palace were mainly due to the shape of the hill, and this explains the complex and strange structure of the current Vatican Palace. The group of buildings occupied a high position, making it easy to defend them, but as it expanded and acquired value, the need to build defensive walls arose. In the northern part of the ancient basilica, and connected by the northern access initially built by Pope Symmachus (498-514), a conglomerate of buildings of great value had been built, such as the Cappella Magna, the Aula prima and the Aula seconda, connected with the papal edifice begun by Pope Innocent III (1198-1216), and continued by Nicholas II (1277-1280). The group of valuable buildings had grown and needed a greater defense. For this reason Pope Boniface IX (1389-1404) created the first defensive wall, which surrounded the Vatican Palace in its southern and eastern part. The wall started from the Aula Prima and reached the Porta San Pietro.

The wall surrounded the small hill at the bottom and had a capricious shape due to the orography of the land and the existence of buildings of a certain value.

With the return of the papacy to Rome under Martin V (1417-1431) in 1420, the Vatican became the first papal residence, and it has remained that way to this day.

Stage 10 (Layout OSP-E10)

1455 A.D. Nicholas V (1447-1455). Start of the old basilica reform

In the times of Pope Nicholas V (1447-1455), a vast restructuring of the *civitas Leoniana* (between the old basilica of S. Peter and Castel Sant'Angelo) and also of the Vatican Palace was planned. The project is exhaustively described in the pope's biography, written by his friend and court humanist Giannozzo Manetti. The north wing of the Vatican Palace (north of the *Cortile dei Pappagalli*) was built, including a tower (Borgia Tower).

An enveloping wall was also built, extending to the east and north (wrapping what in the future would be known as *Cortile San Damaso*), and converging on a large tower (Torre di Niccolo V) [189].

With respect to the basilica, in 1449, in view of the Jubilee of Pope Nicholas V (1447-1455), 4 granite columns were placed framing the three portals that had previously been built within the three original Roman arches of the basilica in times of Hadrian I (772-795). These columns were removed in 1612 as the construction of the new basilica continued eastwards [190] (Fig. 5.32).

Due to the poor state of conservation of the basilica, Nicholas V decided to carry out an important reform project. It is not known for sure which architect was responsible for the works, although Rossellino, a disciple of Alberti, is often cited as the author of the project. According to a testimony of the chronicler Mattia Palmieri, Alberti would have even advised against the pope to reform the basilica, so we can hardly think that the project had any kind of participation. On the other hand, at that time, from 1451, the Florentine architect Bernardo Rossellino was in the service of Nicholas V, who undoubtedly participated in the design. However Vasari affirms that Rossellino's project for S. Peter "*andato male*", and other "*architetti*" (whose names he does not mention) carried out new projects. For all this, nothing can be categorically affirmed about the author of project [191].

According to the writings of Mattia Palmieri, with the reform project of Nicholas V the transept and the apse of the old basilica would be replaced by a square transept and three arms of equal magnitude. The western arm will end in a semicircular apse on the inside and polygonal on the outside. In the transept a dome will rise; the transverse arms would be flanked by columns next to the walls, and would be covered by ribbed vaults. The longitudinal body would be restructured although the shape of a basilica with five naves with columns, with a wooden roof, would be preserved; only the side aisles would be covered only by vaults, and the side chapels adjacent to the basilica would be torn down and others built with a regular shape. In the walls of the central nave, round windows will open in the upper part. Two bell towers would be built on the sides of the main portico, and the atrium would be transformed into a regular four-sided portico.

Based on this description, and based on the *GDSU 20 A* drawing by Bramante, the reform project of Nicholas V. Bramante made a large number of plans and sketches for the design of the new basilica with little margin of error. In one of them, *GDSU 20 A*, he made a fairly accurate measurement of the walls of the north, south and west arms of the basilica. For this reason, and taking into account the exact shape of the old basilica deduced above,

and taking into account the construction practices of the time, the reform project of Nicholas V can be reconstructed.

The reform desired by Nicholas V would extend to the exterior of the basilica. The square outside the basilica would have an elongated rectangular shape, and would be linked to the one in front of Castel Sant'Angelo by three parallel streets.

According to the accounting documents, in June 1452 work began on the *Tribuna grande di San Pietro*, behind the apse of the old basilica. But payments ceased at theend of 1455, and the works were suspended no later than March of that same year, upon the death of the pope.

The construction came only slightly above the foundation. In order to undertake the renovation works, in 1450, the *Anicii Probi mausoleum*, built by the consul Sexto Petronio Probo, located in the western part of the basilica, attached to the apse, as well as other existing buildings in the part west of the basilica [192].

The land to the west of the basilica had an upward slope, so once the land was cleared, it had to be flattened and leveled, carrying out some earth movement, and it is not ruled out that a small earth retaining wall was built that envelop the new apse. It is possible that this wall was the forerunner of another that was later made when Michelangelo's western apse was executed, and that clearly remains in the plan of Leonardo Bufalini, in the year 1551.

The successor of Nicholas V, Pope Callixtus III (1455-58) did not continue with the works of the basilica, since he invested all available resources in arms against the Turks, who after the conquest of Constantinople by Sultan Maometto ll (1453), directly threatens Europe.

Stage 11 (Layout OSP-E11)

1464 A.D. Pius II (1458-1464). Lodge of blessings

The successor of Calixto III, Pope Pius II (1458-1464) did not carry out any work on the basilica, but ordered the reform of the main facade to build what would later be called the Lodge of Blessings. Its architect Francesco del Borgo designed a building as a loggia on three floors, with arches over pilasters to which he attached an order of semi-columns, following the model of Roman theaters [193]. The reform includes a structure of eleven sections through the width of the front, hiding the medieval buildings in front of the

atrium (Fig. 5.33). The main staircase that connects the new loggia with Piazza San Pietro is also reformed.

The stairway was completed in 1462, and two colossal statues of the Apostles Peter and Paul are placed at its sides, the statue of S. Peter on the left and the statue of S. Paul on the right [194]. The upper part of the pedestal of the sculptures has a width of respectively 1.37 m and 1.38 m, and a depth of 0.81 m and 0.865 m [195].

At the death of Pius II, on August 15, 1464, only the three northern sections of the ground floor had been built with the corresponding arches, columns and back walls, a fourth section on the ground floor was being built, while the foundations, piers, entablature and columns of at least three other sections are in preparation [196].

There is a lot of information about the dimensions of the Lodge of Blessings and the surrounding architectural elements, including the access stairway to the old basilica of S. Peter, so it is relatively easy to make detailed plans of it.

The most important sources are Peruzzi's drawing *GDSU 11 Ar* (Fig. 5.34), and Maderno's drawing *GDSU 263 A* (Fig. 5.35). Other drawings are *GDSU 787 A* drawing, by Antonio da Sangallo (Fig. 5.36), *GDSU 287 A* drawing, by Bramante (Fig. 5.37), the anonymous *GDSU 4170 Ar* drawing (Fig. 5.38), and the *Atrium drawing of San Pietro*, by anonymous author, kept in the Österreichische Staatsbibliothek in Vienna (Fig. 5.39).

Complementarily there are perspective drawings, without dimensions, but that complement the previous drawings to help understand the evolution of the design of the Lodge of Blessings. Among these is the drawing by C. Duchet, *"*View of the square of S. Peter*"* (A. Lafrérie, Speculum) (Fig. 5.40), the anonymous drawing, *"*View of the square of S. Peter*",* made in the middle of the 16th century (Zurigo, Collezione Schraft) (Fig. 5.41), the anonymous drawing, *"*View of the Piazza San Pietro*",* made in the middle of the 16th century (Ehrle-Egger) (Fig. 5.42), the painting by G. M. Zoppelli of the Lodge of Blessings (Palazzi Vaticani, Sala Regia (Fig. 5.43), the drawing by Maarten van Heemskerck, *"*View of the Piazza San Pietro*"*, about the year 1535 (Berlin, Staatliche Museum Preussischer Kulturbesitz, Gabinetto delle Stampe) (Fig. 5.44), and the anonymous drawing, *"*View of the Piazza San Pietro*"* (Dresden, Gabinetto delle Stampe) (Fig. 5.45).

In Peruzzi's *GDSU 11 Ar* drawing the distance 77 2/3 *palmi* is indicated between the outer wall of the gate house and the beginning of the staircase. In drawing *GDSU 787 A*, by Antonio da Sangallo, of the restructuring project of the Sacra Rota of the Palace of Innocent VIII, a depth of the colonnade of the Lodge of the Blessings of about 30 *palmi*

between the wall of the facade and the front columns (including the thickness of the columns), and a width of 48 *palmi*.

In the construction control documents and payments to the bricklayer Manfredino da Como, from the year 1462, a length for the north parapet of the basilica of 12 *passi* is indicated (120 *palmi*), and for the south parapet of 113 *palmi* [197]. Maderno indicates in drawing *GDSU 263 A* dimensions of approximately 100 and 110 *palmi* respectively for these parapets. In the payment documents of the bricklayer, the parapets of the staircase are 3 *palmi* wide, which considering the marble coating, they reach 4 *palmi* measured by Maderno.

As shown in a previous chapter, the entrance esplanade of the staircase (between the facade and the steps) was initially designed in the 4th century with a dimension of 56 *roman feet* (74.66 *palmi*), equivalent to a quarter of the outer width of the main body of the basilica (224 *roman feet*). This dimension is 3 *palmi* less than the dimension indicated by Peruzzi in drawing *GDSU 11 Ar* (77 2/3 *palmi*), and this is undoubtedly due to the reform carried out by Pius II, in which he added new marble slabs on the battered steps of the old Constantinian staircase. By adding these marble slabs, the steps were separated from the facade, and 3 *palmi* is a correct dimension according to the reform carried out.

The parapets of the staircase were initially projected with a dimension of 82.25 roman feet (109.66 *palmi*), and could have been repaired at different times in the Middle Ages and finally repaired by Pio II (as Alfarano points out), which would explain the small variations with respect to what was measured by the masons, as well as by Maderno or Alfarano (whose measurements all vary slightly around 110 *palmi*).

The width of the parapets was initially 2.25 feet (3 *palmi*) (as measured by the mason Manfredino da Como), corresponding to the width of the columns of the atrium (*concinnitas*), although being covered by marble plates in times of Pius II, its thickness would increase until reaching the 4 *palmi* measured by Maderno. Maderno also indicates the width of the staircase of 248 *palmi*. In the previous chapter, the implications of these magnitudes have been exhaustively discussed.

Stage 12 (Layout OSP-E12)

1484 A.D. Sixtus IV (1471-1484). Chapel of Sixtus IV

Paul II (1464-71) wishes to continue with the construction of the choir of Nicholas V, probably on the occasion of the Jubilee year of 1475, which he himself proclaimed in

1470. On this date, payments are made for works in the *Tribuna di San Pietro*, and Giuliano da Sangallo and Meo del Caprina are mentioned as architects [198]. The pope has a medal struck showing the interior of the new apse, but already in the year of his death the works were suspended again.

His successor, Sixtus IV (1471-1484) seems to have definitively renounced the idea of a renaissance or a transformation of the basilica, although he does promote some constructive activity in its close surroundings. For example, Sixtus IV built, attached to the south-south side of the longitudinal body of the old basilica, a new and spacious chapel for the choir, also destined to house his tomb.

The most important construction activity of Sixtus IV was the construction of the *Cappella Sistina*. The *Cappella Sistina* was built on the same site and replacing an older chapel, the *Cappella Maggiore*, which existed since the time of Pope Nicholas III (1277-1280). The *Cappella Maggiore* received this name (*Cappella Magna*) since it was the most important and there was a secondary chapel (*Cappella Nicolina*) used by the pope and his entourage for daily worship. According to a statement from Andreas de Trebisonda to Sixtus IV, at the time of its demolition, to make way for the current chapel, the Cappella Maggiore was in a state of ruin, with the sloping walls [199].

The Cappella Sistina was designed by Baccio Pontelli for Sixtus IV, from whom it takes its name, and built under the supervision of the architect Giovanni de Dolci between 1473 and 1481 [200]. Once completed, the chapel was decorated with frescoes by some of the most famous artists of the High Renaissance, which made it a privileged place for art.

Stage 13 (Layout OSP-E13)

1503 A.D. Julius II (1503-1513). Start of the new basilica project

The popes Innocent VIII (1484-1492), Alexander VI (1492-1503) and Pius III (1503-1503) did not carry out any works in the basilica. Only in the times of Pope Alexander VI (1492-1503) did the construction of the second floor continue (begun in the time of Paul II (1464-1471)) of the four sections already begun of the Lodge of Blessings.

In 1505 Bramante built the third floor of these four sections, which remain isolated, since due to the beginning of the construction of the new basilica, it was decided to stop the renovation works of the old basilica and not continue with the construction of the loggia. It is worth mentioning that throughout the Middle Ages (and as has been shown in the last 7 stages) all kinds of houses and precarious buildings were attached to the south face

of the basilica. As has been seen, over time the basilica was enlarged on its south face, since it was easier to build than on the north face since the land had less slope and two floors could also be built. These constructions had noble floor at the height of the basilica floor level, and a lower floor, between the ground floor and the basilica floor. Over time the basilica was expanded in the southern area, between the staircase of Symmachus (498-514) and the southern exedra, and in this way the Secretarium antiquum, and the Secretarium novellum were built, and after in a western direction (and already in the 15th century), the oratorio di S. Tommaso poi battistero, the cappella di Sisto IV, e nuovo coro dei canonici, the Coro d'inverno, the Sacrestia maggiore and the library. Between these last two rooms there was a staircase to descend to the rooms on the ground floor.

Between these buildings attached to the old basilica and the two imperial mausoleums there was a corridor, through which it was possible to access both the two imperial mausoleums, as well as the rooms on the ground floor.

On the other hand, from the Secretarium antiquum to the Chiesa di S. Apollinare, various constructions to extend the basilica, and several courtyards, were attached to the south face of the atrium. All these buildings were accessed from the upper floor of the basilica and the lower floor was descended by means of internal stairs. There were hardly any exits to the outside on the ground floor, as secondary emergency exits. These constructions left blind walls in the southern part so that, throughout the Middle Ages, private houses and all kinds of constructions attached to these walls were built and up to the path that connected the square with the entrance of the two imperial mausoleums. These attached buildings were precarious and arranged in a disorderly way, forming a chaotic set of buildings.

Some historical documents provide an idea of what these chaotic buildings might have looked like in the middle of the 16th century). For example, the engraving made by Natale Bonifacio da Sebenico and Giovanni Guerra, in 1586 ("The transport of the Vatican obelisk", The British Museum, nº 1892,0714.41 (Fig. 4.23), and also the fresco made by Giovanni Guerra, "The transport of the Vatican obelisk", 1586, Palazzo Apostolico Vaticano, Biblioteca Sistina, II sala (Fig. 4.26).

In order to reconstruct the architectural structure of this chaotic conglomerate of constructions, one drawing of Domenico Fontana has been especially taken into account: "Della transportatione dell´obelisco vaticano e della fabriche di nostro signore Papa Sisto V", libro primo, engraver Natale Bonifacio, Roma (1590), f. 15 recto (Fig. 5.46) [201]. This drawing shows the outline on the ground floor of the buildings on both sides of the road

in the situation in which they were when the obelisk began to move. It also shows the access stairs to the upper floor of the buildings and especially to the narthex of the old basilica. Therefore it is to be assumed that at some point in the Middle Ages, the stairs built by Pope Symmachus (498-514) were demolished, and in their place the stairs that can be seen in this engraving (and in the fresco and engraving by Giovanni Guerra) were built.

Notes 5

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[4] The most complete reference on the details of the construction of the foundation platform is: Richard Gem, 'From Constantine to Constans', 46

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[8] The archaeological plan of Paolo Liverani is located in: Paolo Liverani, *La topografia antica del Vaticano* (Vatican City: Edizioni Musei Vaticani, 1999). Certain aspects of the plans made by Rodolfo Lanciani have also been taken into account, in which his ideas about the urban structure of the Vatican City in three historical periods are superimposed: ancient Rome, the Middle Ages and today. Lanciani's plans have multiple inconsistencies, such as the fact that it oriented the main entrance of the circus to the west, which was impossible since this part was partially dug into the hill and was on the opposite side of the access road (which was to that). However, some aspects of the Lanciani drawings are correct and very useful. These plans are included in the following publications: Rodolfo Amedero Lanciani, *The ruins and excavations of ancient Rome. A companion book for students and travellers* (London: Macmillan, 1897); Rodolfo Amedero Lanciani, *Forma Urbis Romae*, Istituto Nazionale di Archeologia s Storia dell Arte (Roma, 1901); Rodolfo Amedero Lanciani, *Storia degli scavi di Roma e notizie intorno le collezioni romane di antichità*, I (Roma: E. Loescher, 1902)

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[130] Sible De Blaauw, *Cultus et decor. Liturgia e architettura nella Roma tardoantica e medievale. Basilica Salvatoris, Sanctae Marie, Sancti Petri*, 2 voll. (Vatican City: Biblioteca Apostolica Vaticana, 1994), pp. 543-544

[131] As a consequence of the excavations carried out in the 40s of the 20th century, it was published that the upper level of the podium was 1.45 m. (4.86 *feet*) above the ground level of the basilica, and the lower level about 0.64 m., (2.14 *feet*) thus leaving a total height of 2.09 m. (so that it was possible to walk easily inside). It is evident that what was intended is that there should be 7 *feet* of difference (4.86 + 2.14 = 7 *feet*), and the construction orders would undoubtedly be to excavate about 2 *feet* below the level of the basilica and to build the podium at a height of about 7 *feet* above the level of the basilica (I can't imagine giving constructive orders to excavate exactly 2.14 *feet* and build exactly at 4.86 feet). For more information, see: Bruno Maria Apollonj Ghetti, Antonio Ferrua, Enrico Josi, Engelbert Kirschbaum, *Esplorazioni sotto la confessione di San Pietro in Vaticano eseguite negli anni 1940-1949*, vol. 1, pp. 173-193

[132] Sible De Blaauw, *Cultus et decor. Liturgia e architettura nella Roma tardoantica e medievale. Basilica Salvatoris, Sanctae Marie, Sancti Petri*, pp. 543-544

[133] Liber Pontificalis 1957, 86 c. 11; Sible De Blaauw, *Cultus et decor. Liturgia e architettura nella Roma tardoantica e medievale. Basilica Salvatoris, Sanctae Marie, Sancti Petri*, pp. 553-555

[134] Bruno Maria Apollonj Ghetti, Antonio Ferrua, Enrico Josi, Engelbert Kirschbaum, *Esplorazioni sotto la confessione di San Pietro in Vaticano eseguite negli anni 1940-1949*, vol. 1, 174-193

[135] Liber Pontificalis 1957, 86 c. 11; Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', in Hugo Brandenburg, Antonella Ballardini, and Christof Thoenes, *San Pietro. Storia di un Monumento* (Milano: Jaca Book, 2015), p. 55

[136] Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', p. 52

[137] Liber Pontificalis 1957, 72, c.2; Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', pp. 52-3

[138] Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', p. 47

[139] Liber Pontificalis 1957, p. 97, c. 57

[140] Antonella Ballardini, 'Un'oratorio per la Theotokos, Giovanni VII (705-707) committente a San Pietro', in *Medioevo: i commitenti*, Atti del XIII convegno internazionale di studi (Parma 21-26 settembre 2010), Artuto Carlo Quintavalle (ed.) (Milano: Electa, 2011), pp. 94-116; Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', p. 68

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[142] Liber Pontificalis 1957, p. 94, c. 52; Sible De Blaauw, *Cultus et decor. Liturgia e architettura nella Roma tardoantica e medievale. Basilica Salvatoris, Sanctae Marie, Sancti Petri*, pp. 576-577

[143] Franz Alto Bauer, *Das Bild der Stadt Rom in Frühmittelalter. Papststiftungen im Spiegel des Liber Pontificalis von Gregor dem Dritten bis zu Leo dem Dritten* (Wiesbaden: Reichert, 2004), pp. 154-159; John Osborne, 'Plus Caesare Petrus: the Vatican obelisk and the approach to Saint Peter's', in Rosamond McKitterick; John Osborne; Carol M. Richardson and Joanna Story (eds.), *Old Saint Peter's, Rome* (Cambridge: Cambridge University, 2013), pp. 279-284

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[146] Liber Pontificalis 1957, p. 34, c. 16

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[148] Liber Pontificalis 1957, p. 94 c. 47

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To see the construction phases of the bell tower see: Sible De Blaauw, *Cultus et decor. Liturgia e architettura nella Roma tardoantica e medievale. Basilica Salvatoris, Sanctae Marie, Sancti Petri*, pp. 526, 641-42

[150] Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', p. 35

[151] Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', p. 35

[152] Giacomo Grimaldi, *La Descrizione della basilica antica di S. Pietro in Vaticano, Codice Barberini latino 2733*, Giacomo Grimaldi, and edited by Reto Niggl (Vatican City: Biblioteca apostólica Vaticana, 1972); BAV, Barb. Lat. 2733, f. 149v (Reto Niggl (ed.), *Giacomo Grimaldi. Descrizione della Basilica Antica di S. Pietro in Vaticano (1619). Codice Barberini Latino 2733* (Vatican City, 1972), p. 185; Richard Krautheimer CBCR V, vol. V, pp. 171-285

[153] Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', p. 45

[154] John Osborne, 'Plus Caesare Petrus: the Vatican obelisk and the approach to Saint Peter's', p. 282

[155] Franz Alto Bauer, *Das Bild der Stadt Rom in Frühmittelalter. Papststiftungen im Spiegel des Liber Pontificalis von Gregor dem Dritten bis zu Leo dem Dritten*, pp.154-159

[156] Liber Pontificalis 1957, p. 94, c. 52; Sible De Blaauw, *Cultus et decor. Liturgia e architettura nella Roma tardoantica e medievale. Basilica Salvatoris, Sanctae Marie, Sancti Petri*, pp. 576-577

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FIGURES 5

Figure 5.1

Roma Antica

Giovanni Battista Piranesi, 1756

Frutaz, Amato Pietro. *Le piante di Roma*. Rome, Istituto di Studi Romani (1962), tav. 69

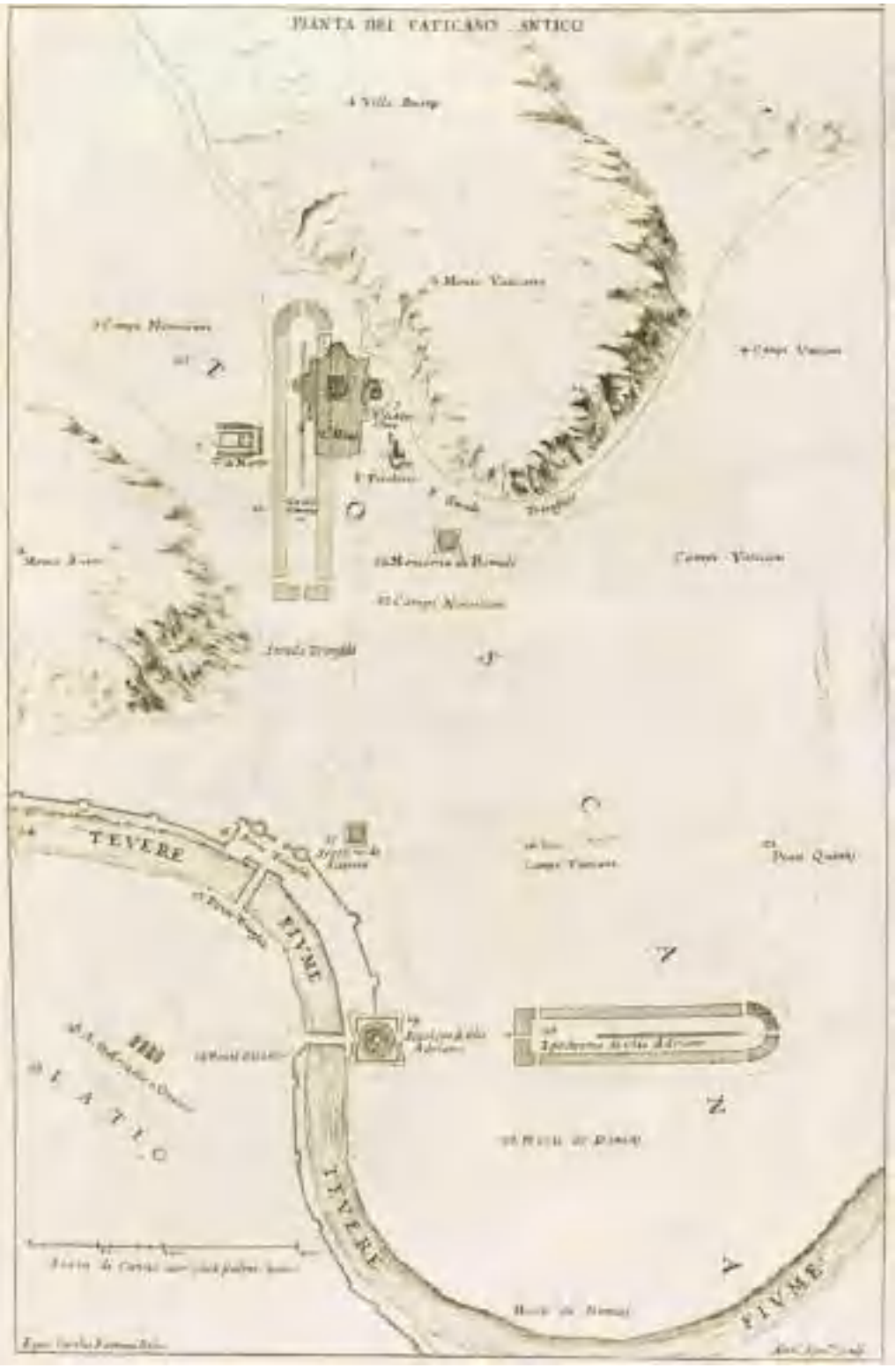


Figure 5.2

Plan of the Ancient Vatican

Carlo Fontana, 1694

Carlo Fontana. *Il tempio Vaticano e sua origine. Con gli edifice piú cospicui antichi e moderni fatti dentro e fuori di esso.* Rome (1694), p. 15

Figure 5.3

Vue Génerale du quartier du Vatican antique au II siècle, 115-125

Paul Marie Letarouilly

Paul Marie Letarouilly. *Le Vatican et la basilique de Saint-Pierre de Rome*, vol.1. Paris (1882). Chapter Cirque de Caius Caligula et Neron, PL1, f. 1

Figure 5.4

3D reconstruction of Neron circus

Drawing by Luis de Garrido, 2020

Figure 5.5

3D reconstruction of Neron circus

Drawing by Luis de Garrido, 2020

Figure 5.6

3D reconstruction of Neron circus

Drawing by Luis de Garrido, 2020

Figure 5.7

3D reconstruction of Neron circus

Drawing by Luis de Garrido, 2020

Figure 5.8

3D reconstruction of Neron circus

Drawing by Luis de Garrido, 2020

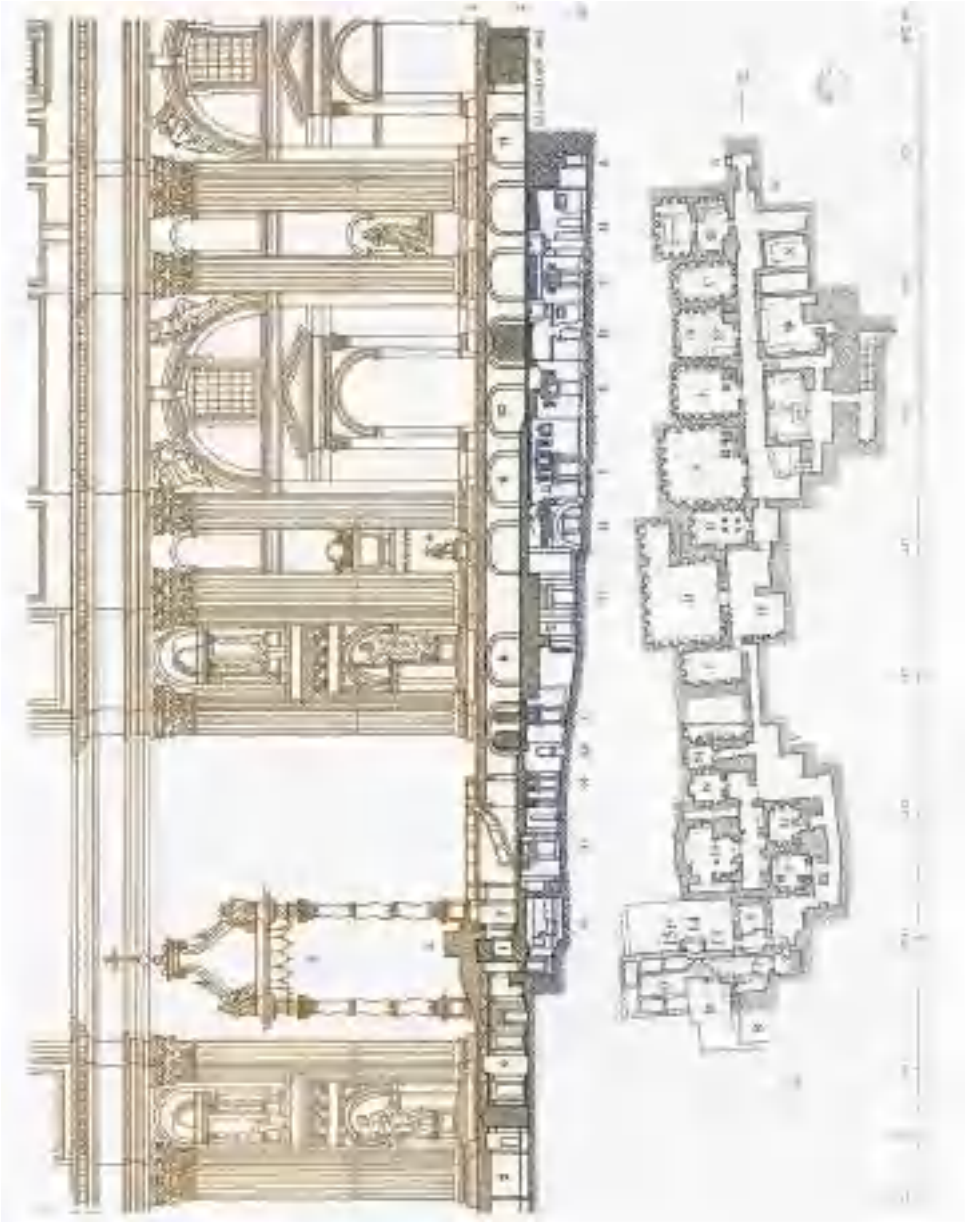


Figure 5.9

Spaccato della basilica moderna e della necropoli sotto la basilica e pianta della medesima necropoli. Section of the modern basilica and the necropolis under the basilica and a plan of the same necropolis. (Design K. Gaertner). A) C. Popilius Heracla; B) Fannia Redempta; C) L. Tullius Zethus; D) Opus Reticulatum; E) Aelii; F) Tulli e Caetenni; G) Docente; H) C. Valerius Herma; I) Quadriga; L. Caetennia Higia; M) Lulii; N) Aebutii; O) Matucci; P) Campo P; Q) Area per inumazione; R1. Tomba R1; S) Tomba S; T) Traebellena Flaccilla; U) Lucifer; V) Tomba V; Z. Egizi; X. Tomba Chi; Φ Marci; Ψ Tomba Psi; 12. Clivus; 13. Muro rosso; 14. Trofeo; 15. Muro dei graffiti Brandernburg, H.; Ballardini, A.; Thoenes, Ch. *San Pietro storia di un monumento.* Vatican City: Elio de Rosa Editore, Fabbrica di San Pietro in Vaticano (2014). p. 11

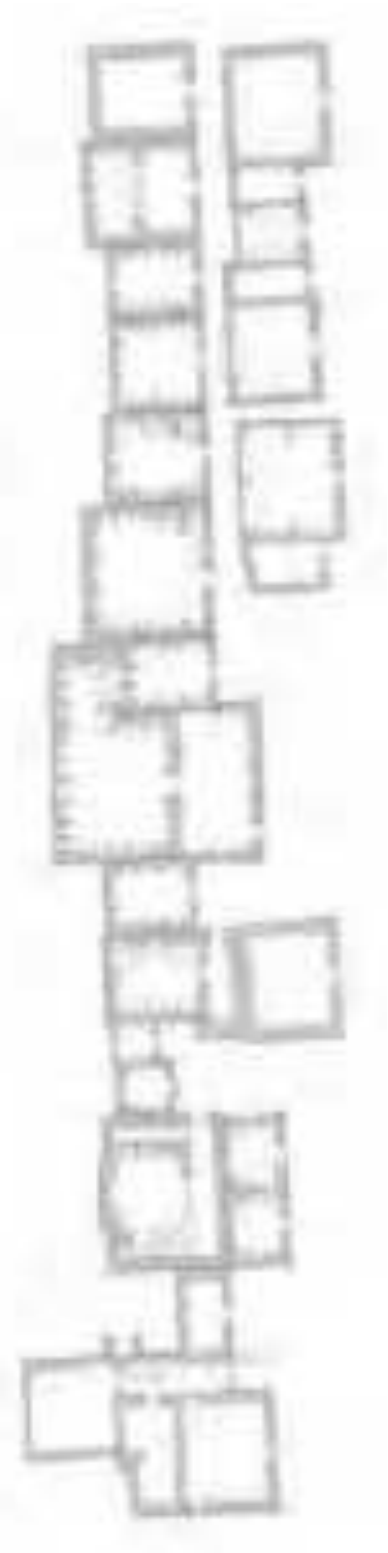


Figure 5.10

Graphic reconstruction of necropolis in 3rd century

Drawing by Luis de Garrido, 2020

Figure 5.11

Graphic reconstruction and evolution of the Z-Psi and H-A tombs. A) C. Popilius Heracla; B) Fannia Redempta; C). L. Tullius Zethus; D) Opus Reticulatum; E) Aelii; F) Tulli e Caetenni; G) Docente; H) C. Valerius Herma; Z) Egizi; Phi Marci; Tomba Chi; Tomba Psi

Mielsch – Hesberg – Gaertner, 1985-1986

Figure 5.12

Graphic reconstruction and evolution of the Z-Psi and A-H tombs

Drawing by Luis de Garrido, 2020

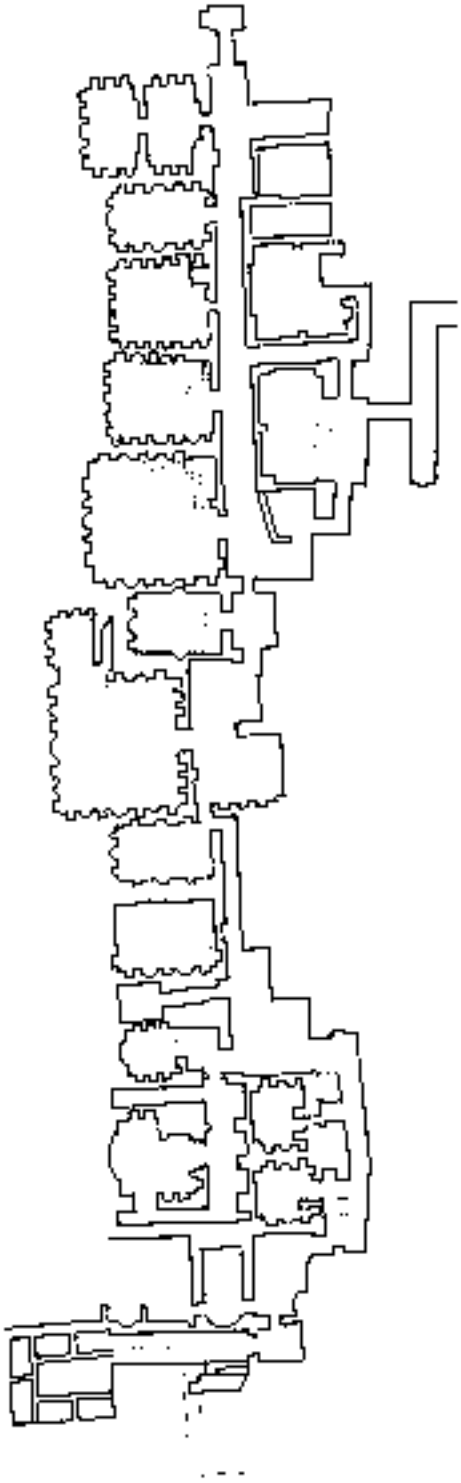


Figure 5.13

Graphic reconstruction of necropolis, XX century

Drawing by Luis de Garrido, 2020

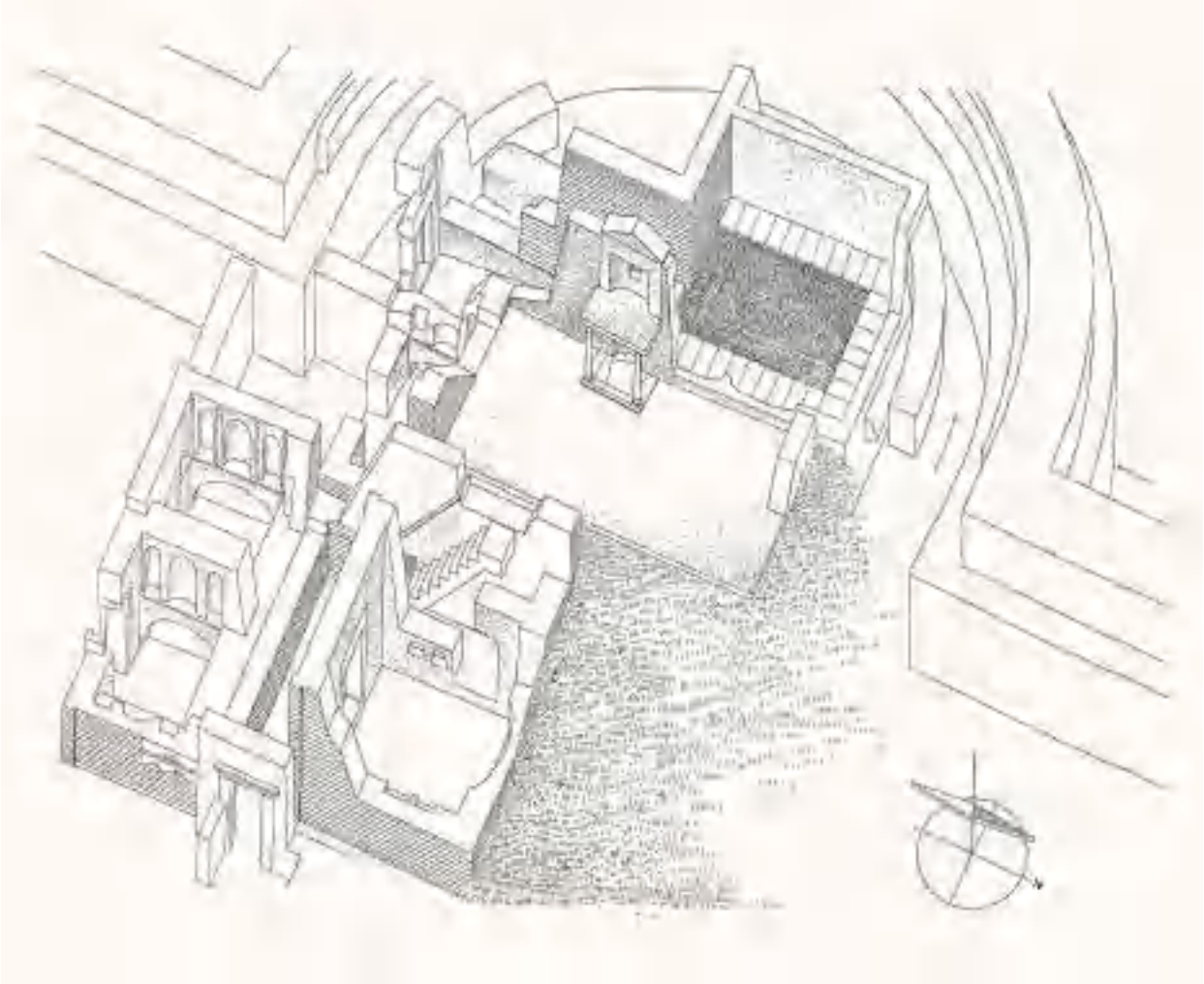


Figure 5.14

Roman tomb buildings around the camp, with the memory of the tomb monument of Peter in the apse of the Basilica of Constantine

Apollonj Ghetti, 1951

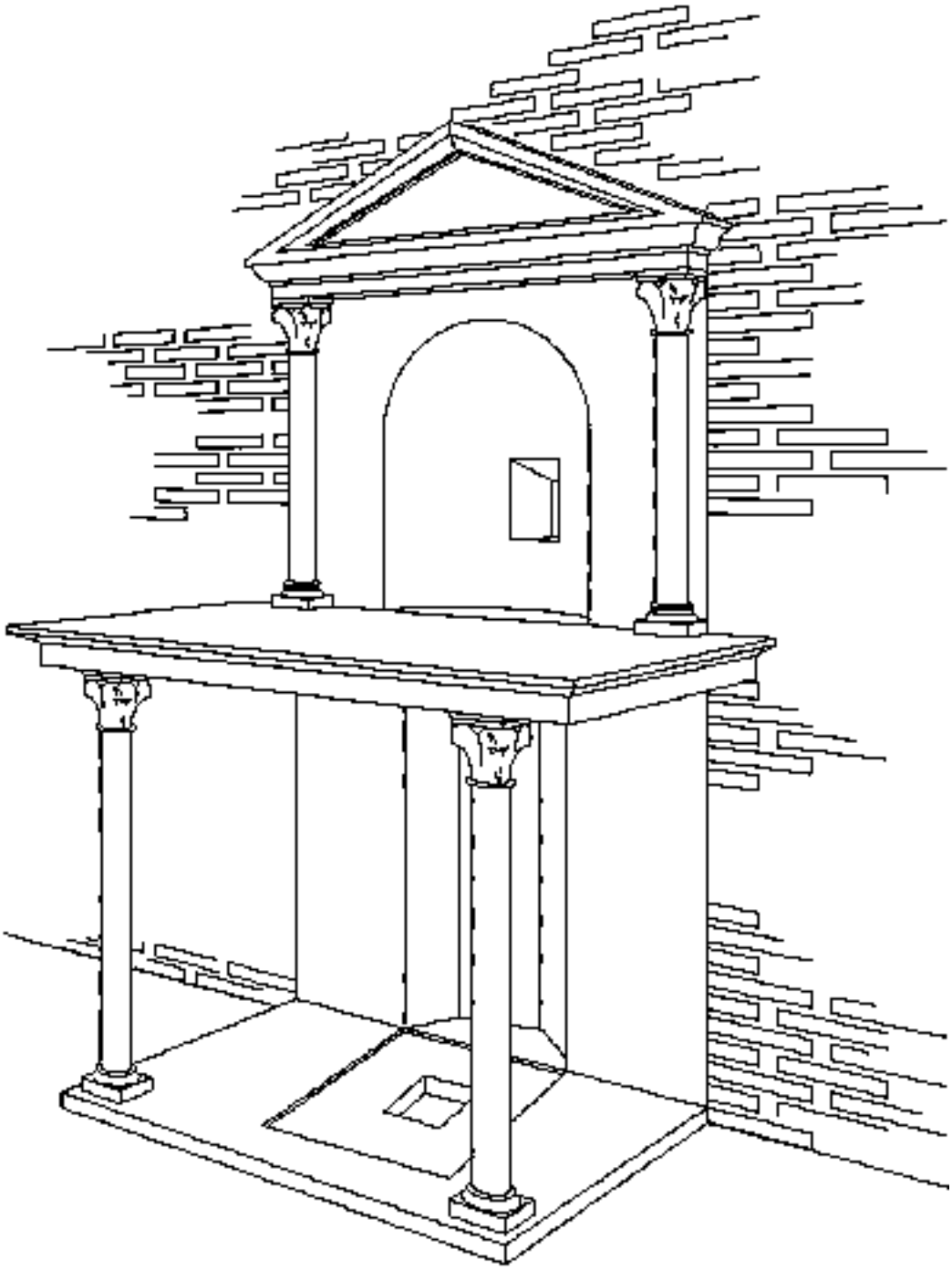


Figure 5.15

Mid-second-century funerary monument of S Peter standing in an open courtyard; reconstruction drawing

G.U.S Corbett. After Toynbee and Ward-Perkins, *The Shrine of Saint Peter*

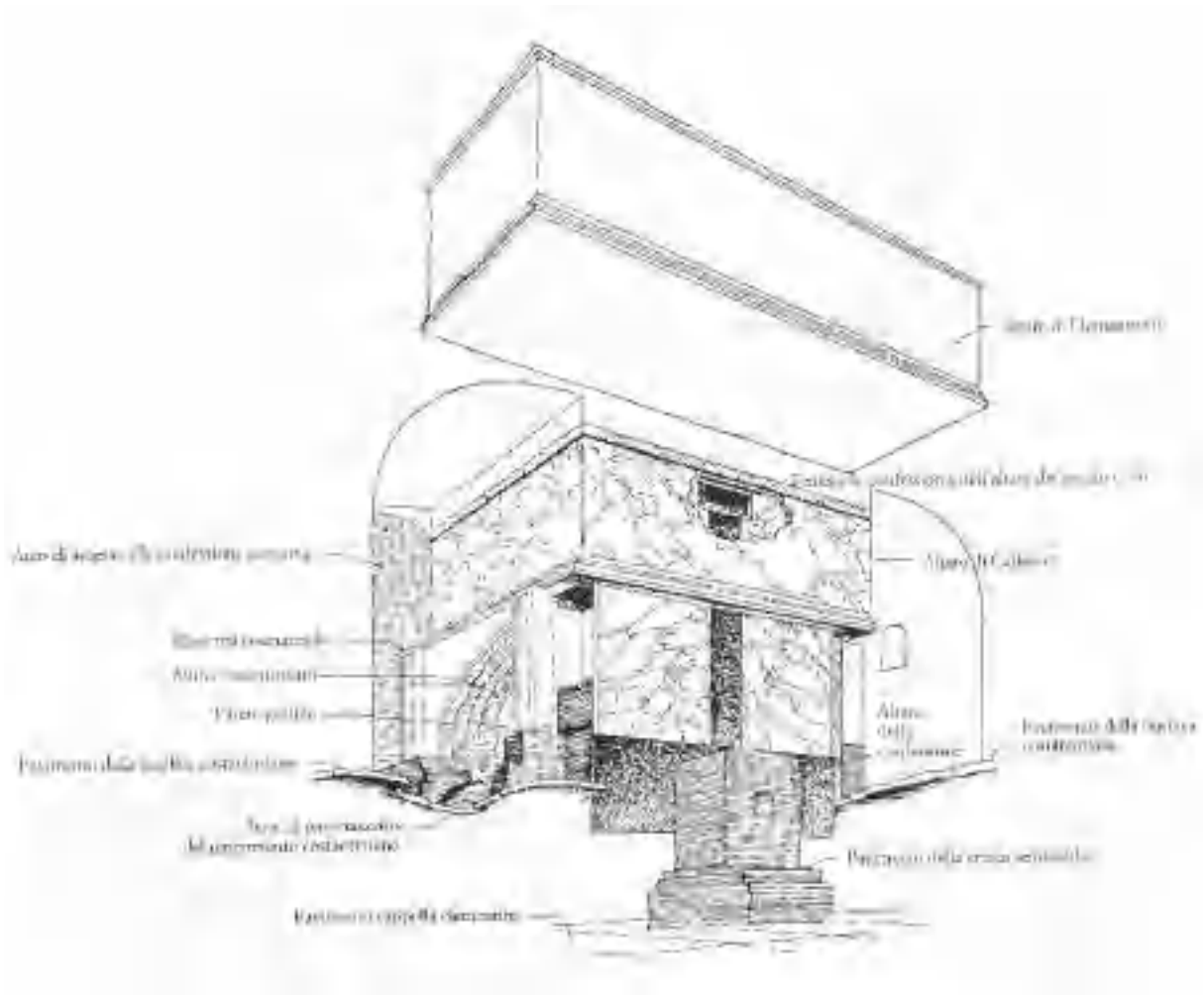


Figure 5.16

Stratigraphy of the altar of the Apostle

Apollonj Ghetti, 1951

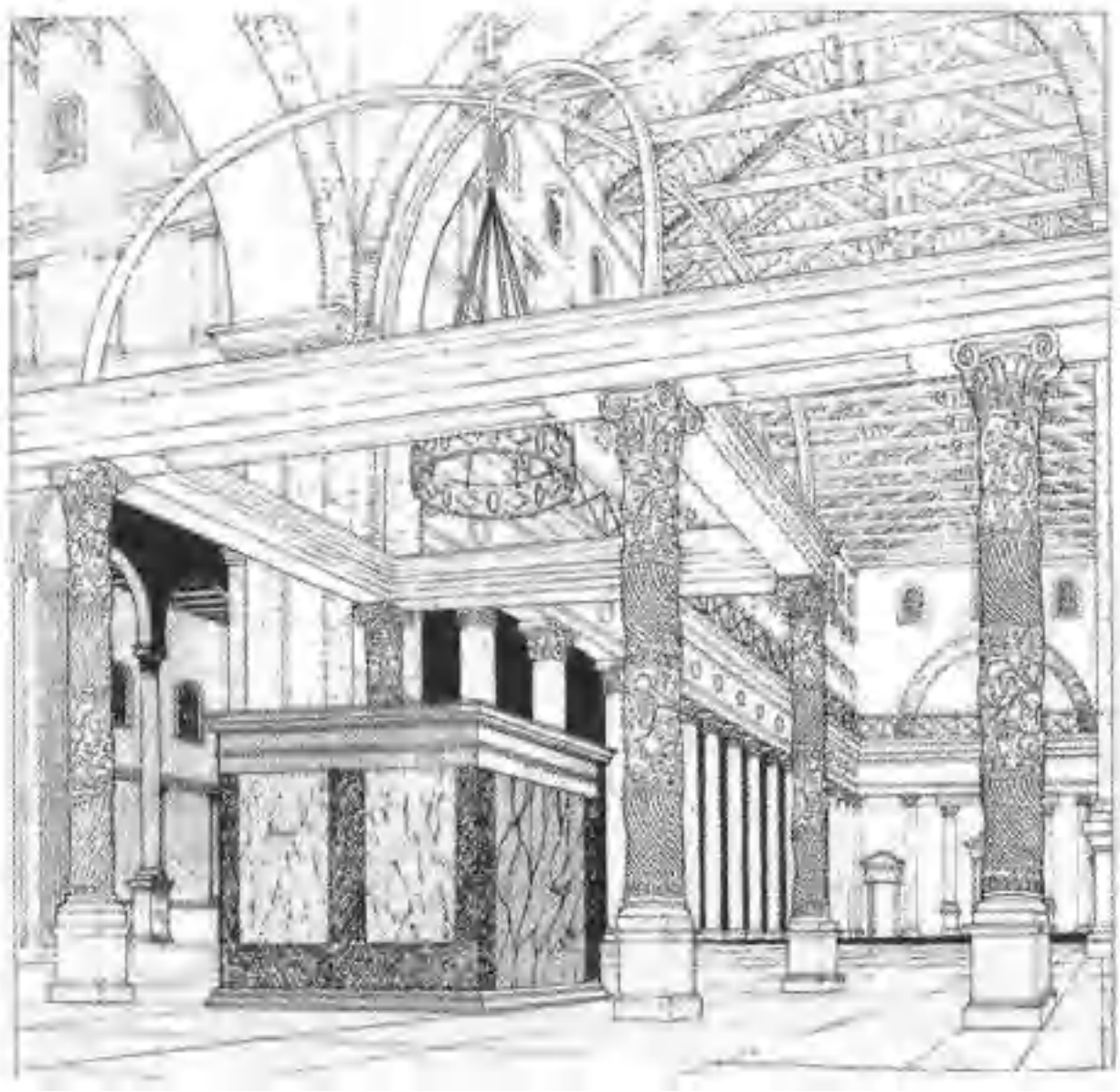


Figure 5.17

Reconstructive drawing of the *Memoria Apostolica* seen from the west with the Constantinian monument under the ciborium supported by the twisted columns from wich the large cross-shaped chandelier takes

P. Zander. *La Necropoli di San Pietro. Arte e Fede nei sotterranei della Basilica Vaticana.* Vatican City: Elio de Rosa Editore, Fabbrica di San Pietro in Vaticano (2014), p. 61

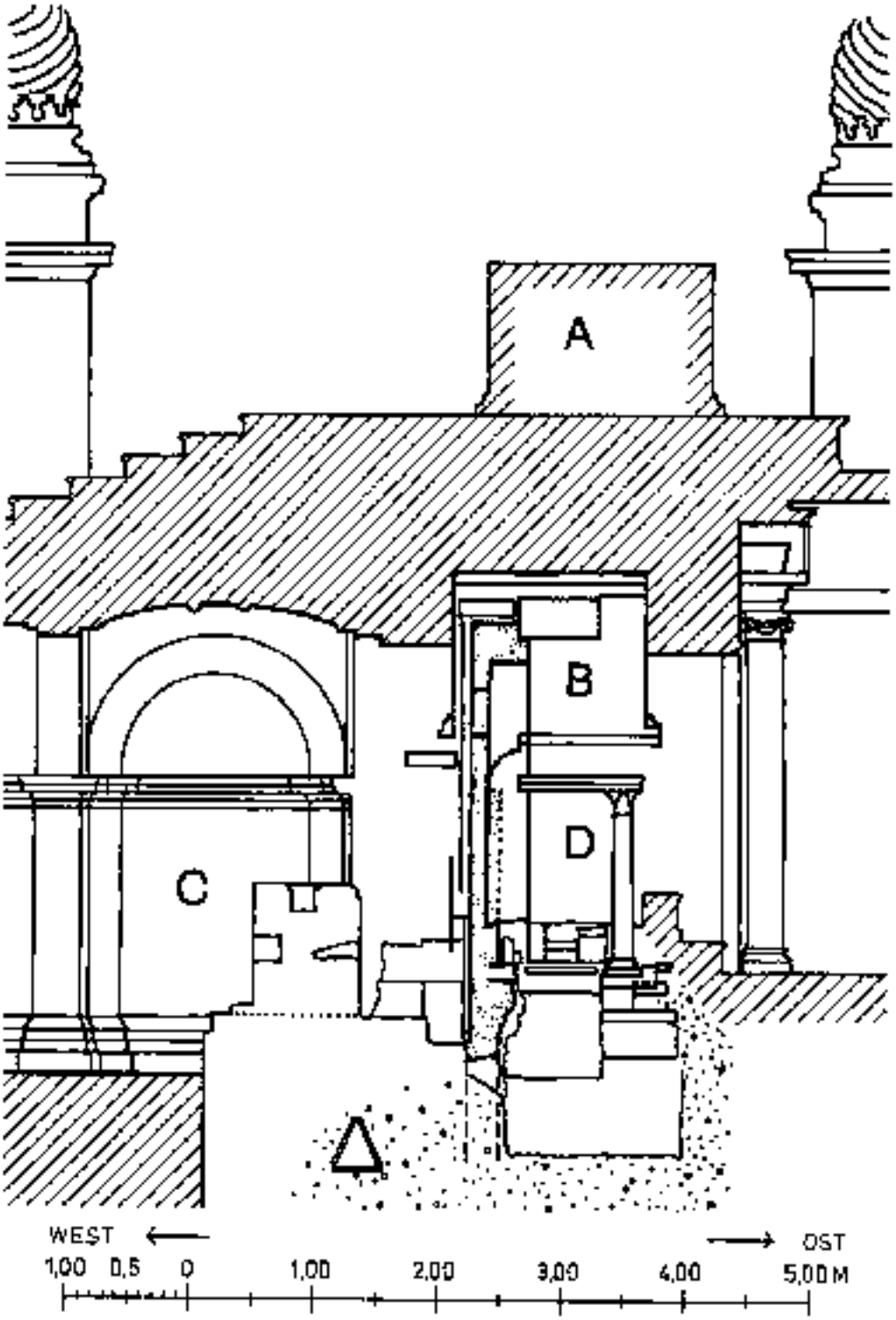


Figure 5.18

Cutaway of the current papal altar and the underlying memory

Brandernburg, H.; Ballardini, A.; Thoenes, Ch. *San Pietro storia di un monumento.* Vatican City: Elio de Rosa Editore, Fabbrica di San Pietro in Vaticano (2014), p. 17

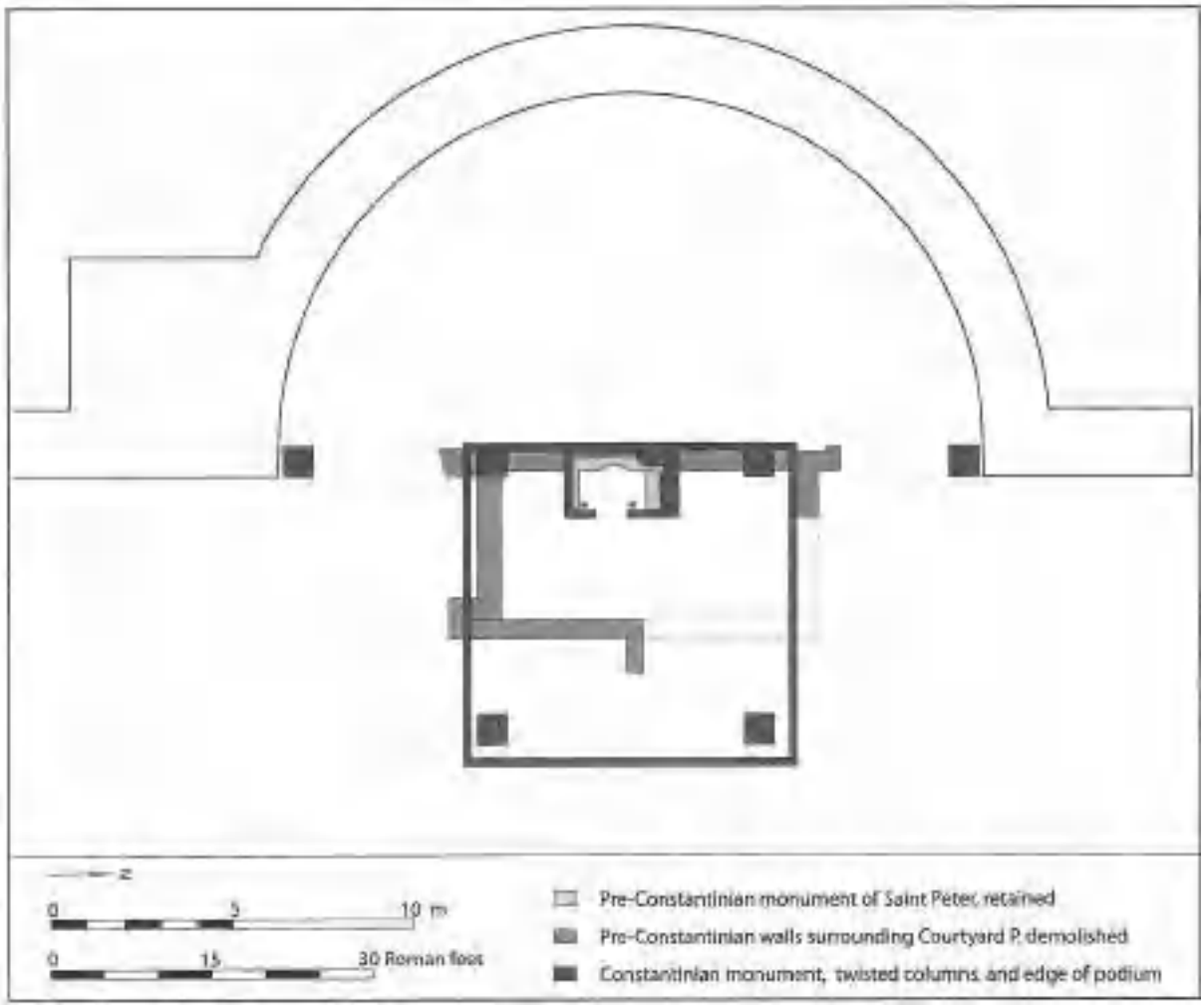


Figure 5.19

Plan based on excavated evidence, showing the Constantinian monument, podium edge (exaggerated for clarity) and column bases, in relation to the earlier monument and courtyard marking St. Peter's grave. Reconstruction by Richard Gem Rosamond McKitterick. *Old Saint Peter´s Rome*. Rome (2013), p. 48

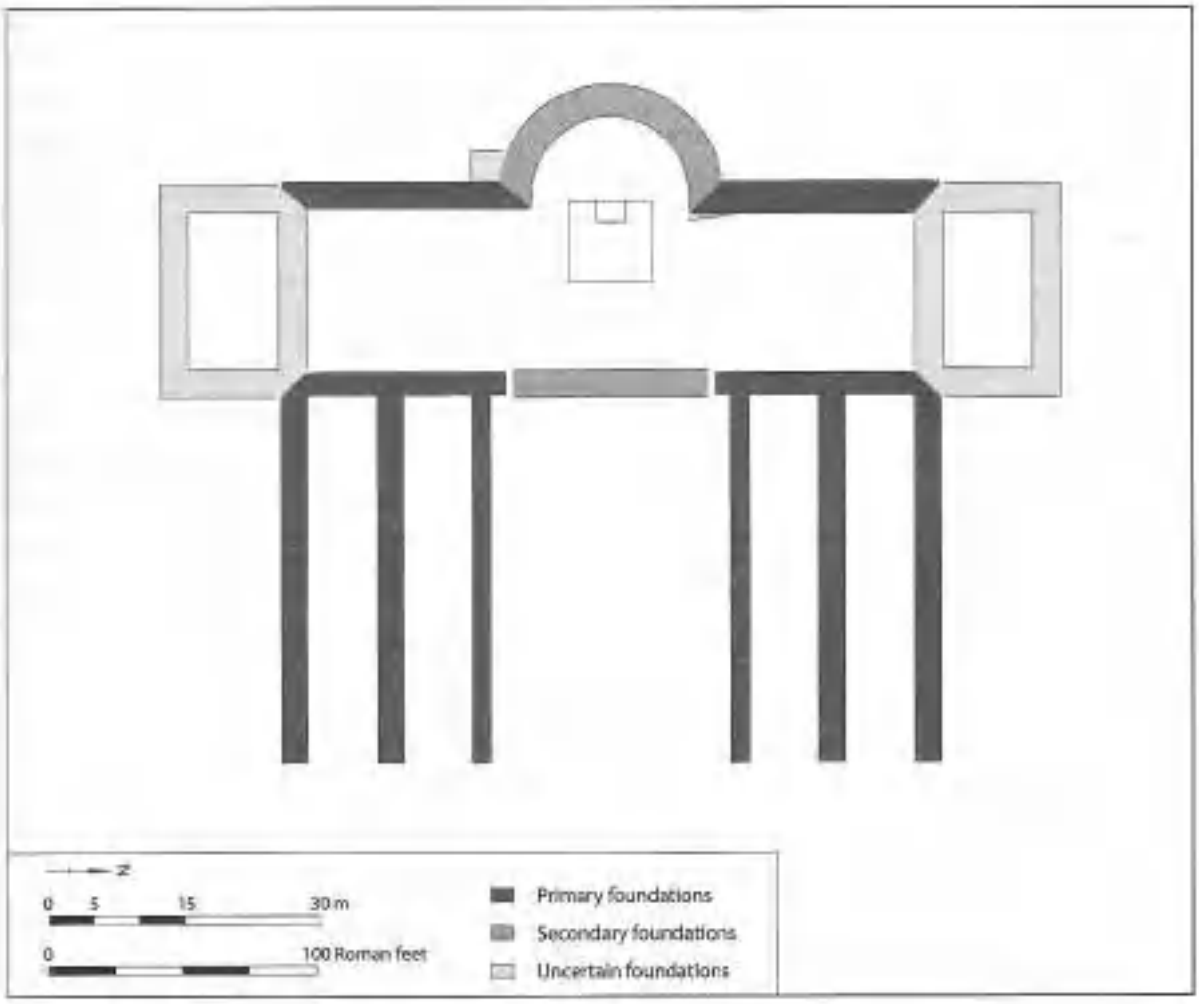


Figure 5.20

Plan of the foundations for the west end of St. Peter's basilica, based on the excavated evidence. Primary foundation walls faced in *opus listatum* and *opus testaceum*; secondary foundations of *opus caementicium*. Reconstruction by Richard Gem Rosamond McKitterick. *Old Saint Peter´s Rome*. Rome (2013), p. 49

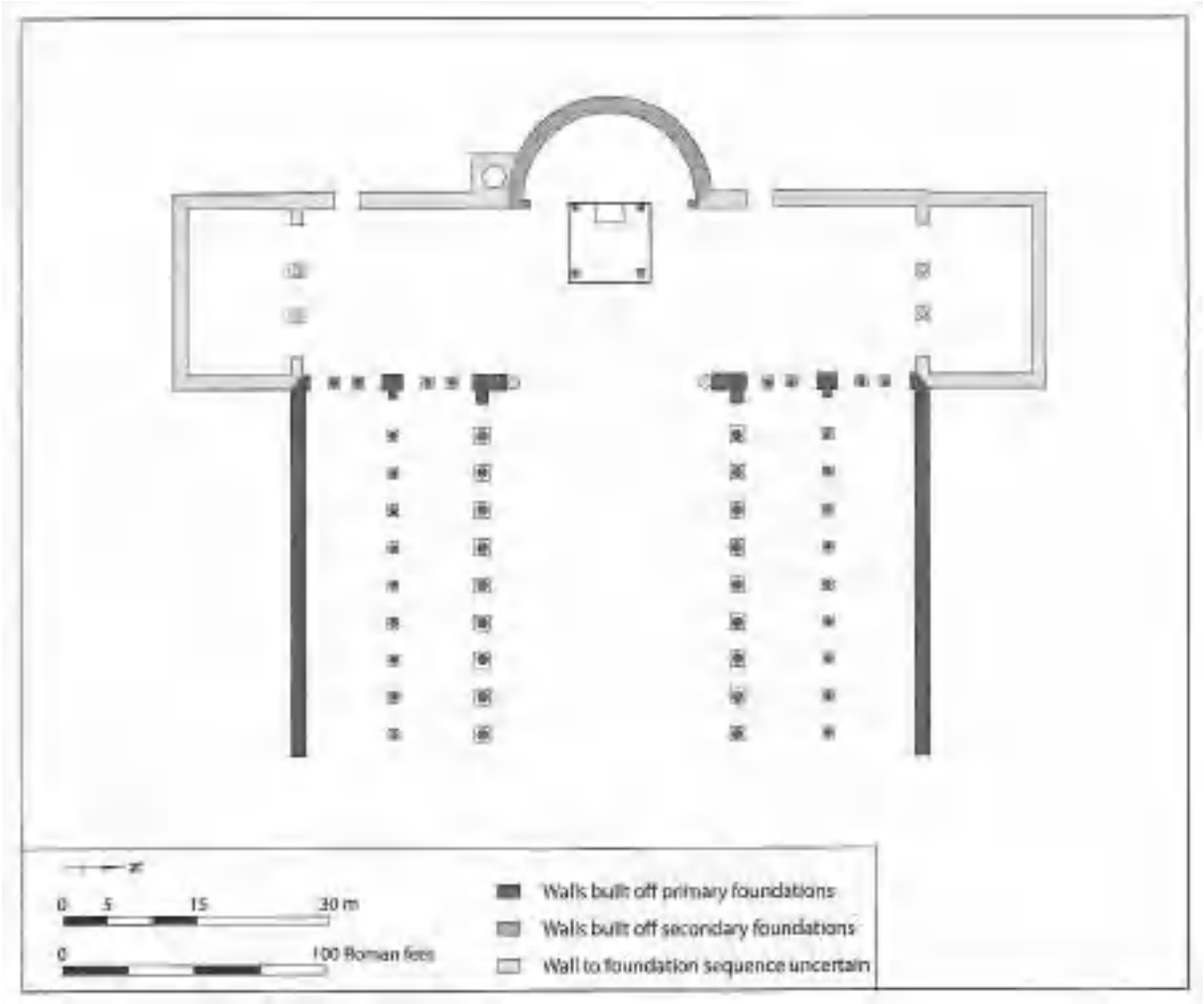


Figure 5.21

Plan showing the relationship of the superstructure to the foundations, based on the limited excavated evidence. Reconstruction by Richard Gem

Rosamond McKitterick. *Old Saint Peter´s Rome.* Rome (2013), p. 53

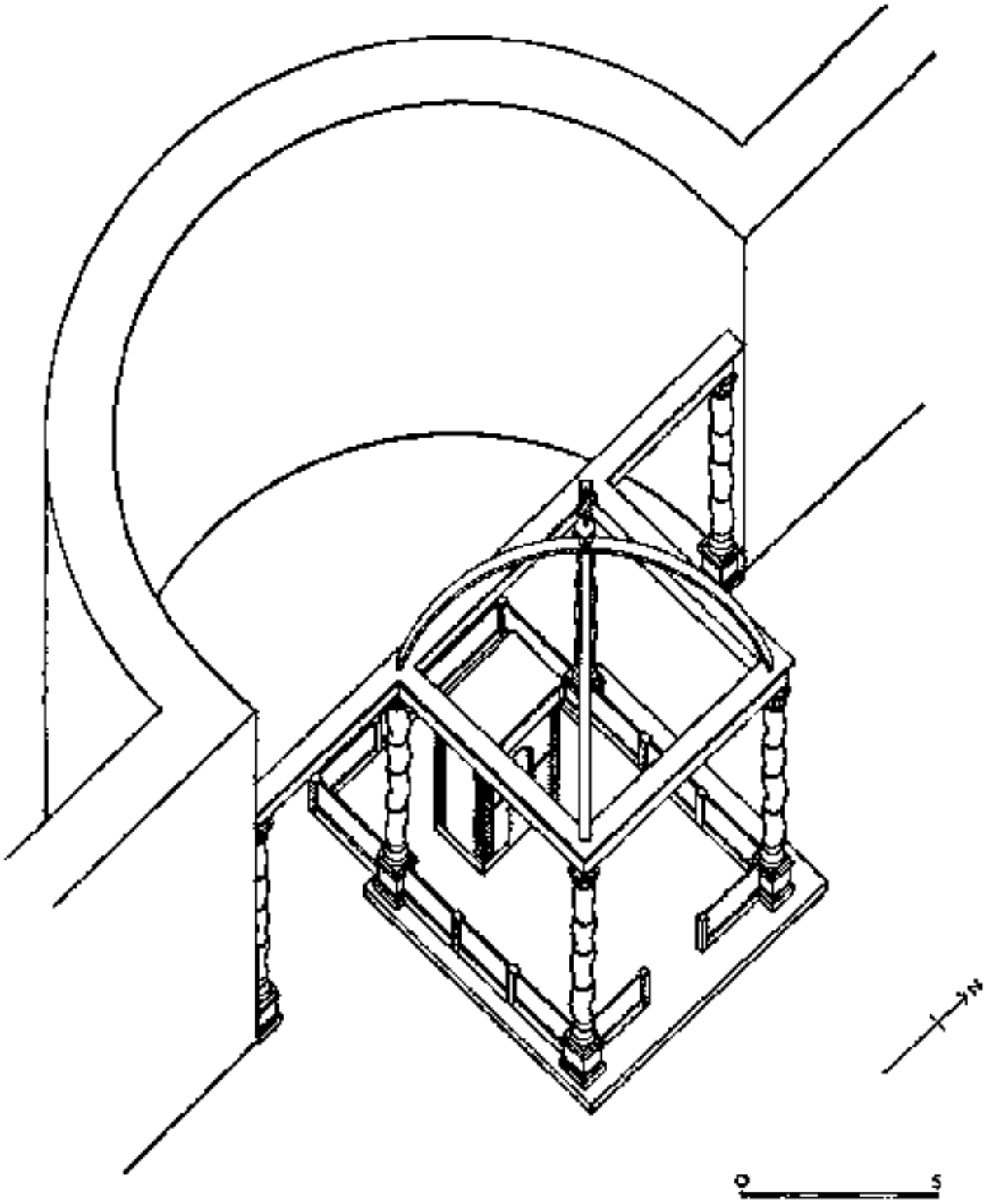


Figure 5.22

Reconstruction of the memory of the tomb with canopy in front of the apse

Kirschbaum, 1974

Figure 5.23

Reconstruction of the apsidal area in the transept of the basilica

Fabbrica di San Pietro

Brandernburg, H.; Ballardini, A.; Thoenes, Ch. *San Pietro storia di un monumento.*

Vatican City: Elio de Rosa Editore, Fabbrica di San Pietro in Vaticano (2014), p. 17

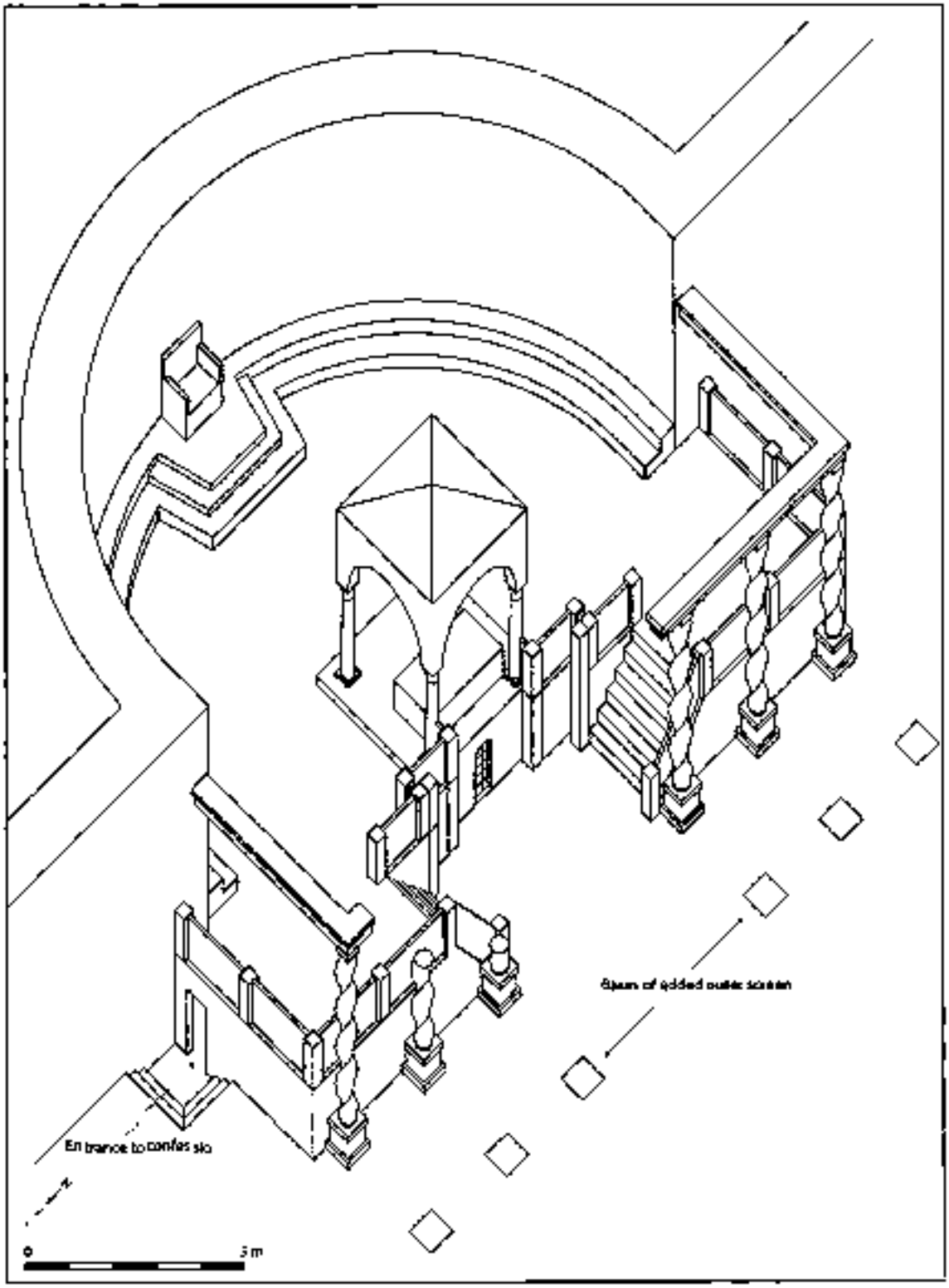


Figure 5.24

Axonometric reconstruction of the *memoria apostolica* and annular crypt at the time of pope Gregorio Magno, with the placement of additional vitinee columns under Pope Gregorio III in the 730's

Toynbee-Ward Perkins, 1956

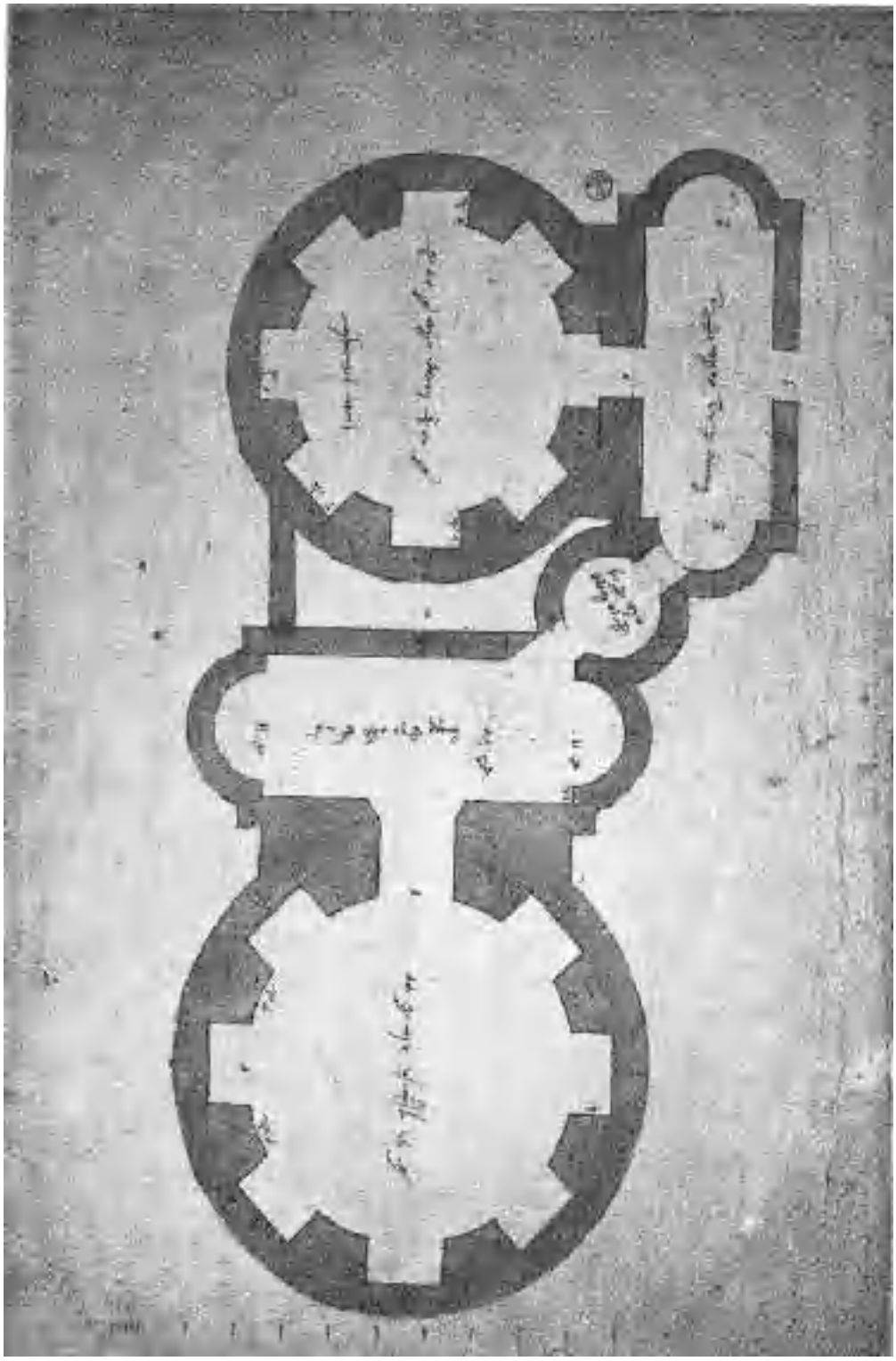


Figure 5.25

Plan layout of the rotundas of S. Andrea and S. Petronilla. Drawing of the second half of the 16th century. In the lower part of the drawing there are some scale lines 10 feet apart

Tatti Jacopo detto Sansovino

GDSU 4336 A

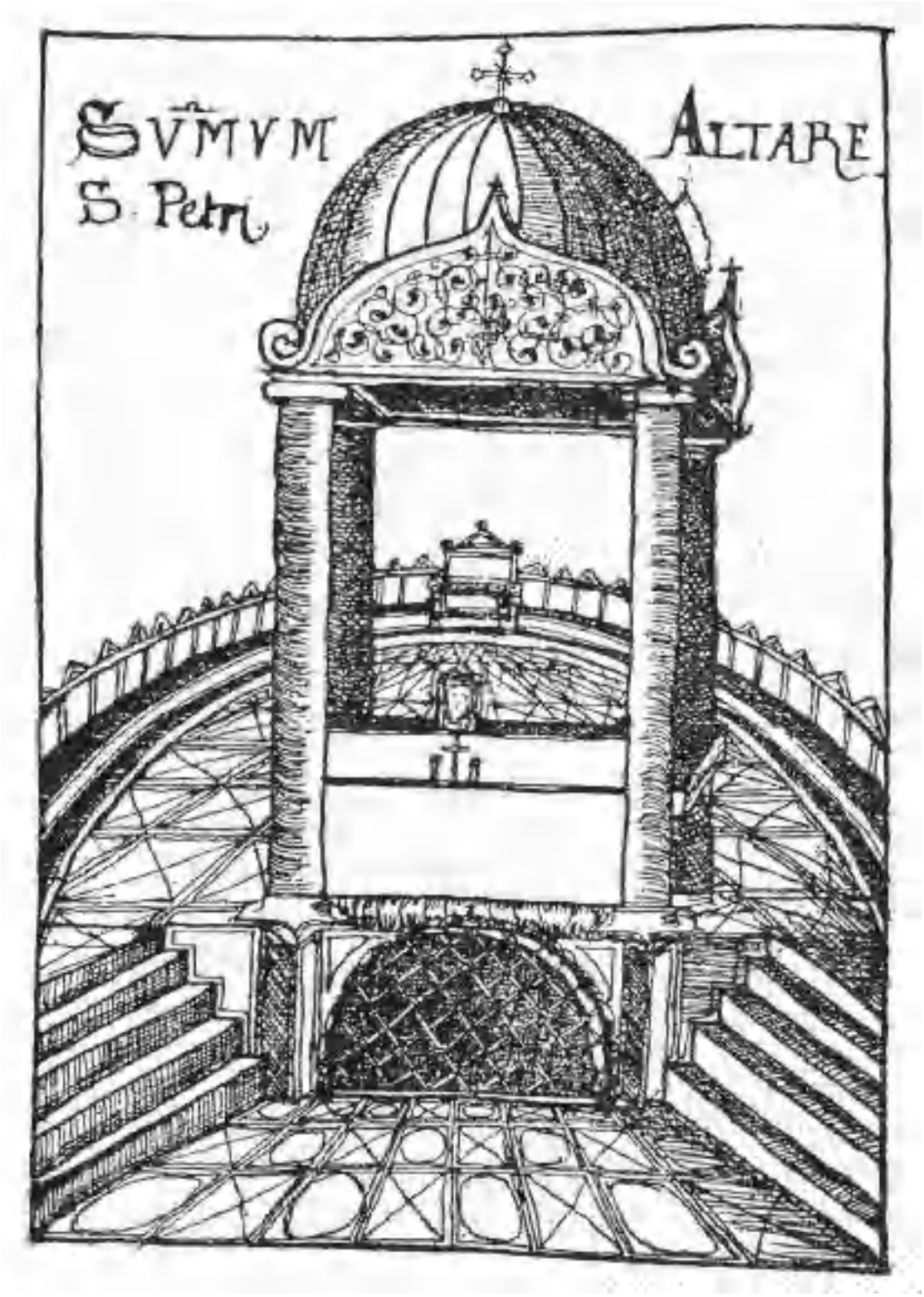


Figure 5.26

Liturgical order of the apsidal hemicycle in the ancient S. Peter's at the time of the pilgrimage

Sebastian Werro, 1581

Fribourg, Bibliothèque Cantonale et Universitaire

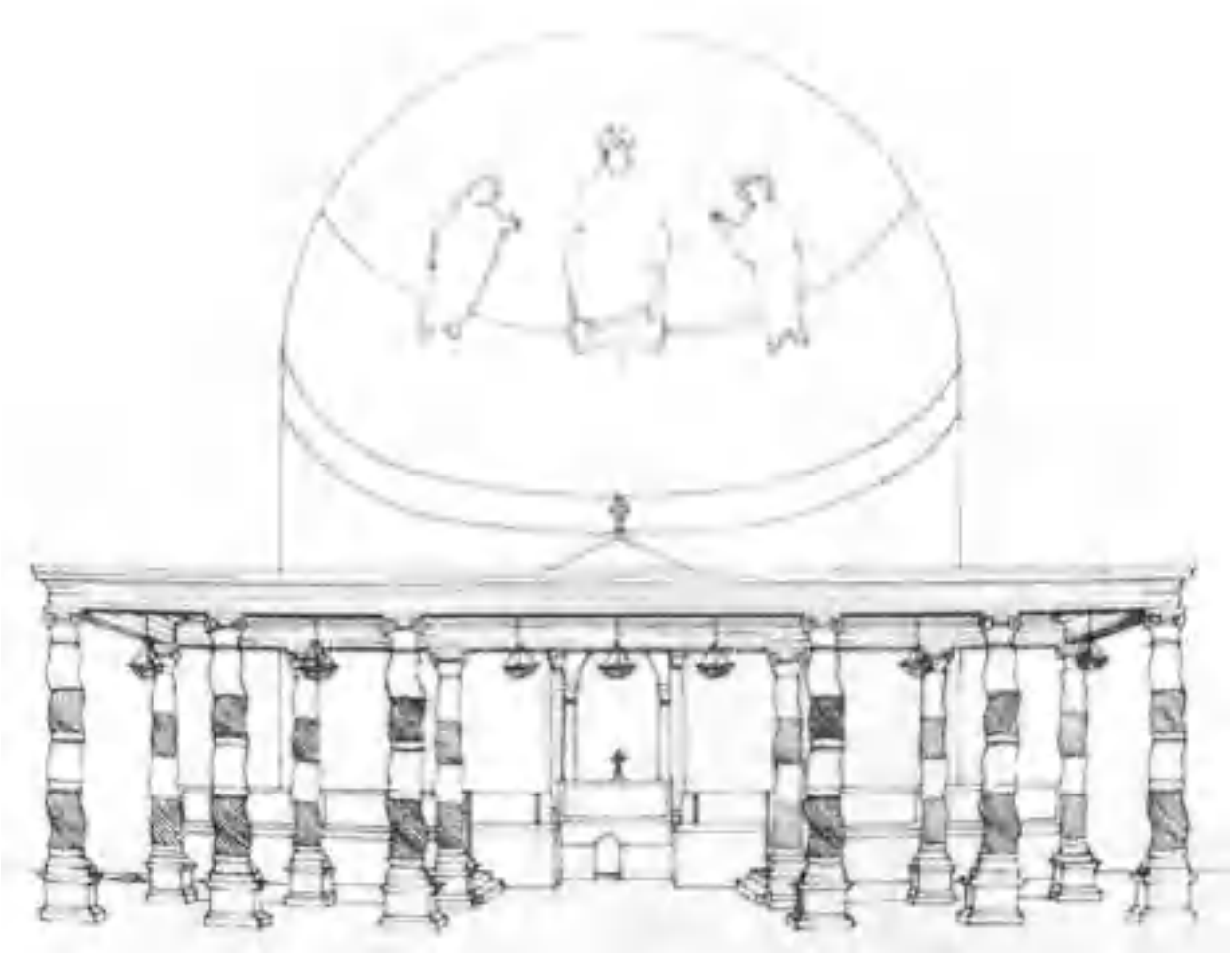


Figure 5.27

Reconstruction of the *pergula* of Gregorio III in front of the Confessione di San Peter

Giuseppe Tilia

P. Zander. *La Necropoli di San Pietro. Arte e Fede nei sotterranei della Basilica Vaticana.* Vatican City: Elio de Rosa Editore, Fabbrica di San Pietro in Vaticano 2014), p. 63

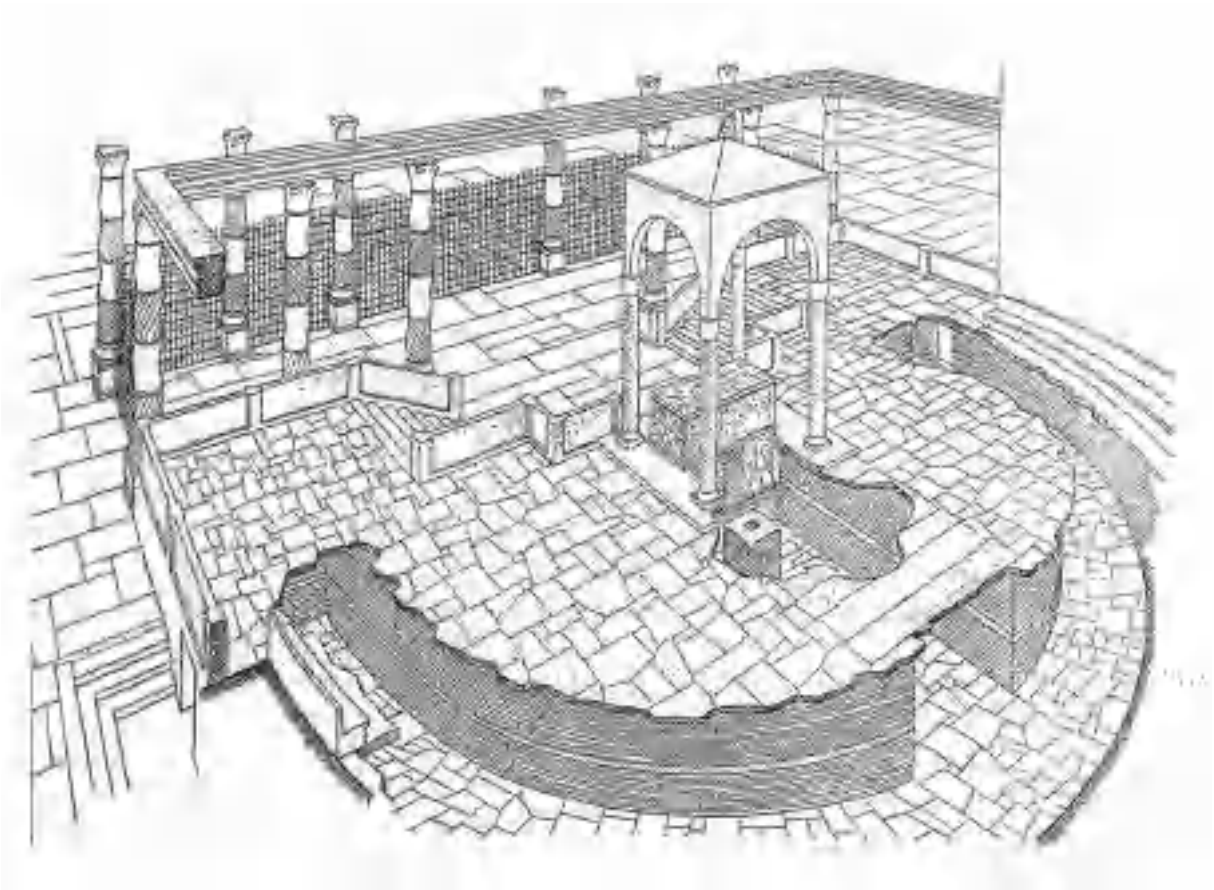


Figure 5.28

Reconstructive drawing of the raised presbytery at the time of Pope Gregorio Magno, with the crypt ("subterranea Confessio") connected to the Old Basilic by the semi-annular peribulum (from explorations in 1951). According to Apollonj Ghetti, Ferrua, Josi, Kirschbaum

Figure 5.29

Il cantharus of S. Peter in a drawing

Simone del Pollaiolo called the Cronaca, 1480

GDSU Santarelli, 157 v

Figure 5.30

Pen drawing depicting the facade of the Constantiniana Basilica before the reconstruction of Gregorio IX, last quarter of the 11th century. Windsor, Eton College, Cod. Farf. 124, f. 122r

Anonymous

Biblioteca di Archeologia e storia dell'arte, Rome; Rodolfo Lanciani Collection

Figure 5.31

The protiro with the bronze door and the marble San Peter

Giacomo Grimaldi, XVII century

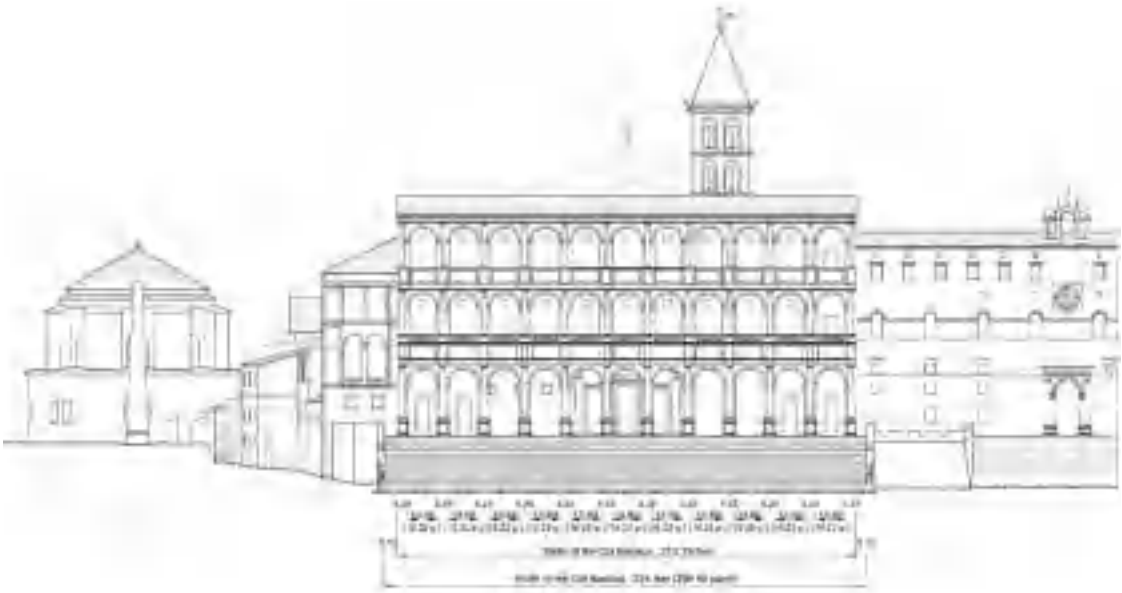
Biblioteca Apostolica Vaticana, Barb. Lat. 2733, f. 145r

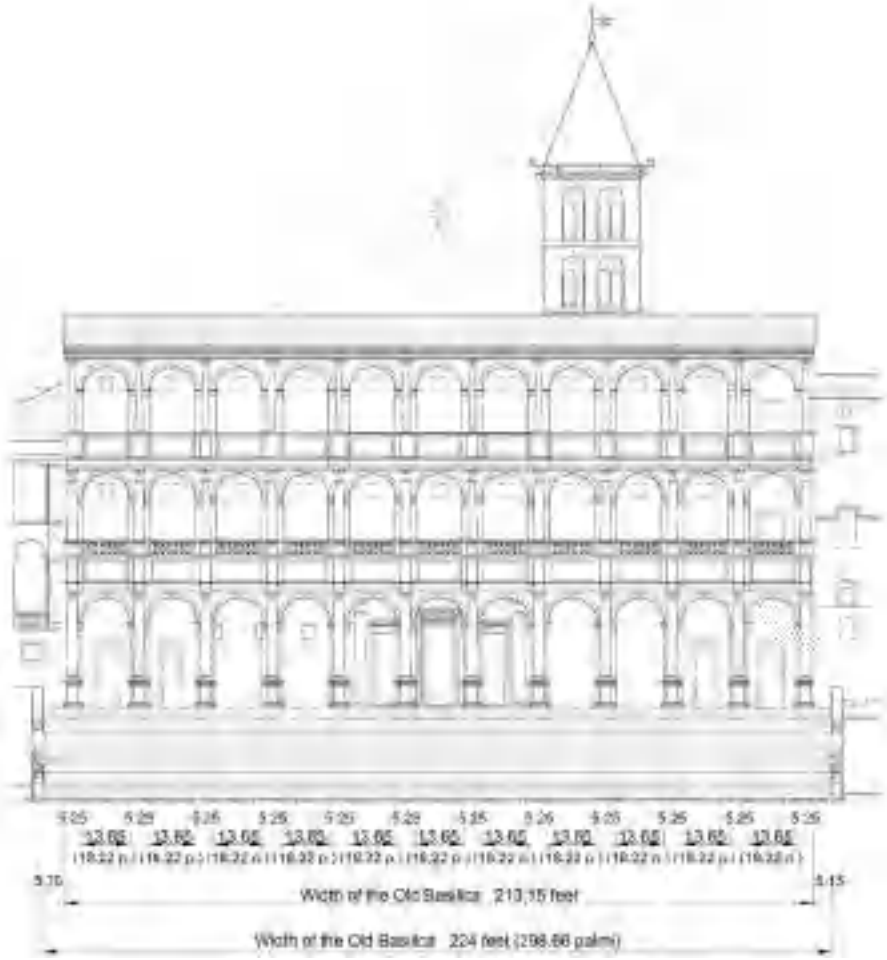
Figure 5.32

The front of Santa Maria in Turri and the access passages to the atrium of San Peter

Giacomo Grimaldi, XVII century

Biblioteca Apostolica Vaticana, Arch. Cap. S. Pietro, H. 2, f. 62r





Detail

Figure 5.33

Project by Franceso del Borgo for the lodge of Blessings of Pope Pius II (1458-1464)

Drawing by Luis de Garrido, 2020

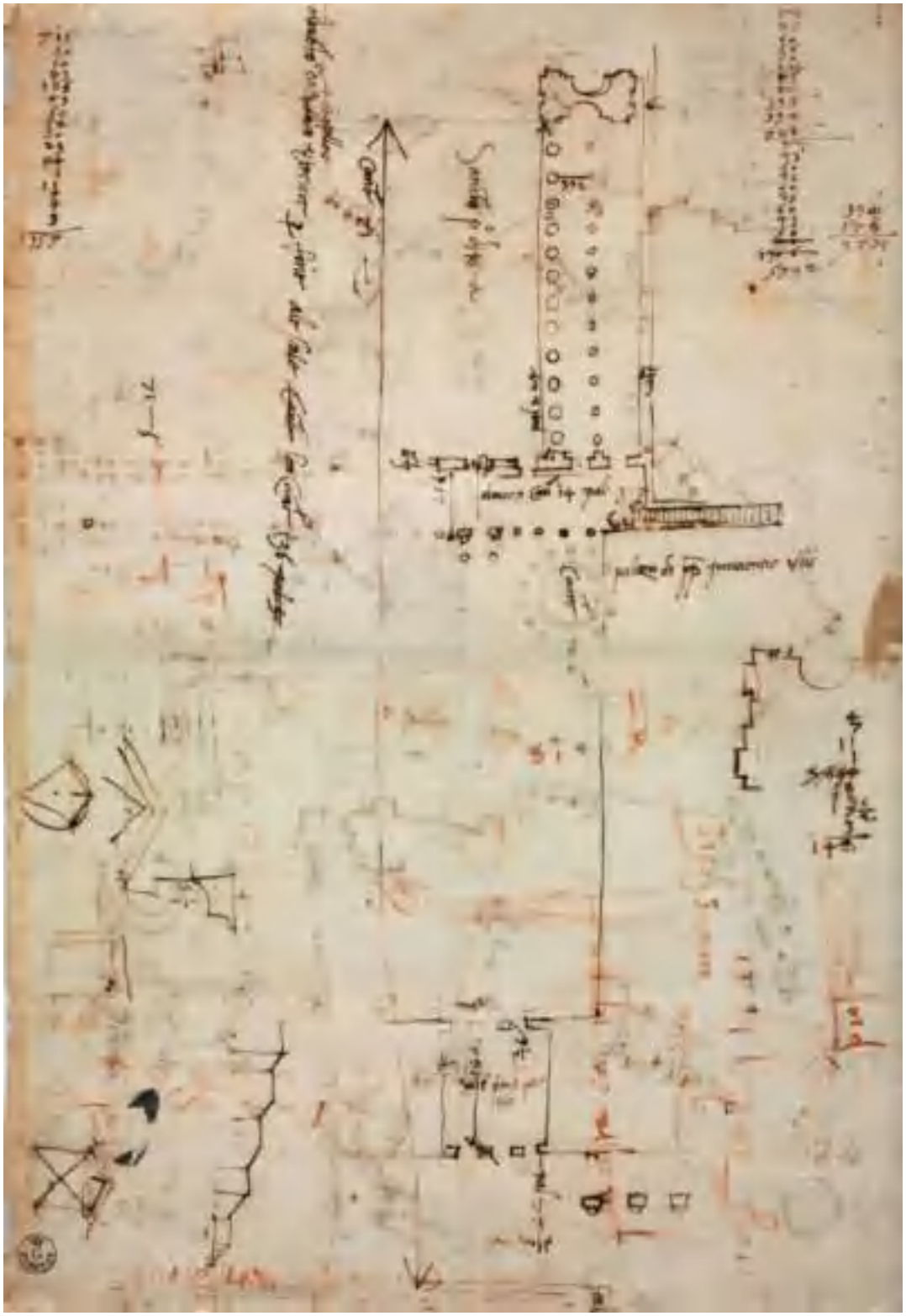


Figure 5.34

Sketch of a floorplan for S. Peter in Rome

Baldasarre Peruzzi, 1520-1521, (made in 1518 according to Luis de Garrido)

GDSU 11 Ar

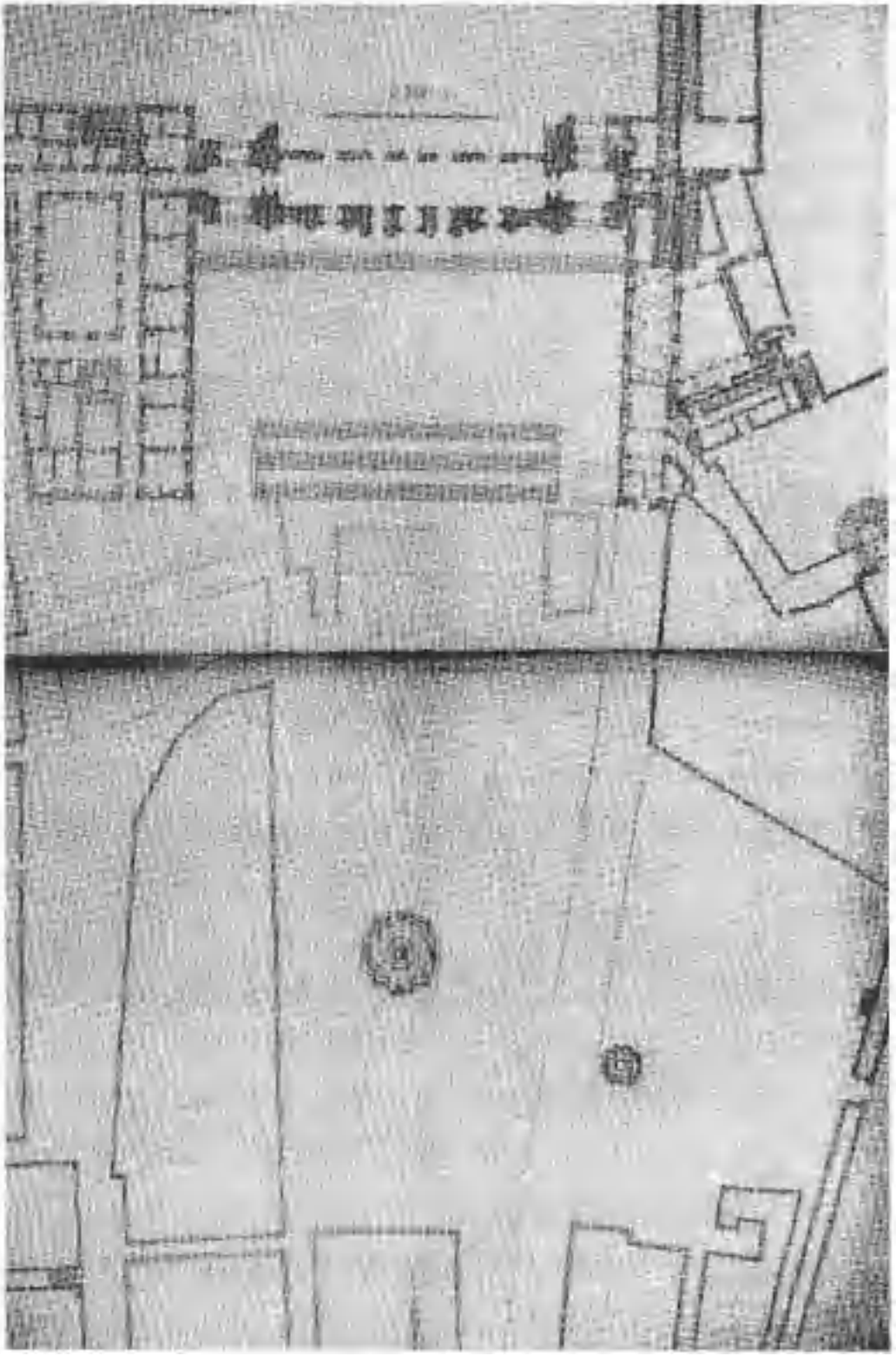


Figure 5.35

Project for St. Peter´s square

Carlo Maderno

GDSU 263 A

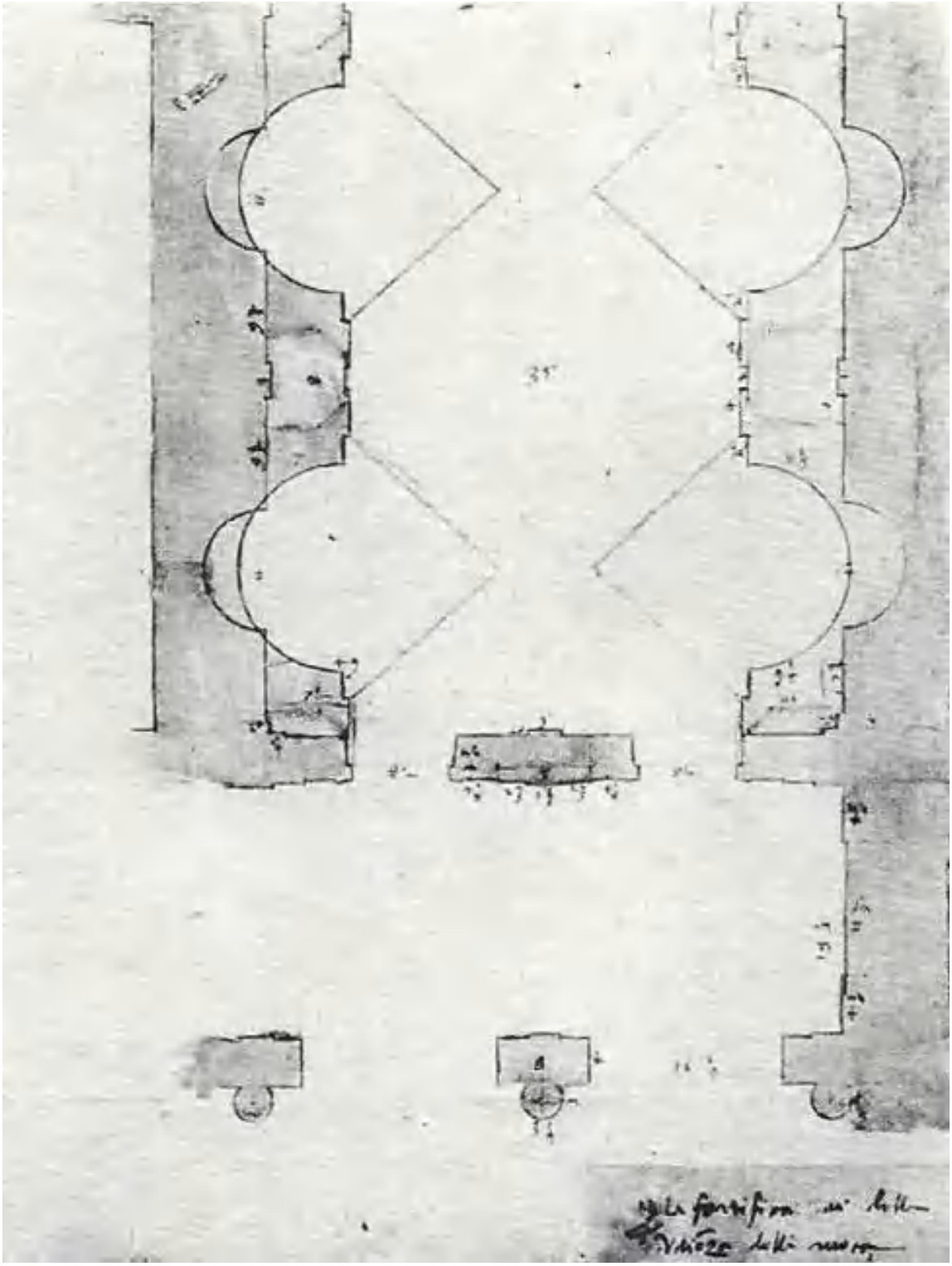


Figure 5.36

Project for the renovation of the Sacra Rota in the Palazzo di Innocenzo VIII

Antonio da Sangallo

GDSU 787 Ar

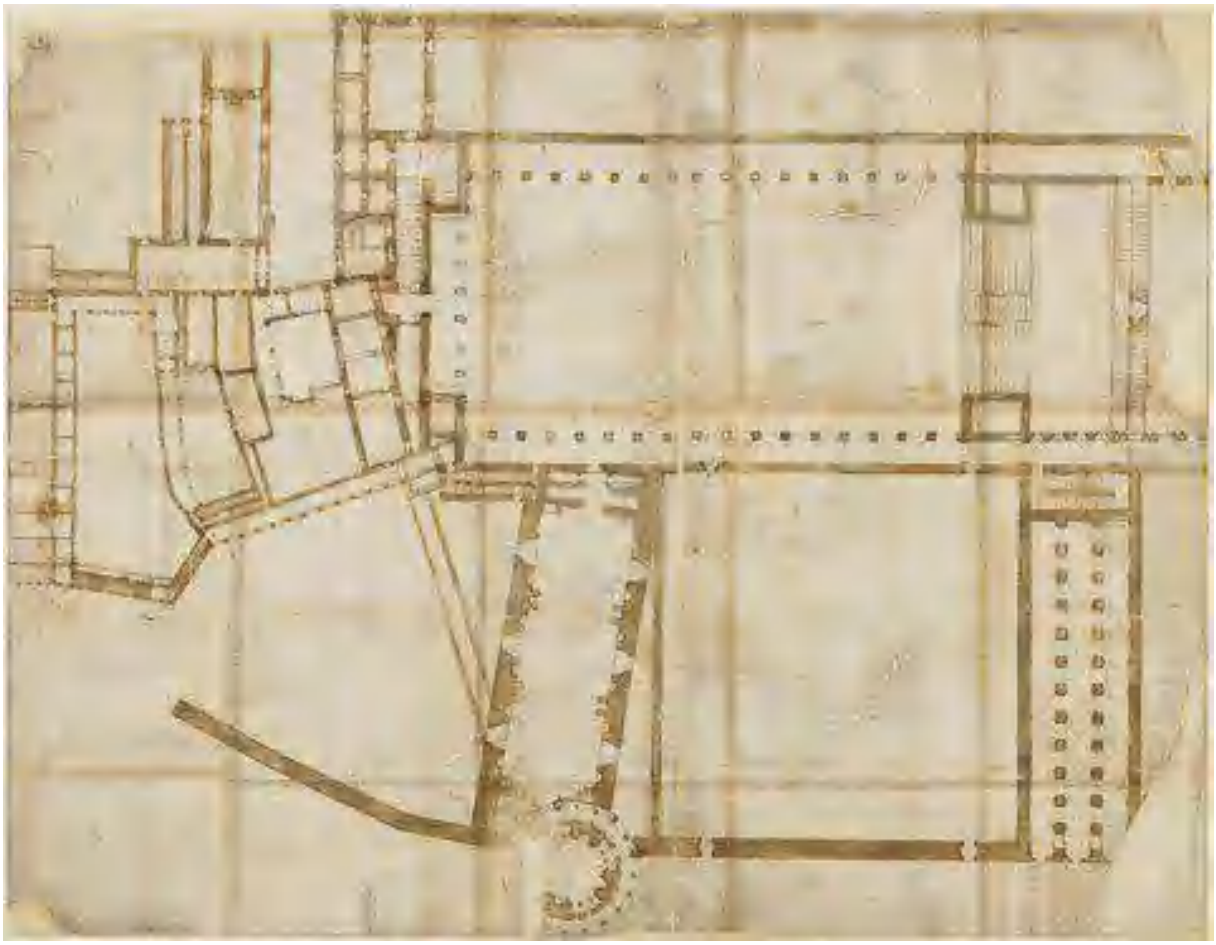


Figure 5.37

Floor plan of the Vatican Palace, Rome

Bramante Donato

GDSU 287 Ar

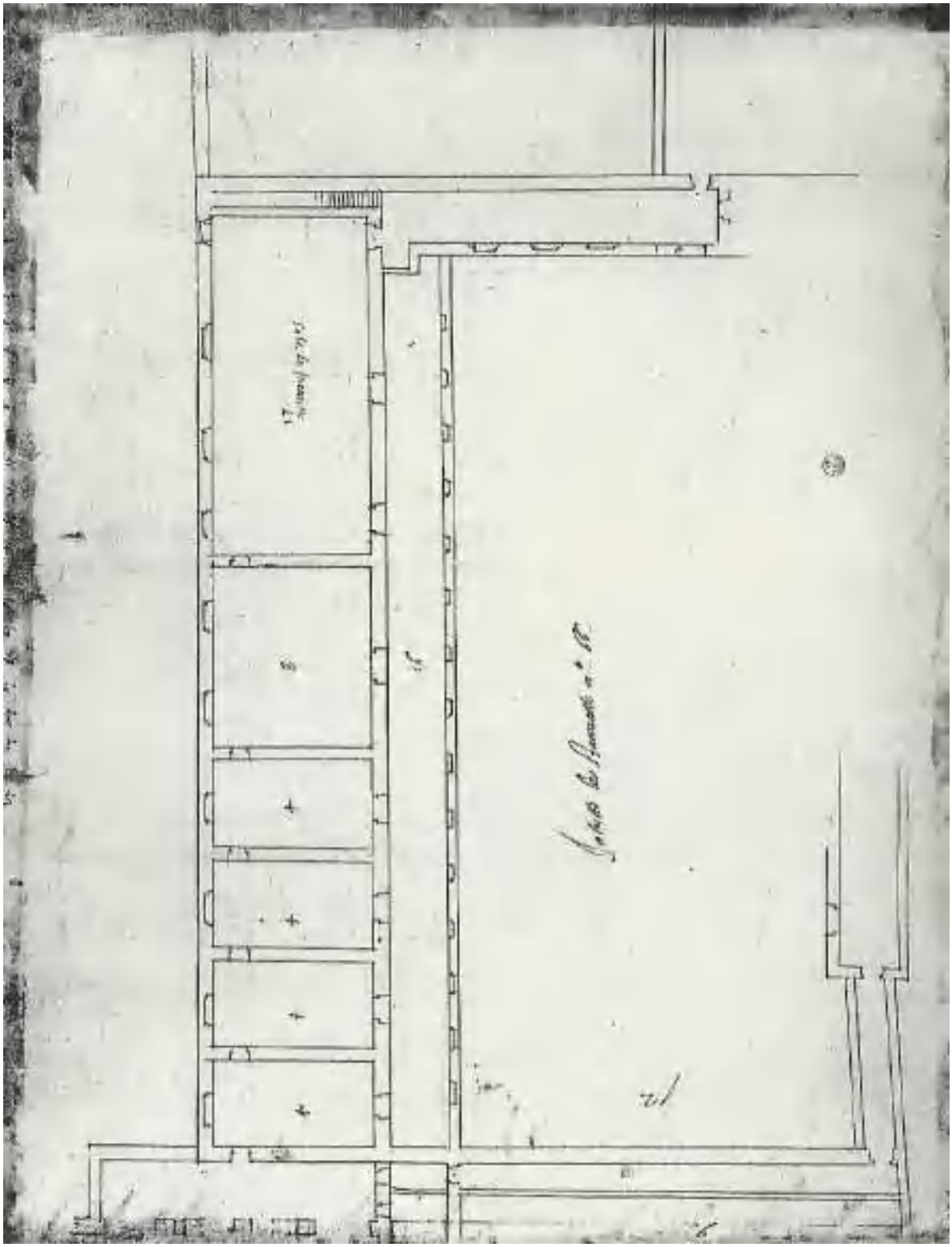


Figure 5.38

Plan of the upper floor of the Palazzo di Innocenzo VIII

Anonymous, 15th century

GDSU 4170 Ar

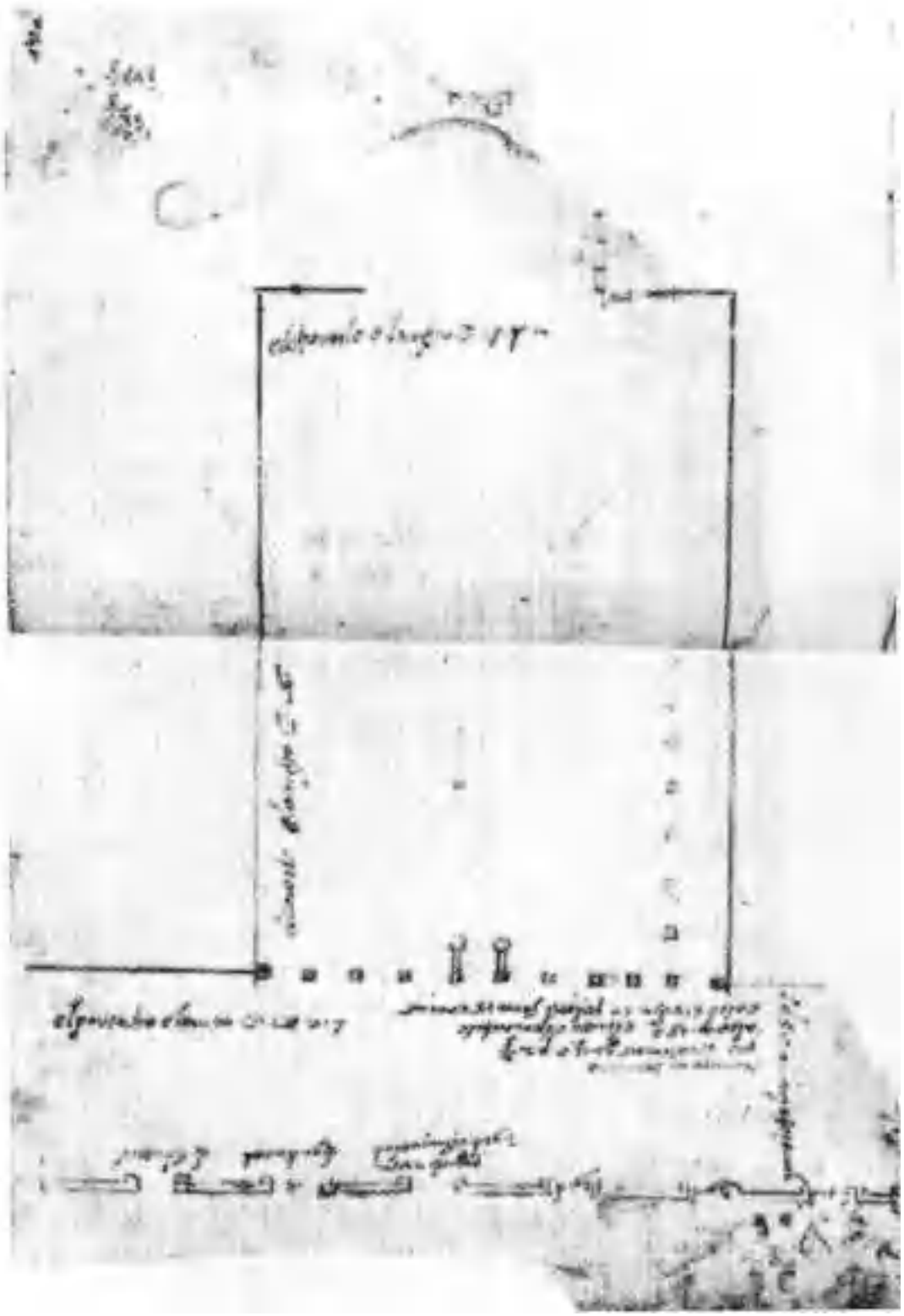


Figure 5.39

Plan of the atrium of St. Peter

Anonymous, 16th century

Vienna, Österreichische Staatsbibliothek

Detail

Figure 5.40

Drawing of the pontiff's blessing in the piazza of S. Peter

Giovanni Ambrogio Brambilla and Claudio Duchetti, late 16th century

The Metropolitan Museum of Art, cod. 41.72(3.69)

Figure 5.41

View of St. Peter's square

Anonymous, 15th century

Zurich, Schraft collection

Figure 5.42

View of St. Peter's square, (by Ehrle-Egger)

Anonymous, 15th century

Frommel, Cristoph Luitpold. *Architettura e Commitenza da Alberti a Bramante*

Editorial Leo S. Olschki Editore (2006), p. 122

Detail

Figure 5.43

Accordi nuziali di Gaspard de coligny davanti alla loggia delle benedizioni. Detail with the view of the Blessing Loggia. Fresco

Giovanni Maria Zoppelli, 1565-1567

Palazzo Vaticano, Sala Regia

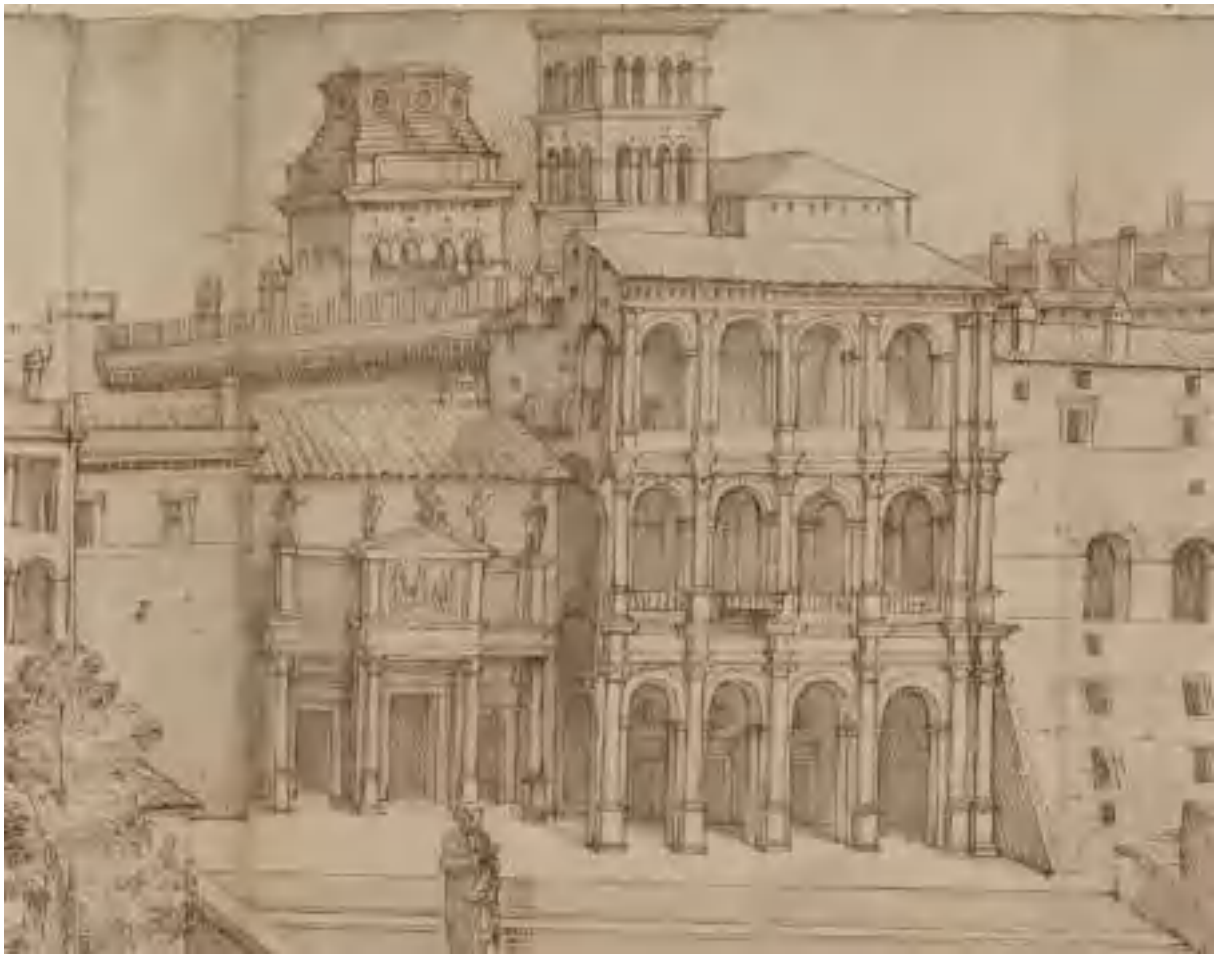
Detail

Figure 5.44

San Peter's square with the statue of Marco Aurelio

Maarten van Heemskerck, 1532-1536

Staatliche Museen zu Berlin, Kupferstichkabinett, nro. 79 D 2 a, f. 53 recto



Detail

Figure 5.45

San Peter from borgo Santo Spirito, with the Sangallesco shipyard, early 1545. The drawing combines studies of the basilica with various architectural projects that were planned but never built, such as the tower at left

Anonymous (Flemish?), 1550-1560

The Courtauld Institute of Art, cod. D.1984.AB.83

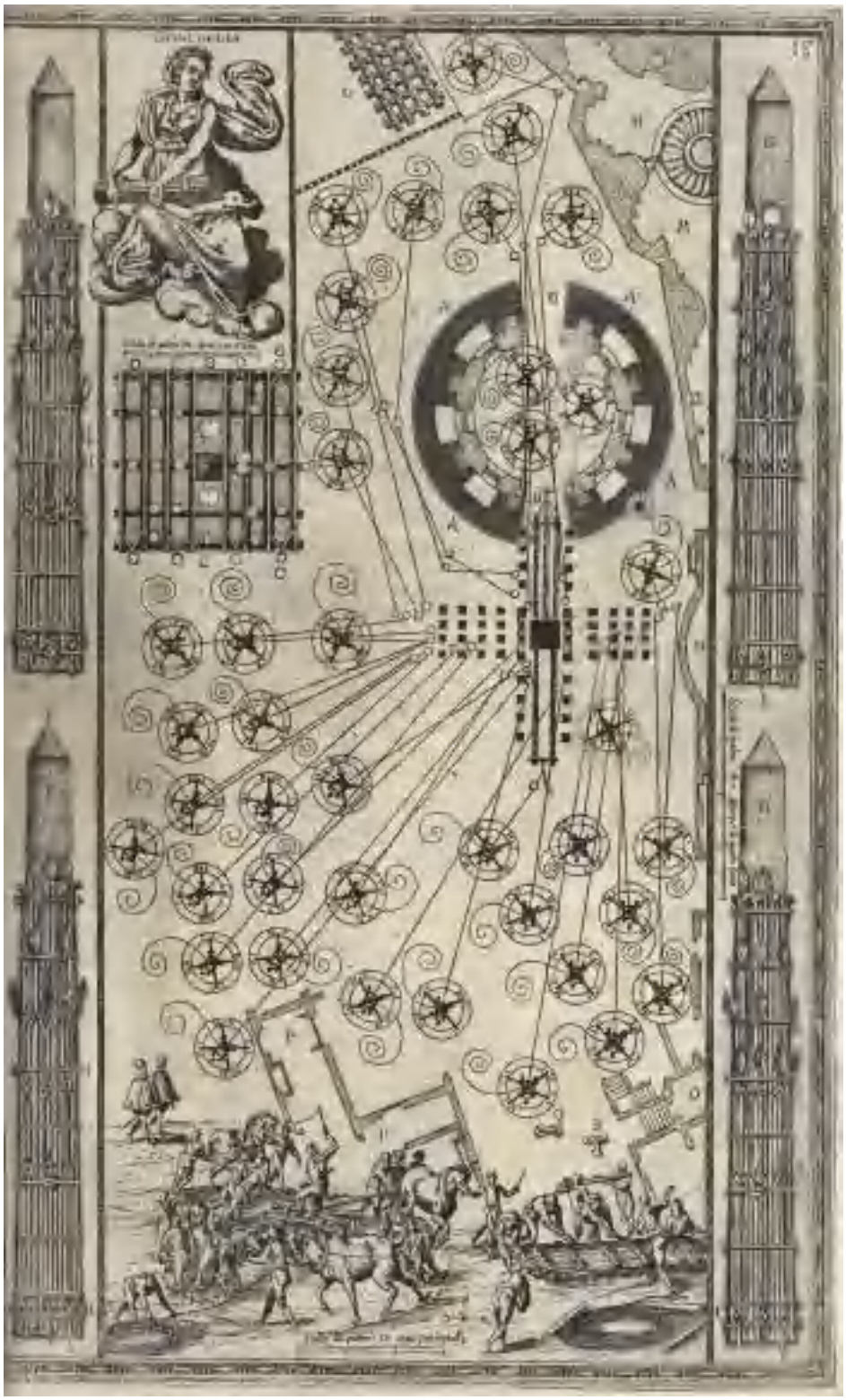
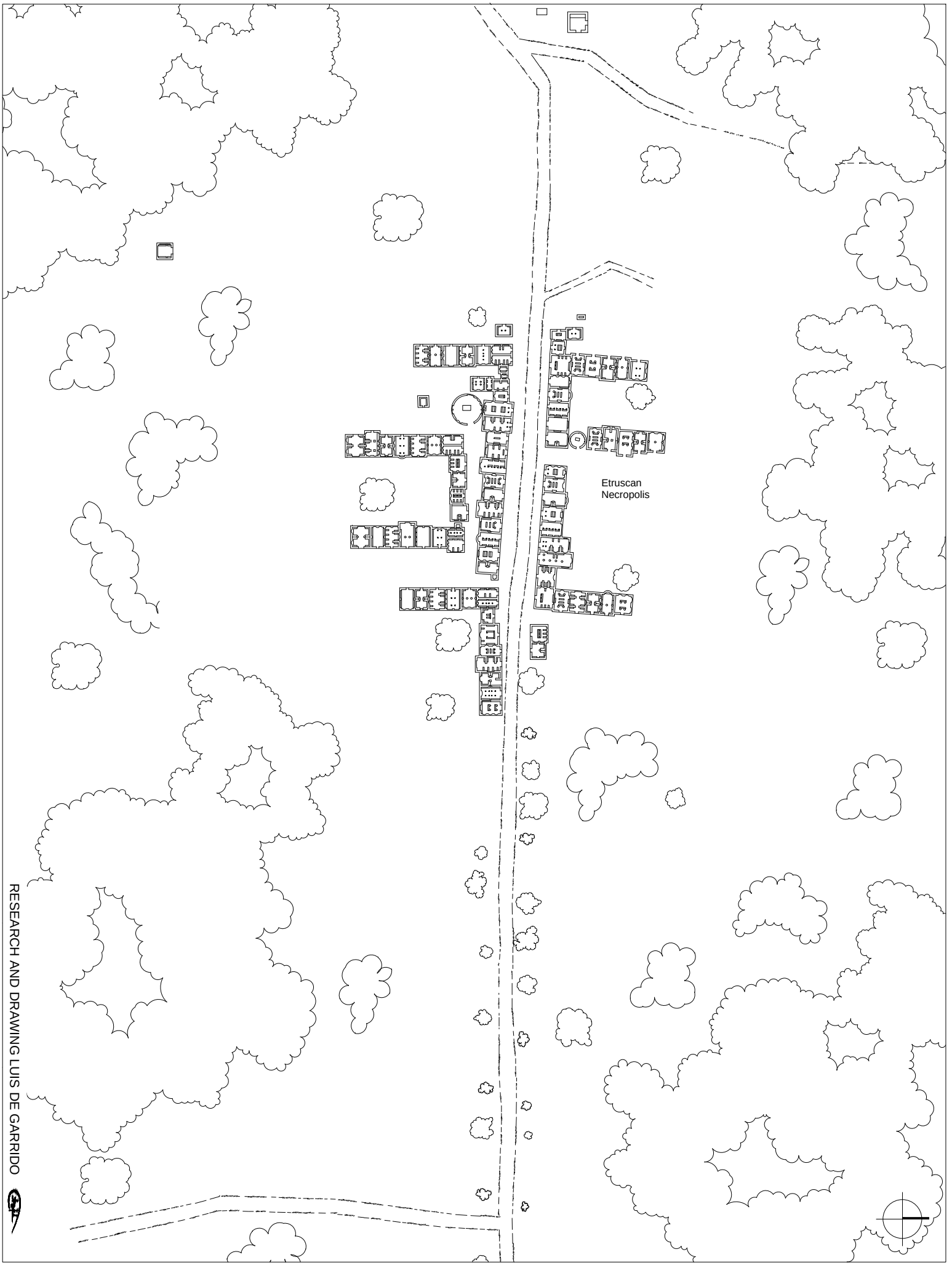


Figure 5.46

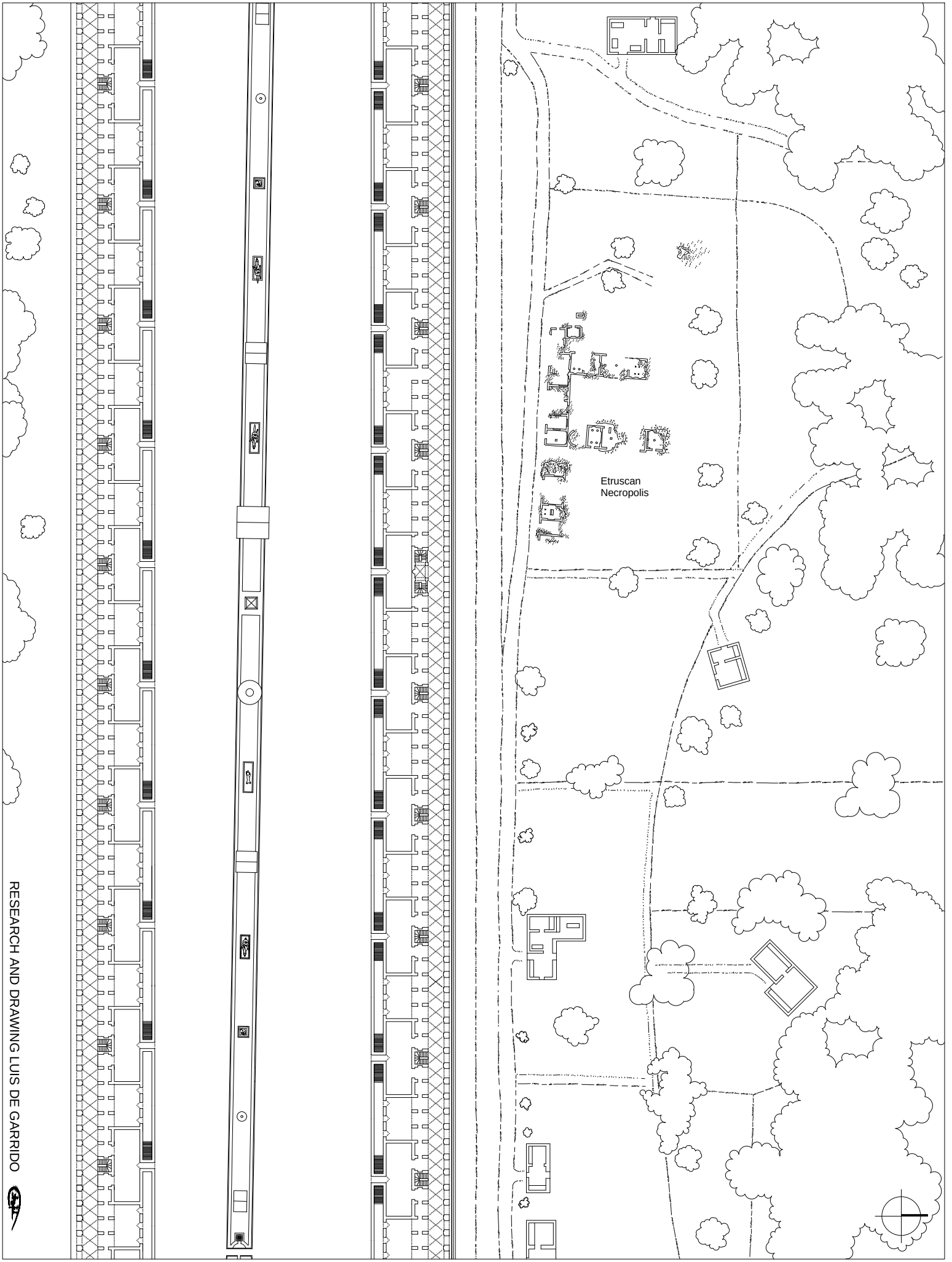
Domenico Fontana, 1590

Fontana, Domenico. *Della trasportatione dell'obelisco vaticano et delle fabriche di nostro signore Papa Sisto V*, libro primo. Engraver Natale Bonifacio. Roma (1590), f. 15 recto

LAYOUTS 5

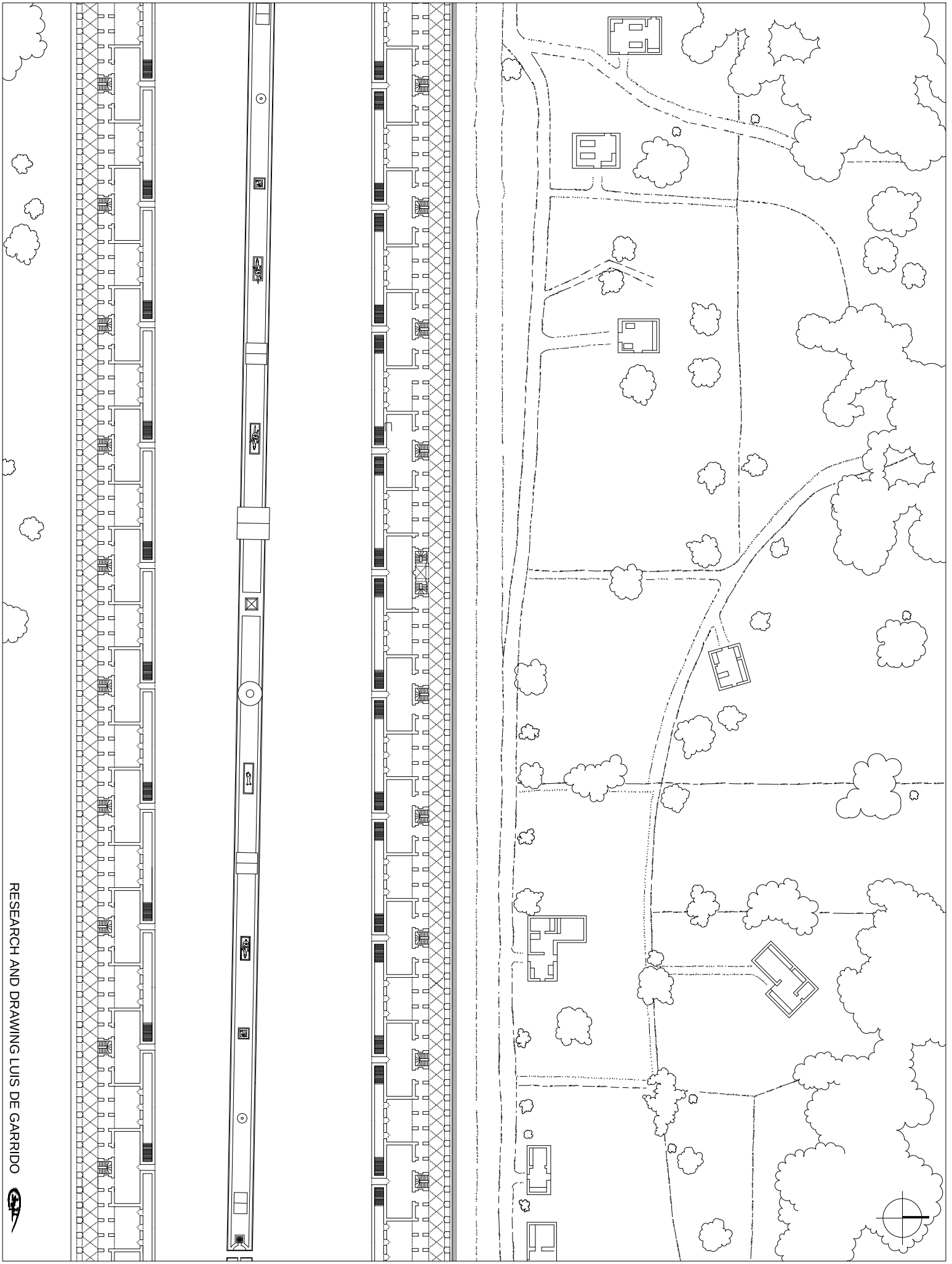


100 BC	ETRUSCAN NECROPOLIS	OSP	CP1

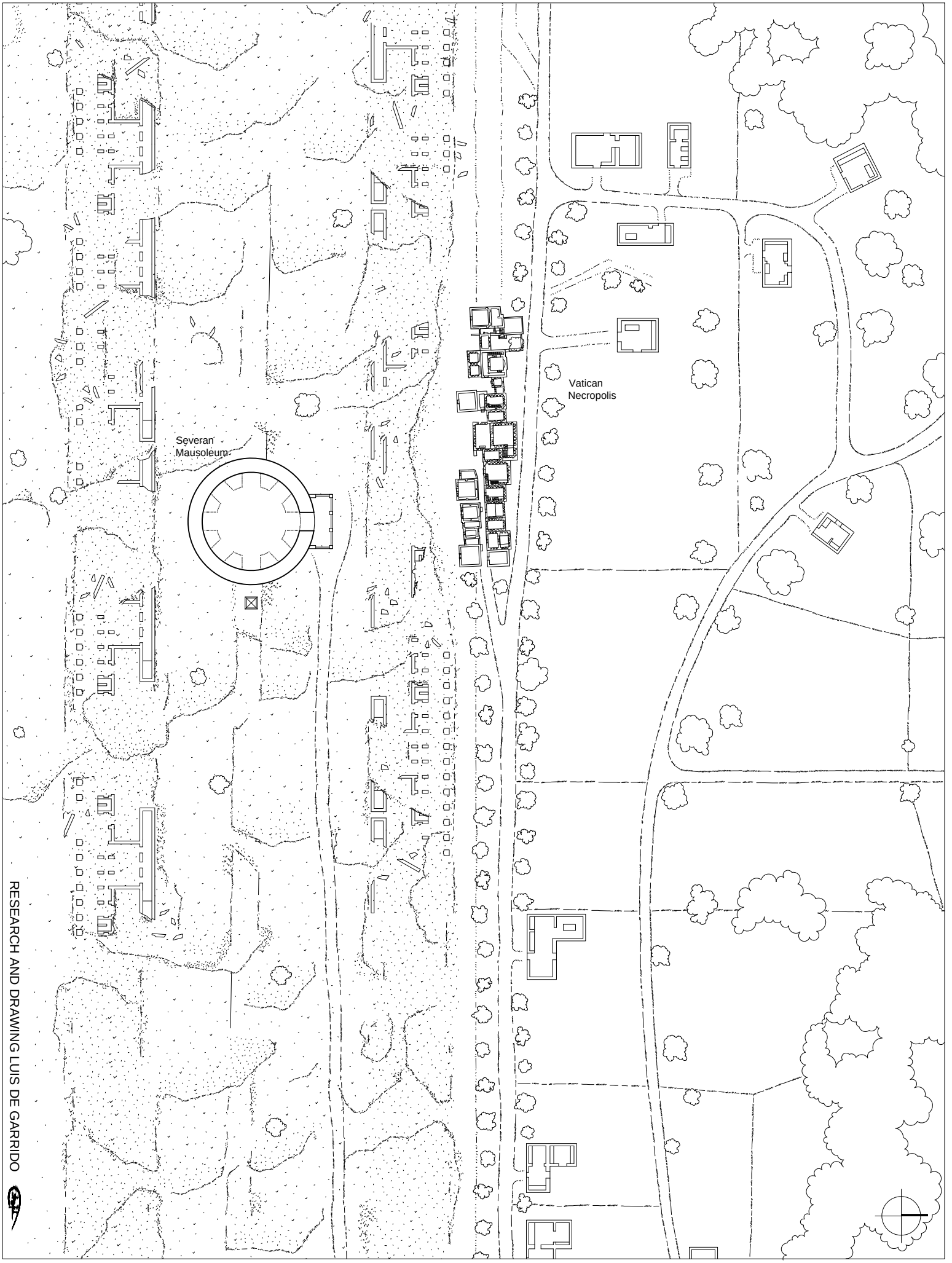


RESEARCH AND DRAWING LUIS DE GARRIDO

37 A.C	CONSTRUCTION OF THE CALIGULA CIRCUS	OSP	CP2

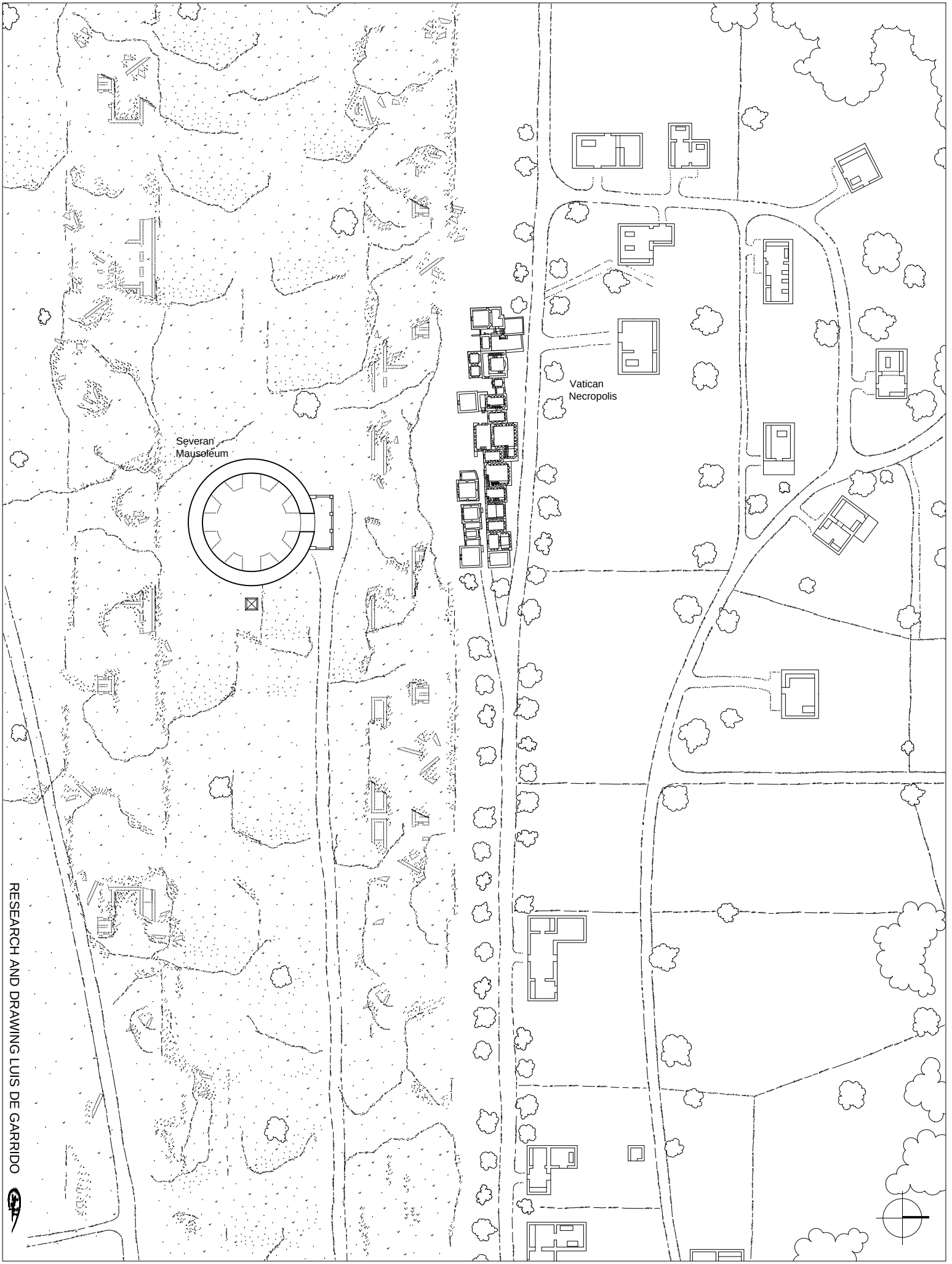


138 A.C	HYGINUS (136 - 142). ROAD CONSOLIDATION	OSP	CP3

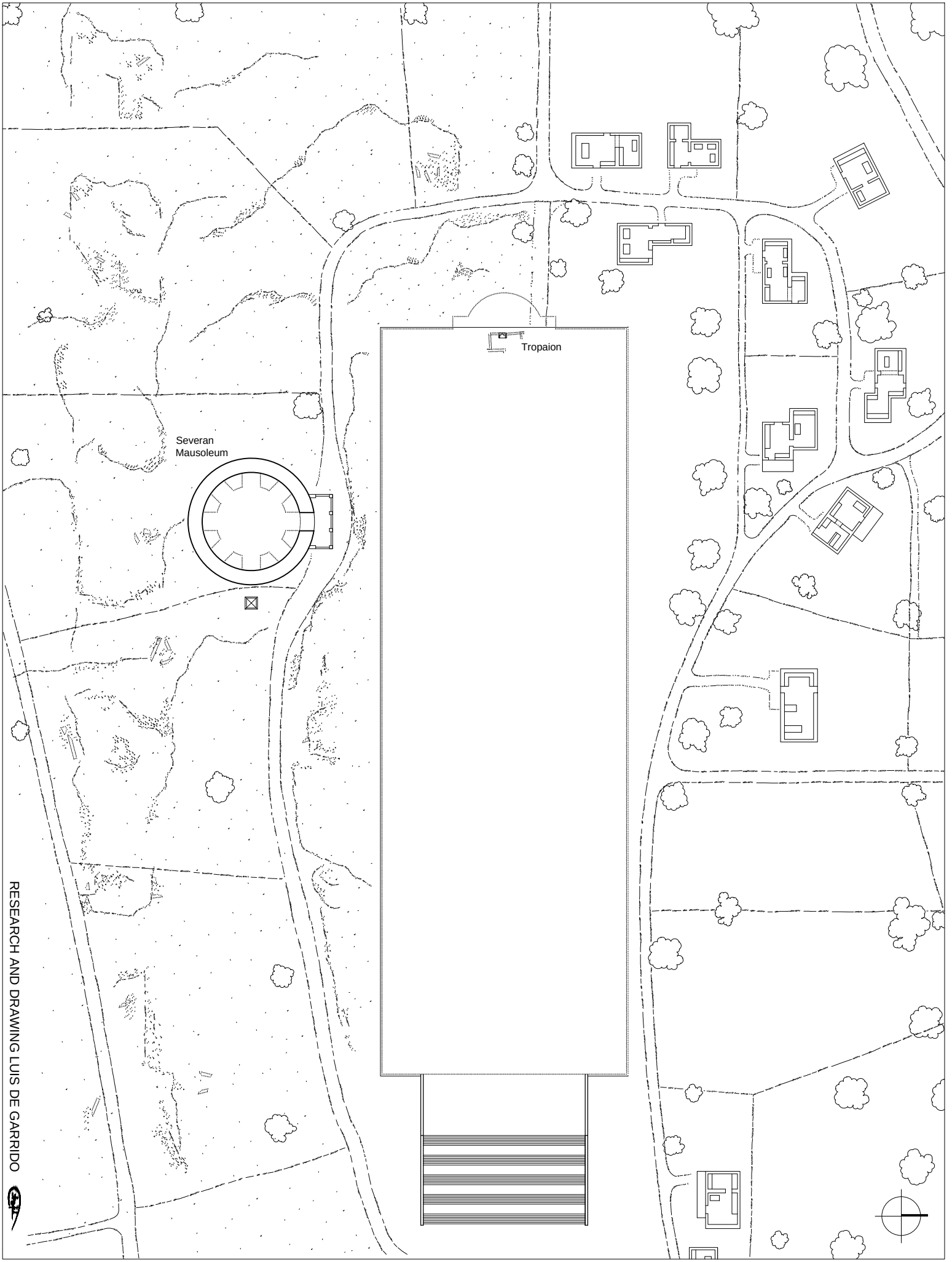


RESEARCH AND DRAWING LUIS DE GARRIDO

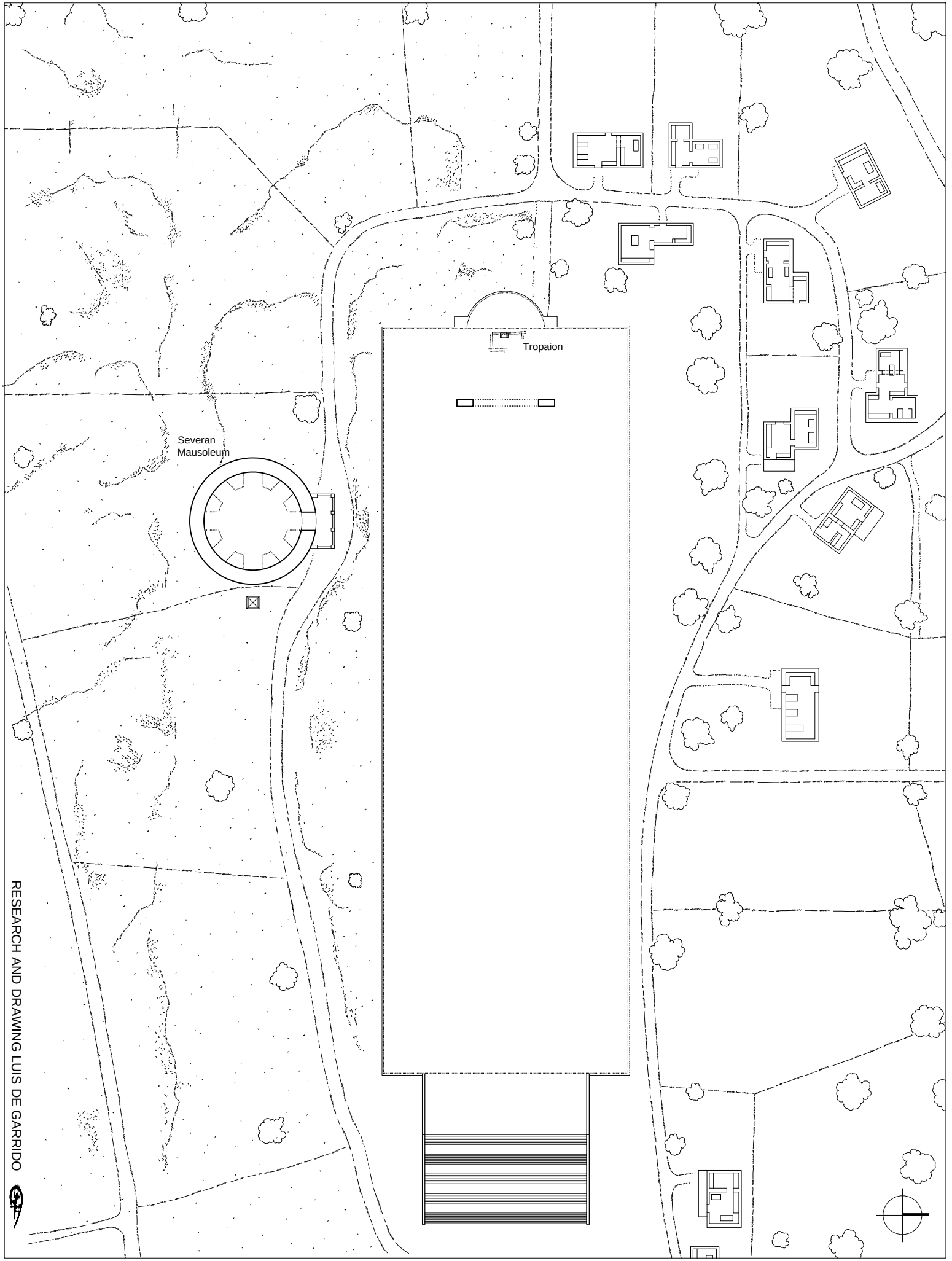
217 A.C	ZEPHYRINUS (199-217). VATICAN NECROPOLIS AND SEVERAN MAUSOLEUM	OSP	CP4



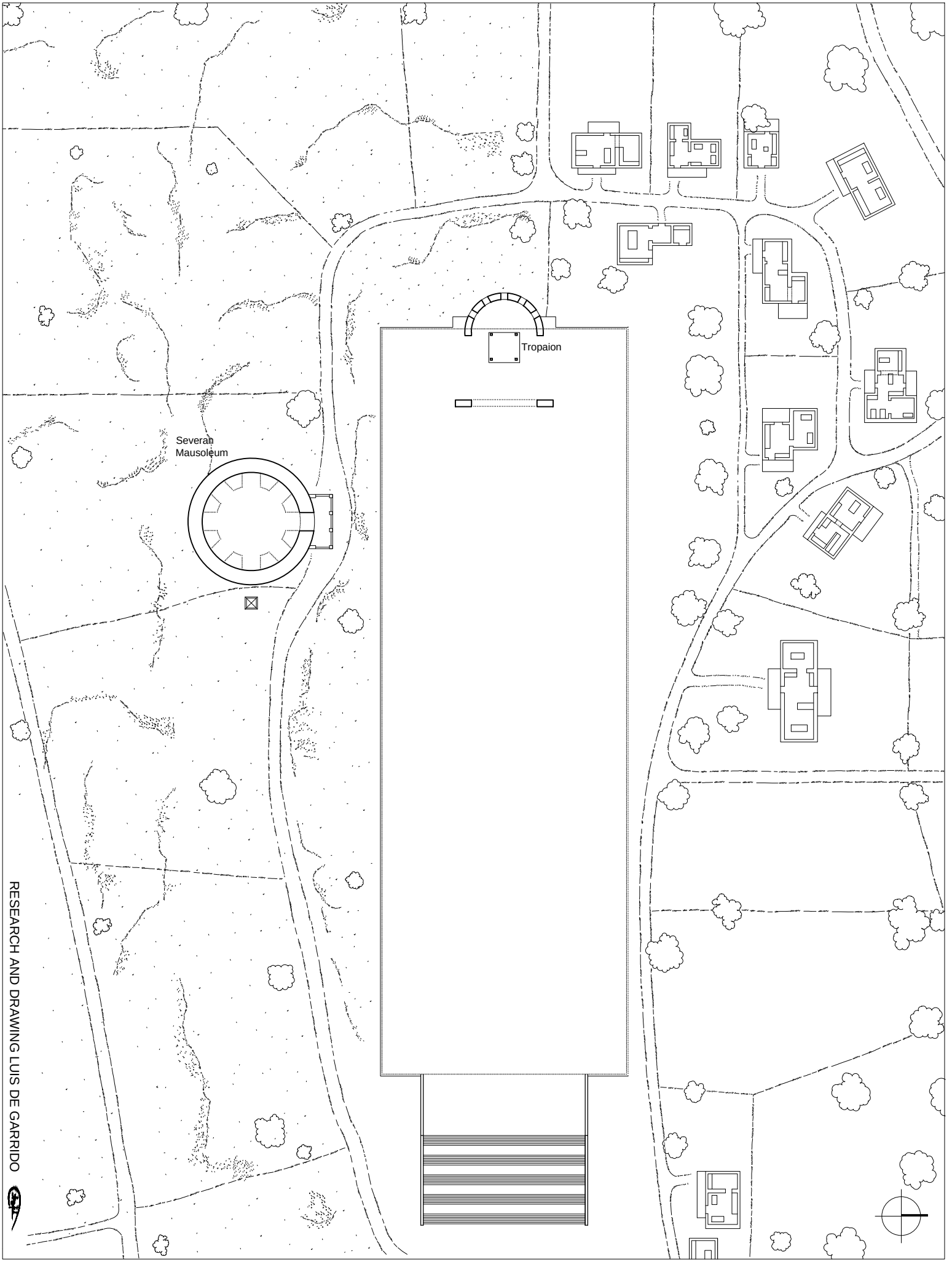
296 A.C	CAIUS (283-296). TROPAION REFORM	OSP	CP5



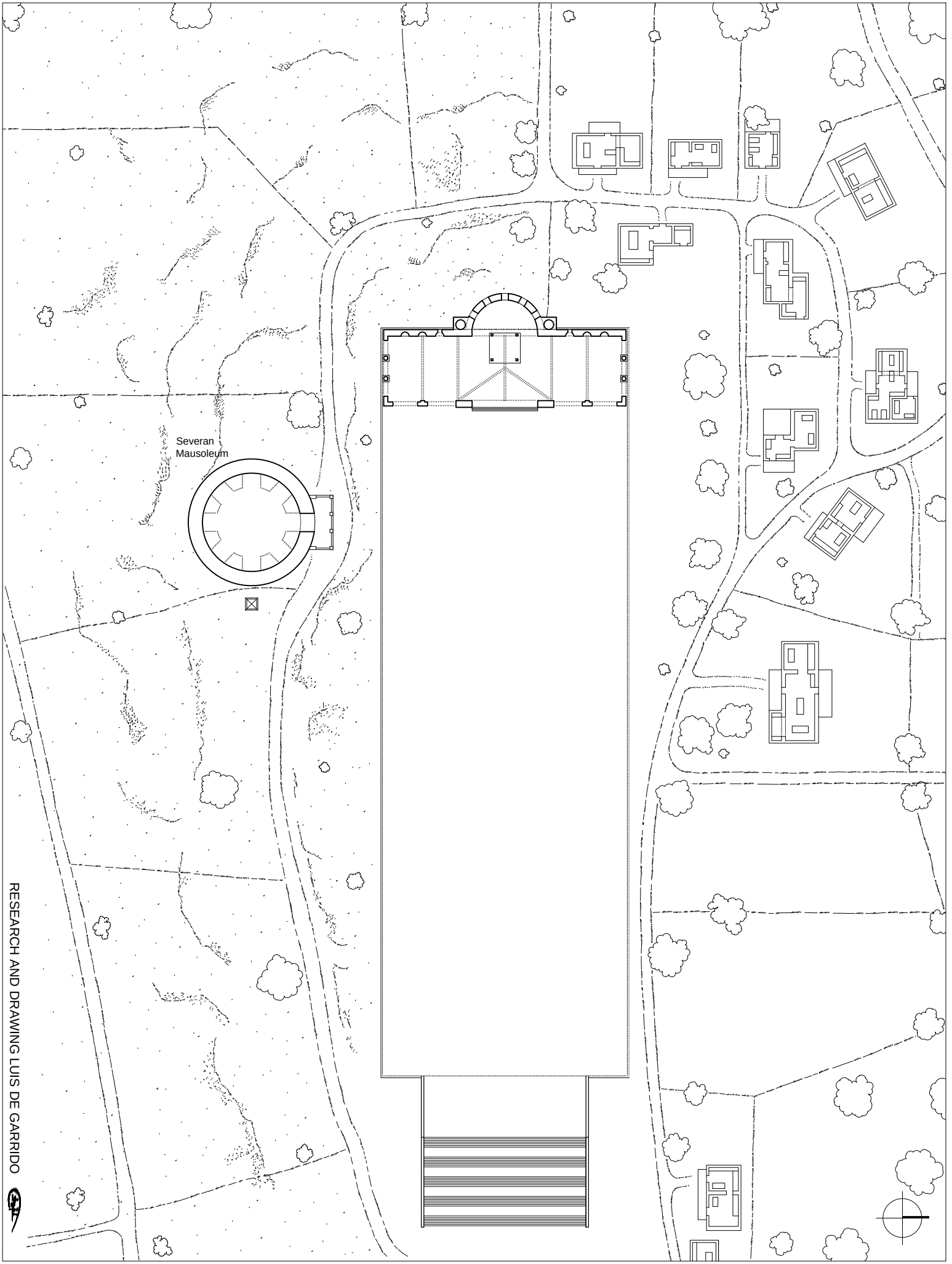
324 A.C	SYLVESTER I (314-335). CONSTRUCTION OF PLATFORM	OSP	CP6



325 A.C	SYLVESTER I (314-335). CONSTRUCTION OF CONSTANTINE ARCH	OSP	CP7

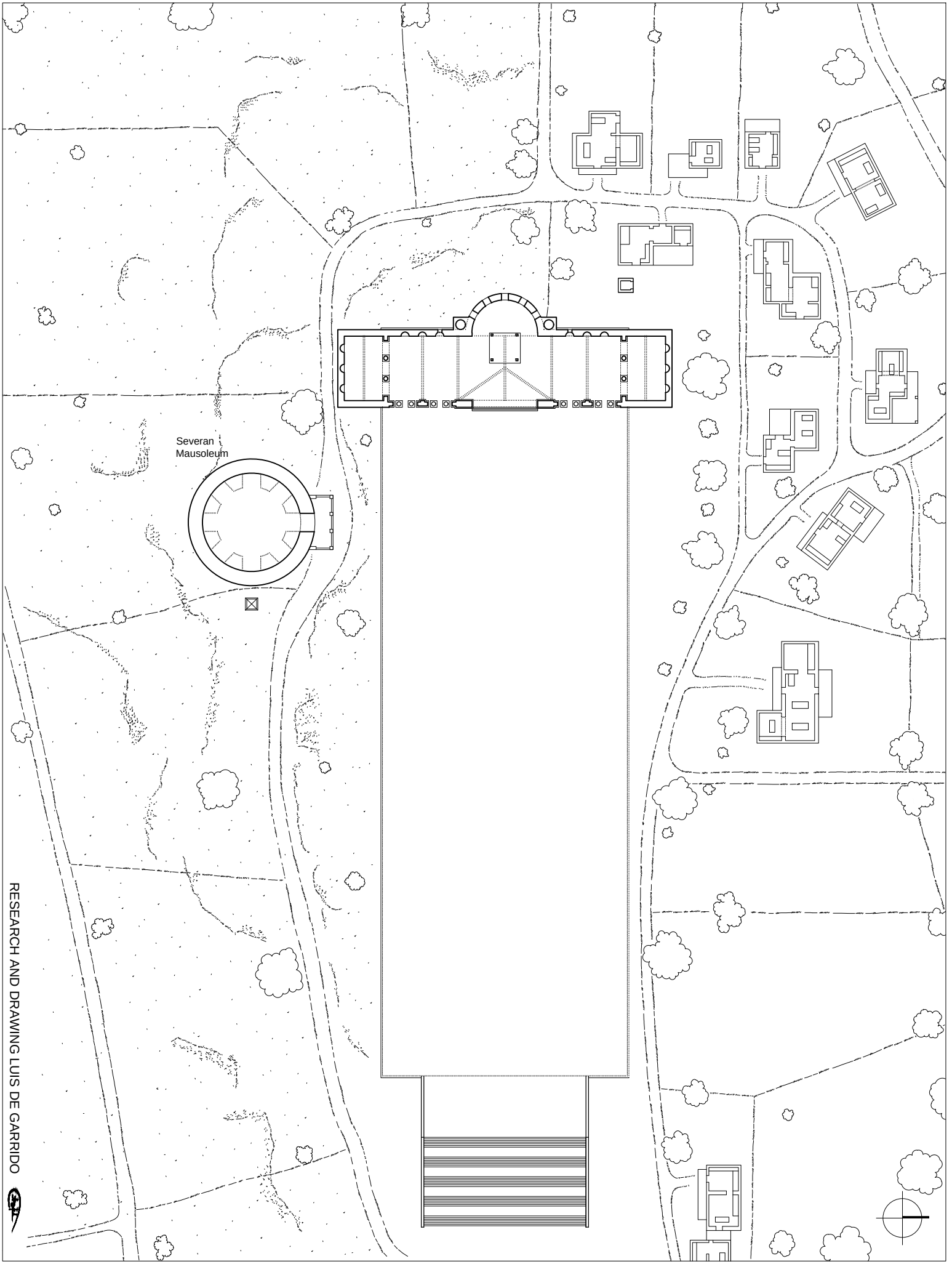


340 A.C	JULIUS I (337-352). CONSTRUCTION OF APSE	OSP	CP8



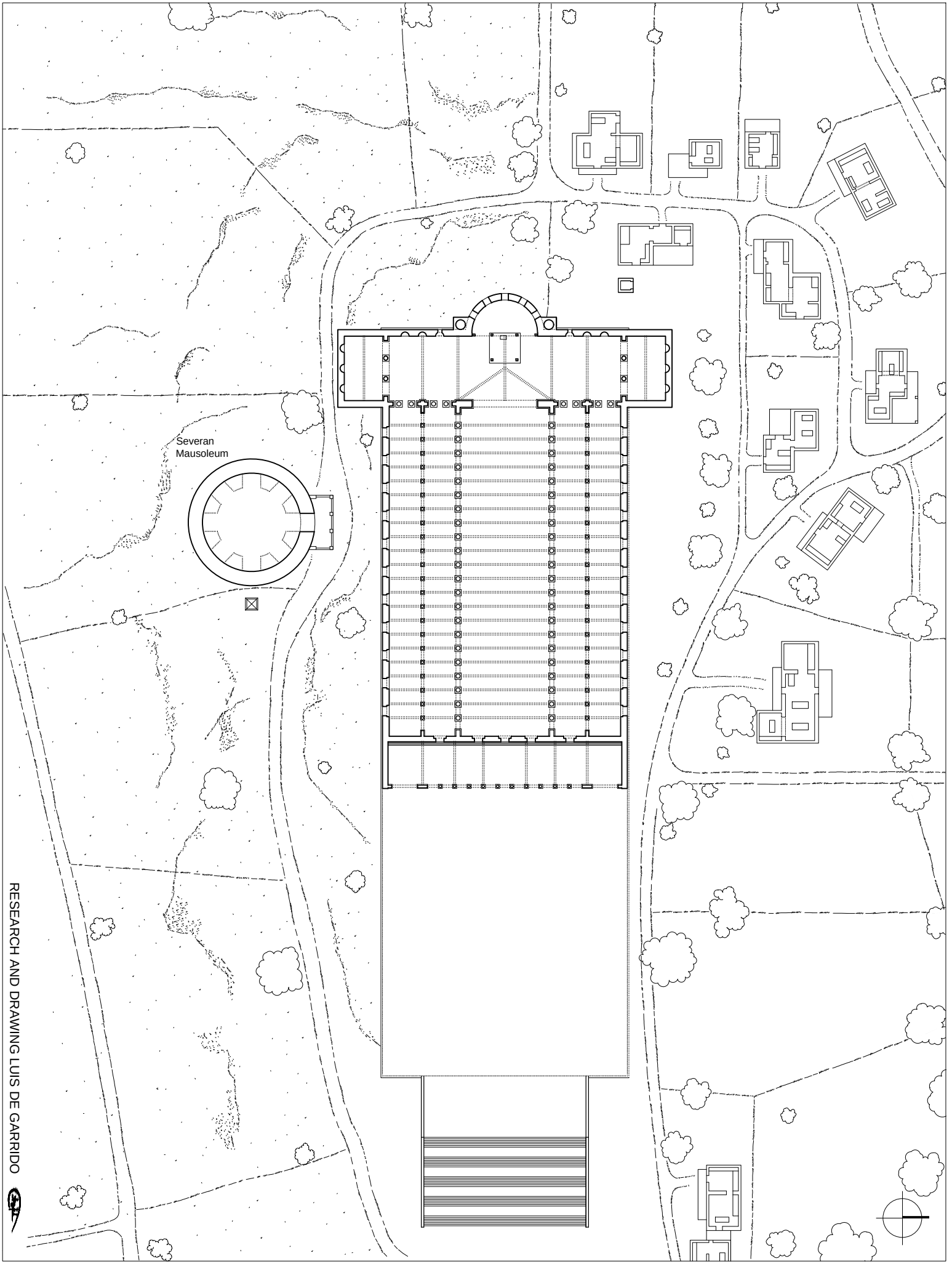
RESEARCH AND DRAWING LUIS DE GARRIDO

345 A.C	JULIUS I (337-352). CONSTRUCTION OF TRANSEPT	OSP	CP9



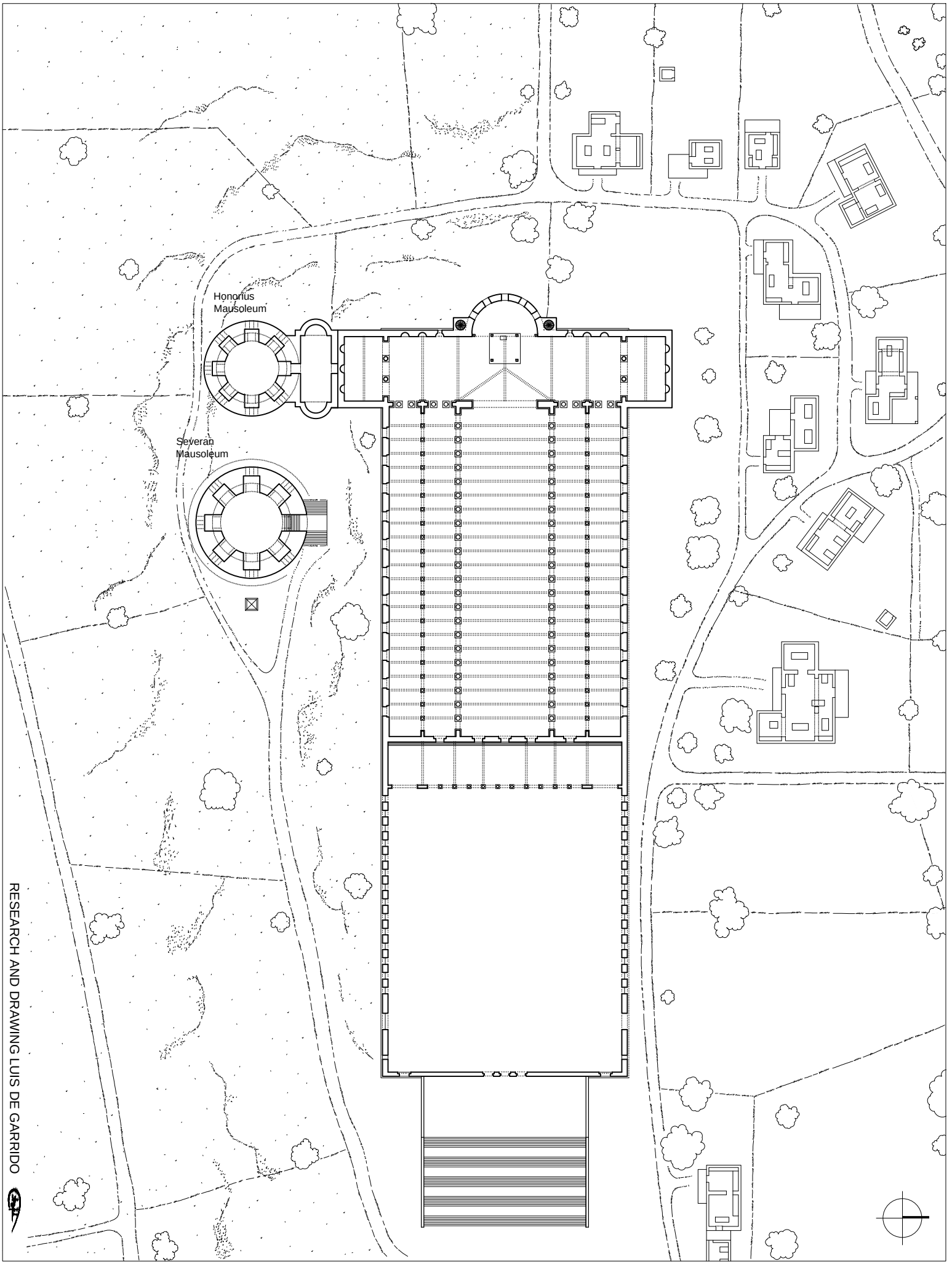
RESEARCH AND DRAWING LUIS DE GARRIDO

350 A.C	JULIUS I (337-352). CONSTRUCTION OF EXEDRAS	OSP	CP10

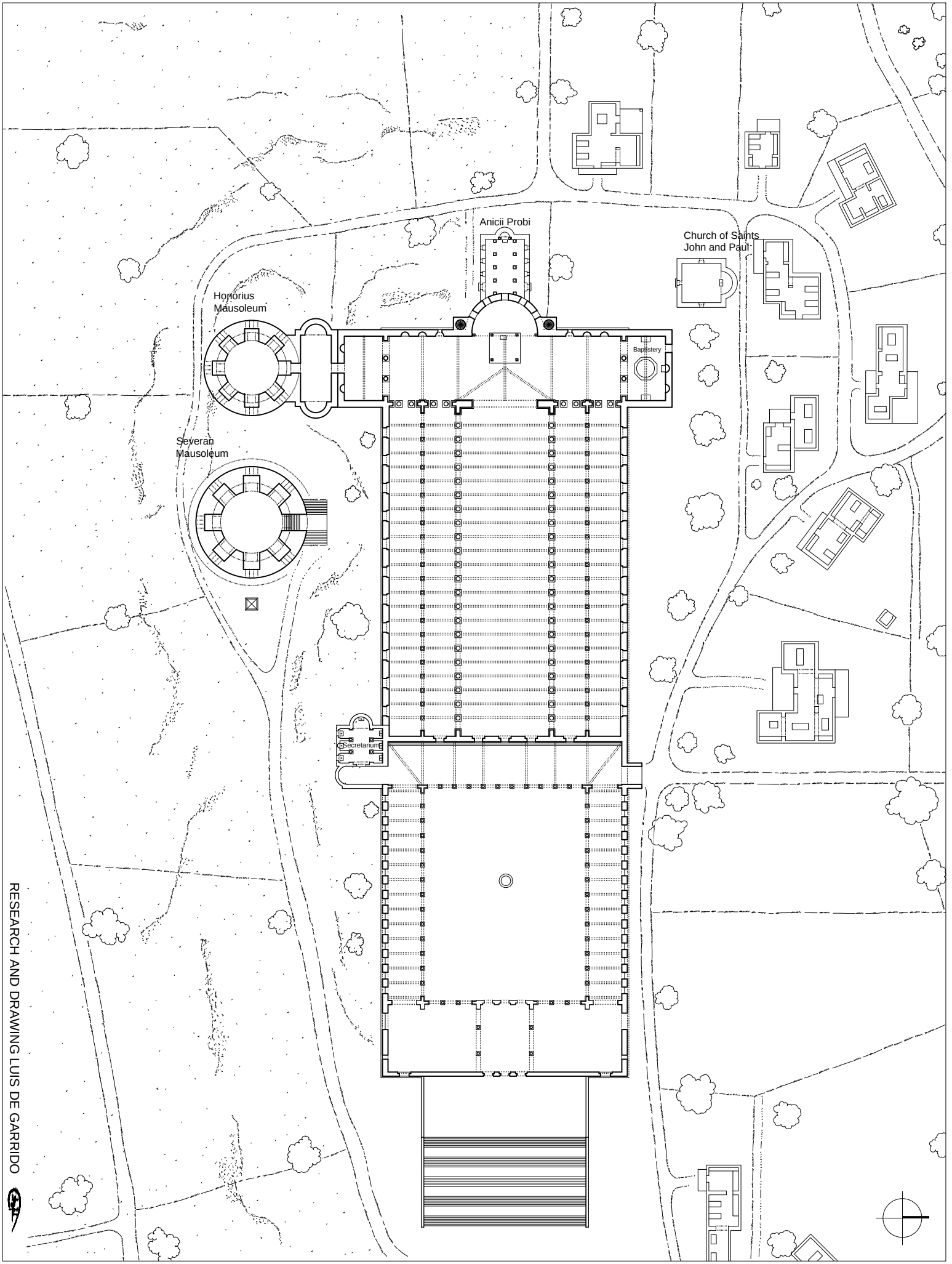


RESEARCH AND DRAWING LUIS DE GARRIDO

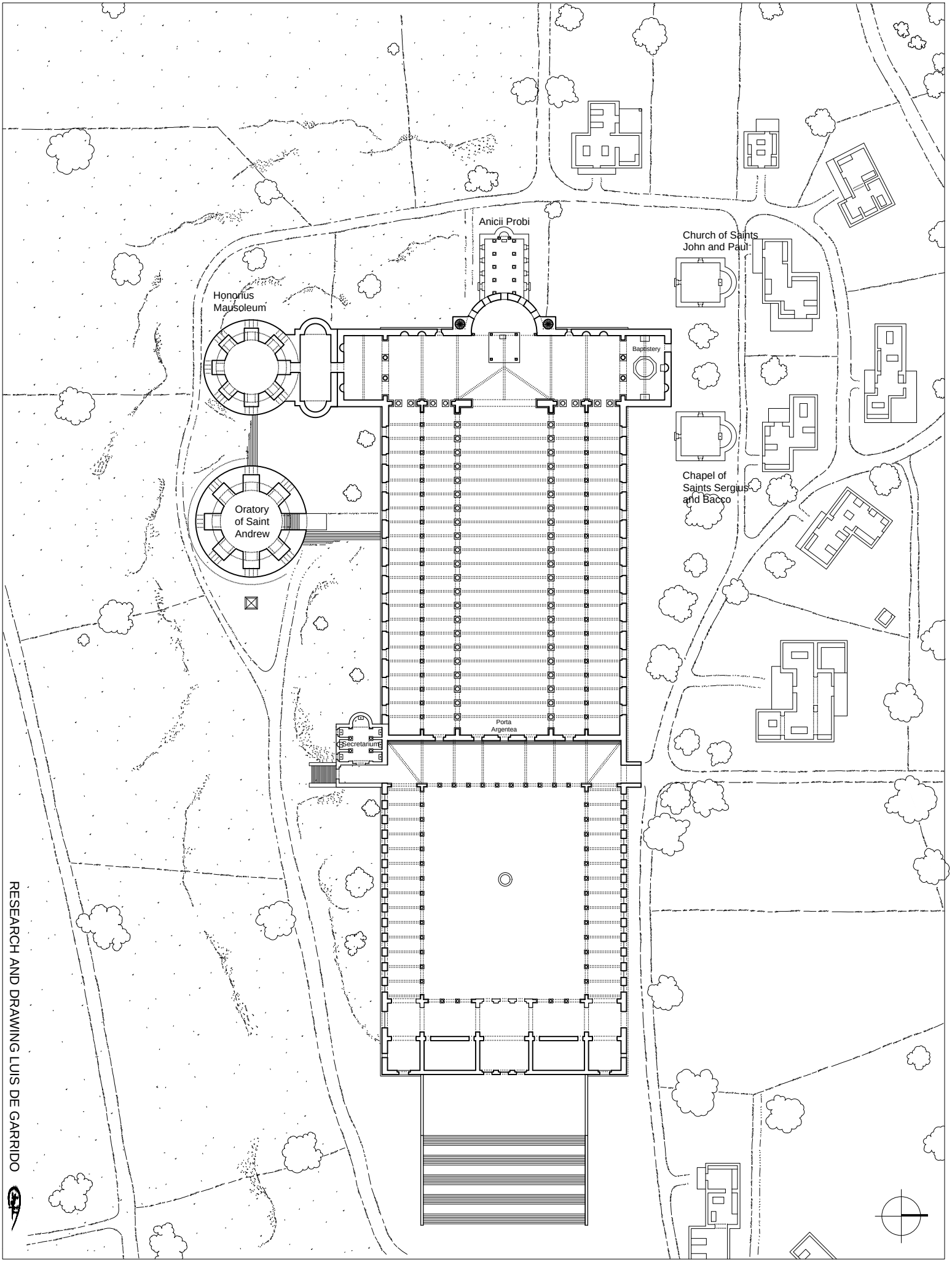
354 A.C	LIBERIUS (352-366). CONSTRUCTION OF MAIN BODY OF NAVES	OSP	CP11



399 A.C	SIRICIUS (384-399). CONSTRUCTION OF NARTHEX AND PERIMETRAL WALL	OSP	CP12



483 A.C	SIMPLICIUS (468-483). CONSTRUCTION OF LATERAL WINGS OF THE ATRIUM	OSP	CP13



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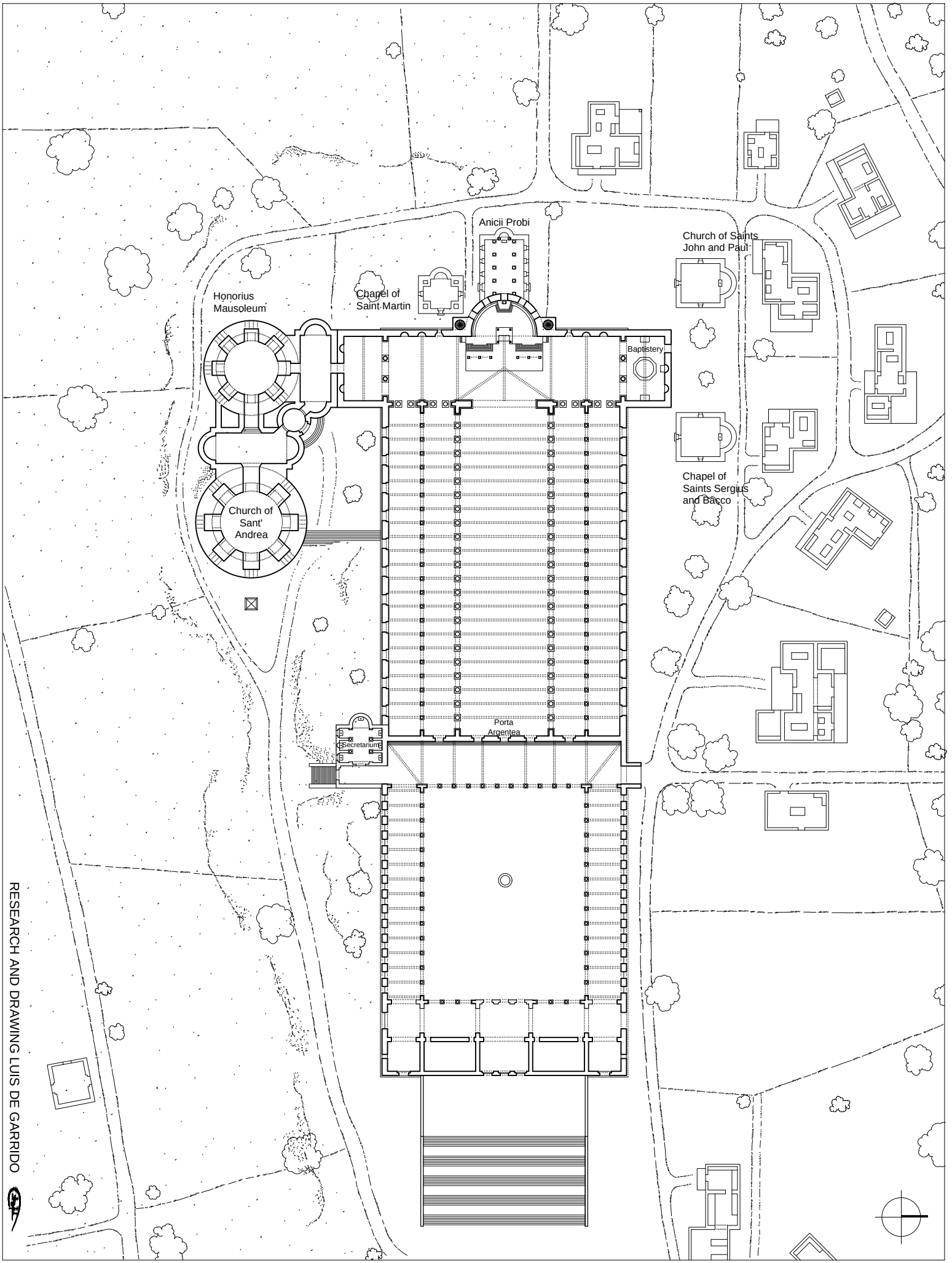
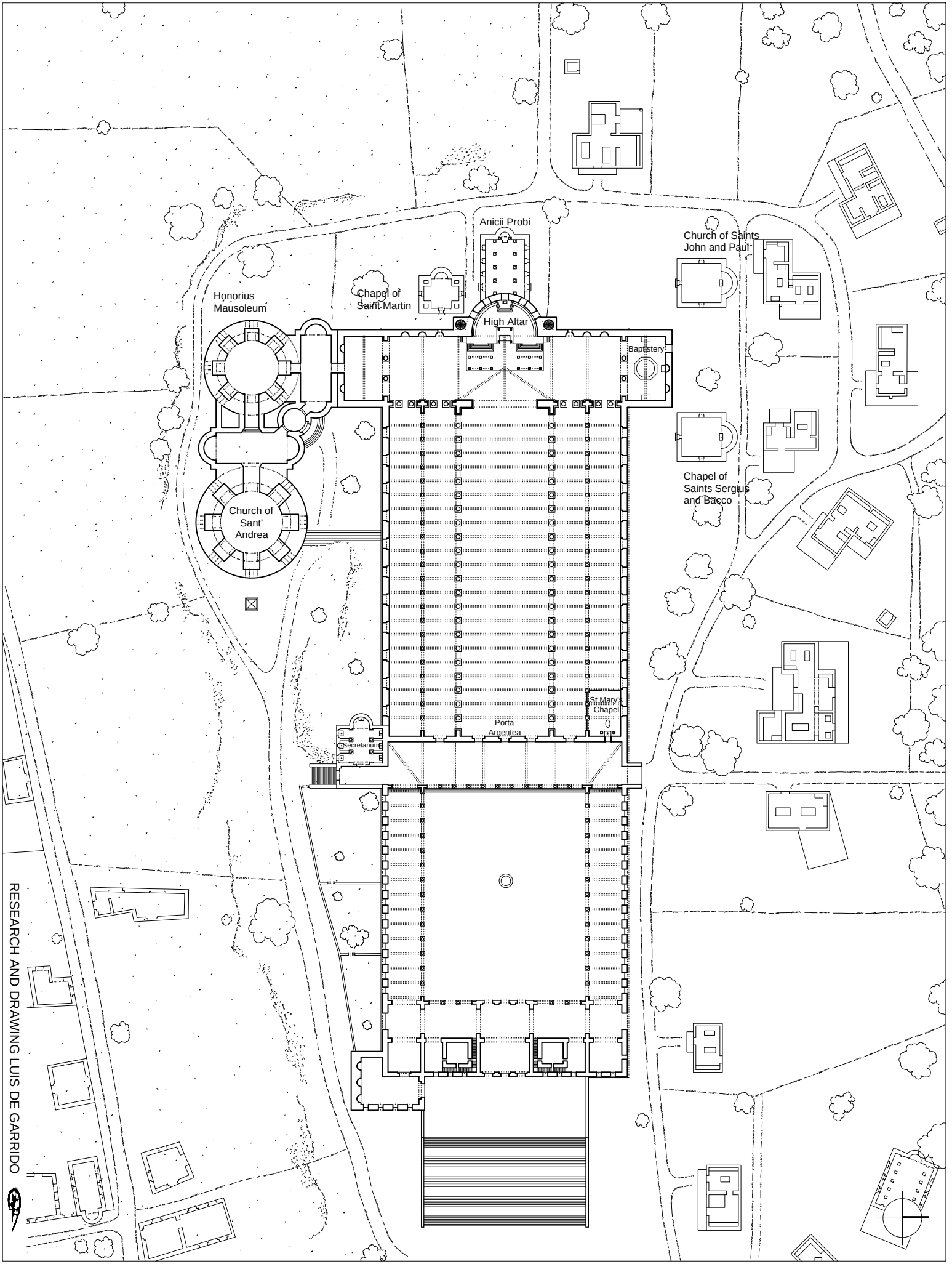
514 A.C	SYMMACHUS (498-514). OLD BASILICA OF S. PETER FINISHED	OSP	CP14

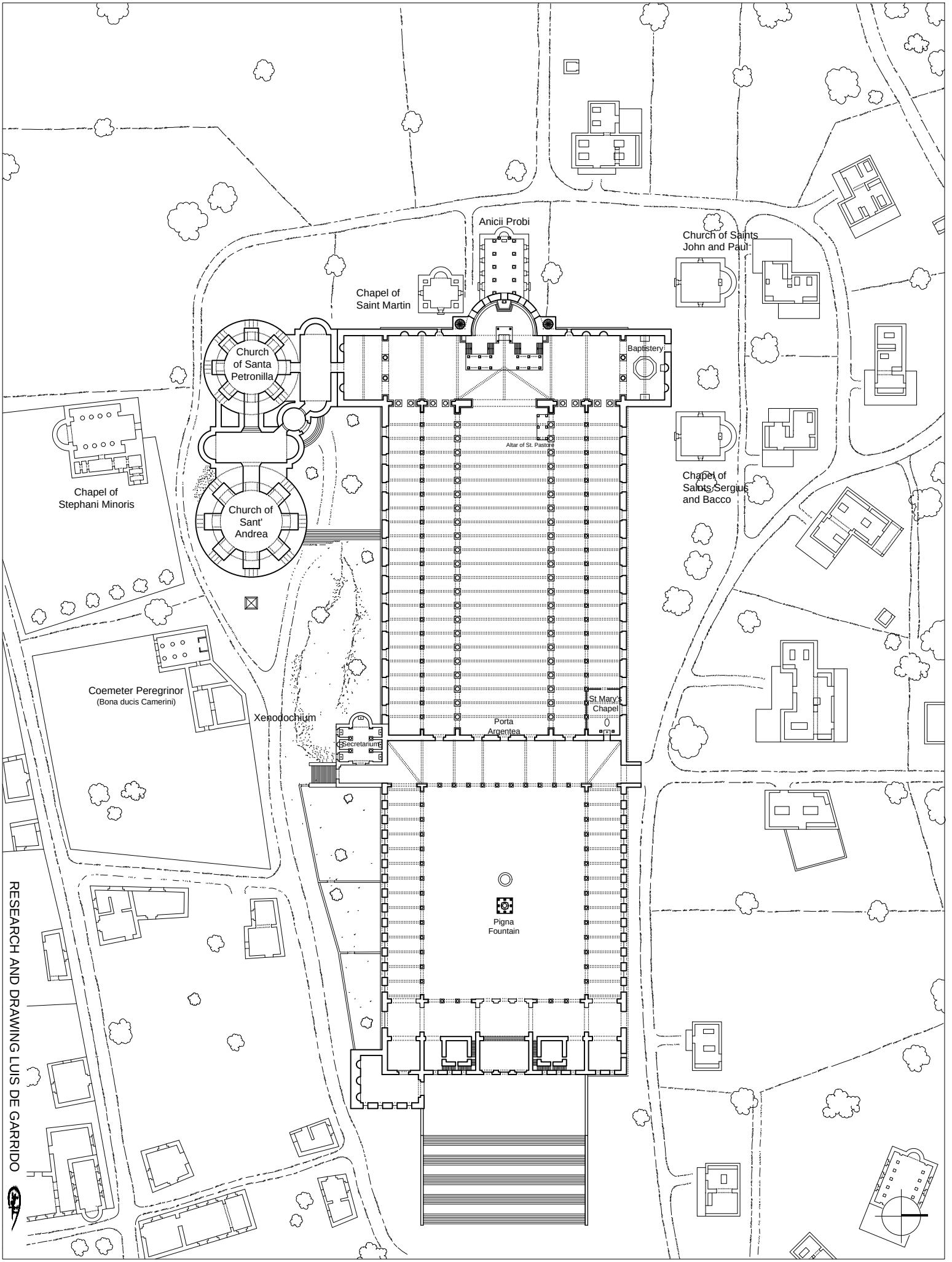


RESEARCH AND DRAWING LUIS DE GARRIDO

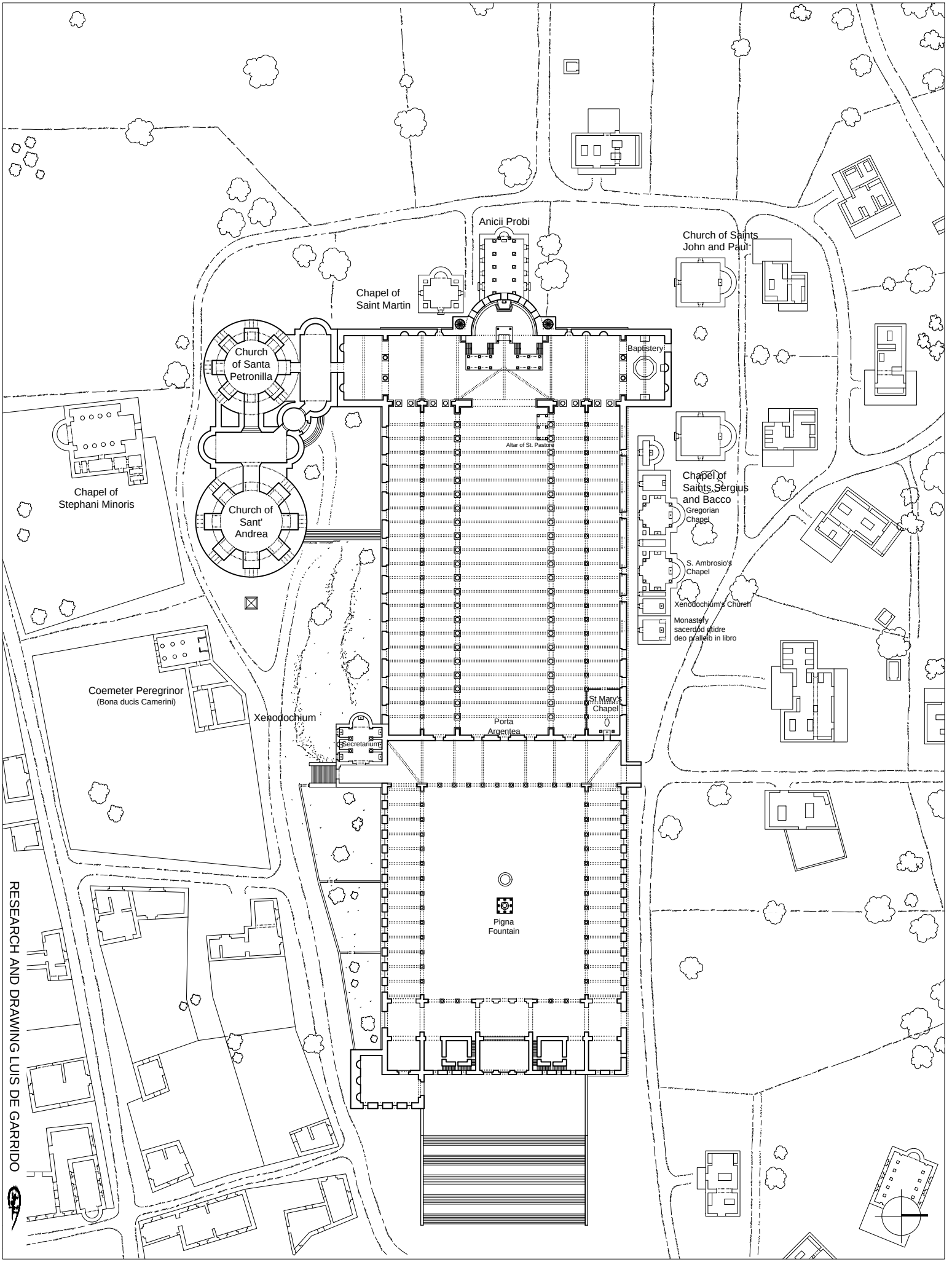
604 A.C	GREGORY I (590-604). APSE RESTRUCTURING. GREGORIAN CANOPY	OSP	E1



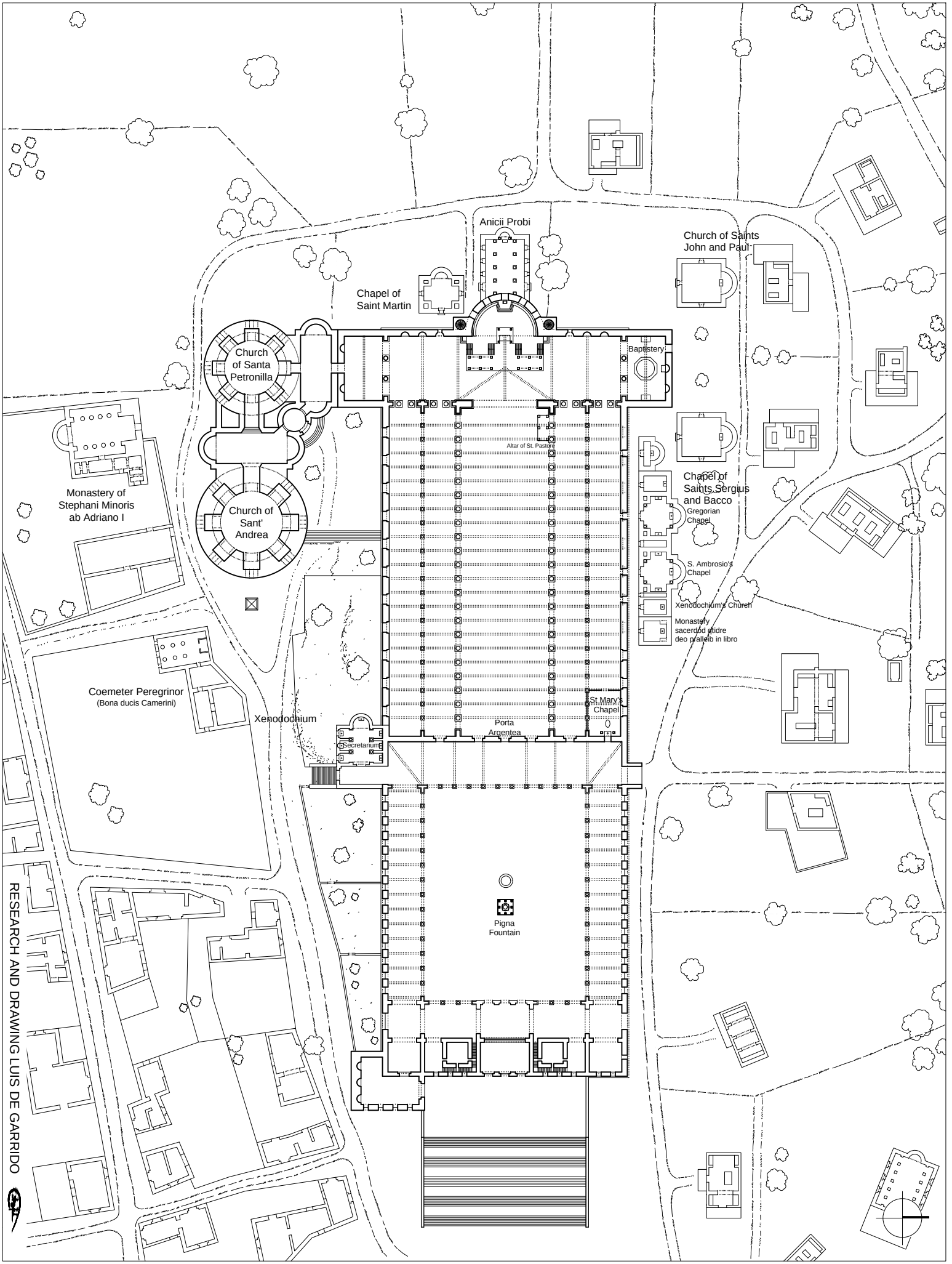
741 A.C | GREGORY III (731-741). REALIZATION OF 12-COLUMN CANOPY-PRESBYTER | OSP | E2



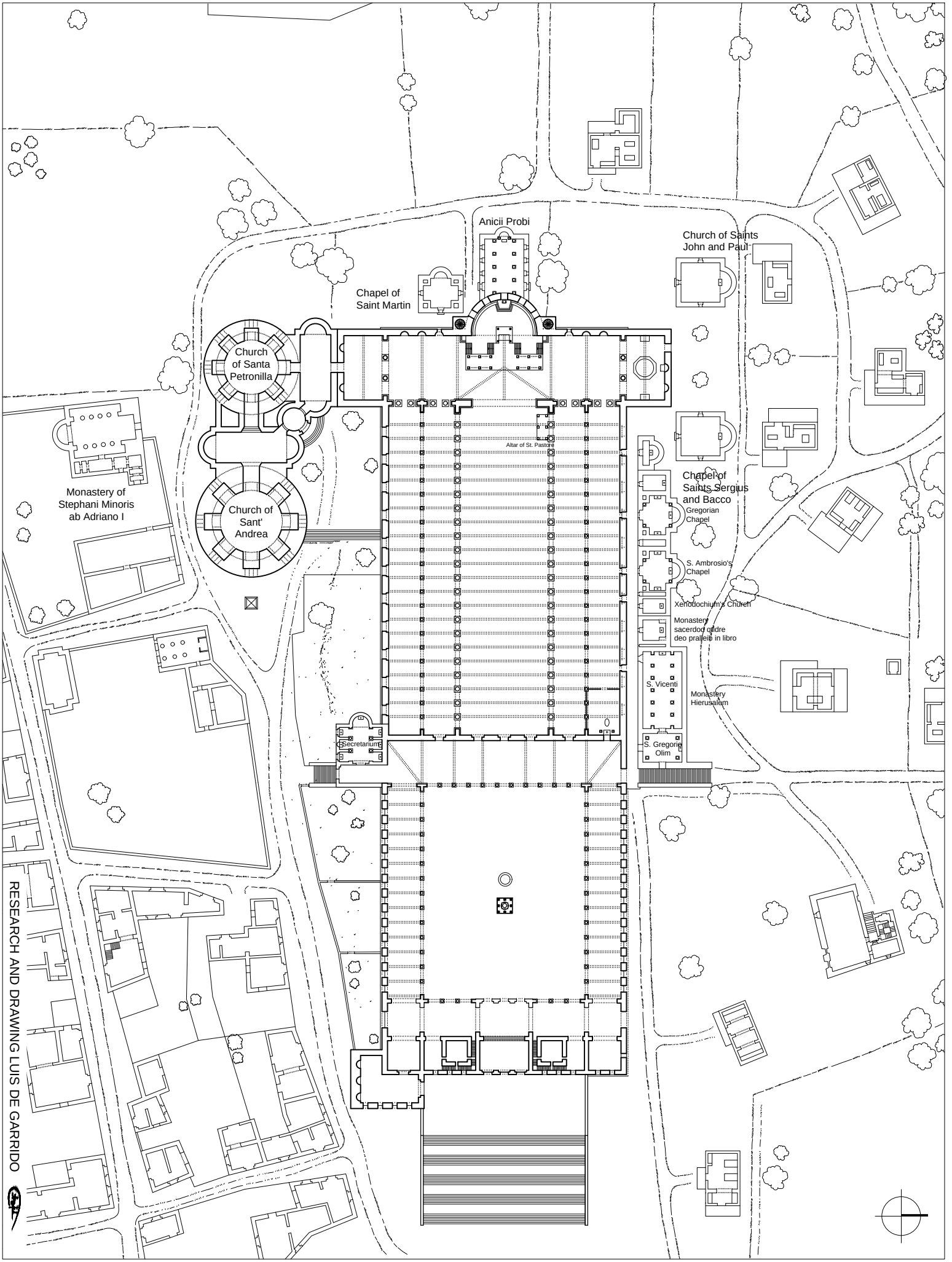
855 A.C	LEO IV (847-855). REFORM OF APSE PODIUM	OSP	E3



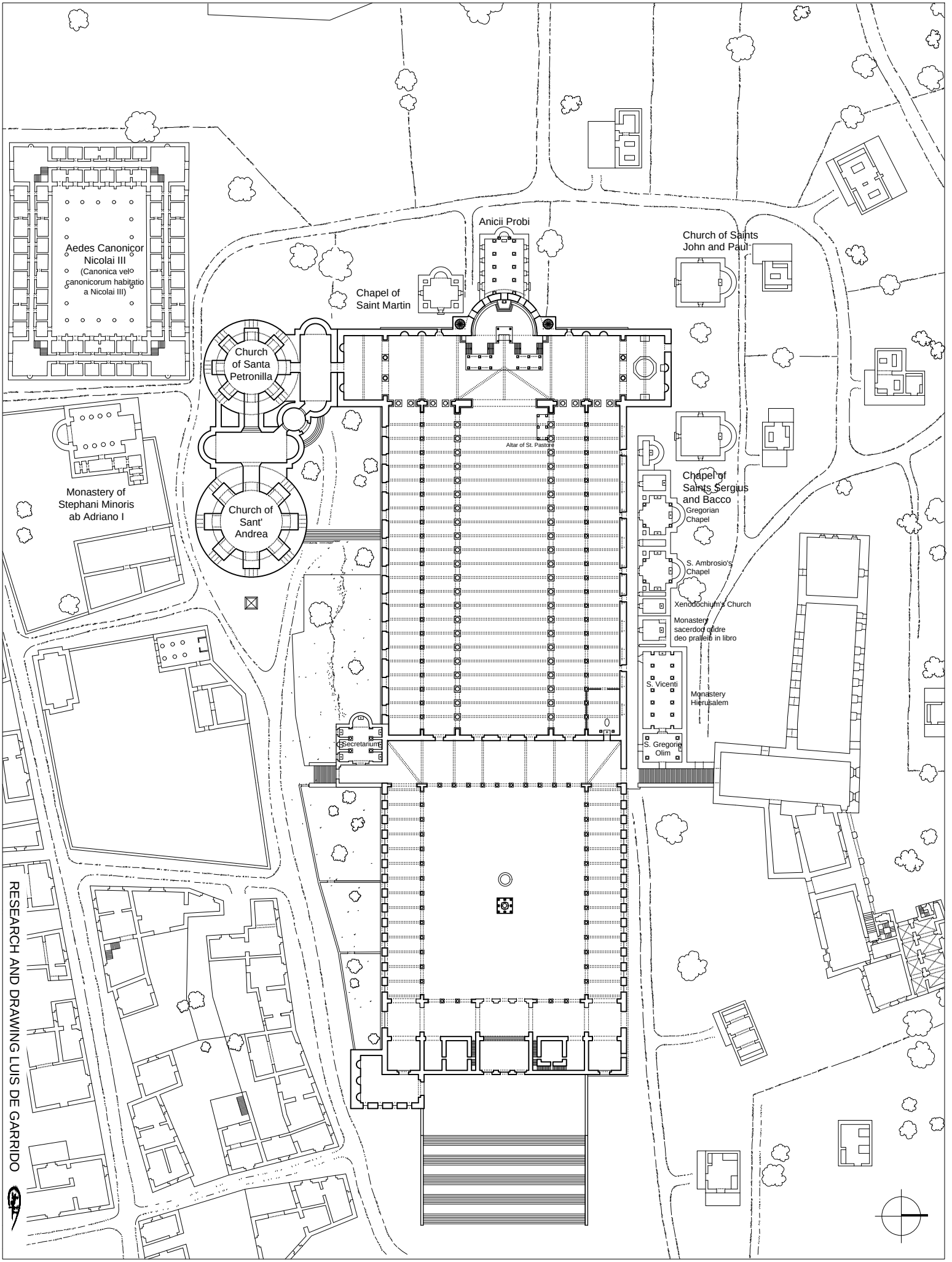
1003 A.C	SILVESTER II (999-1003)	OSP	E4



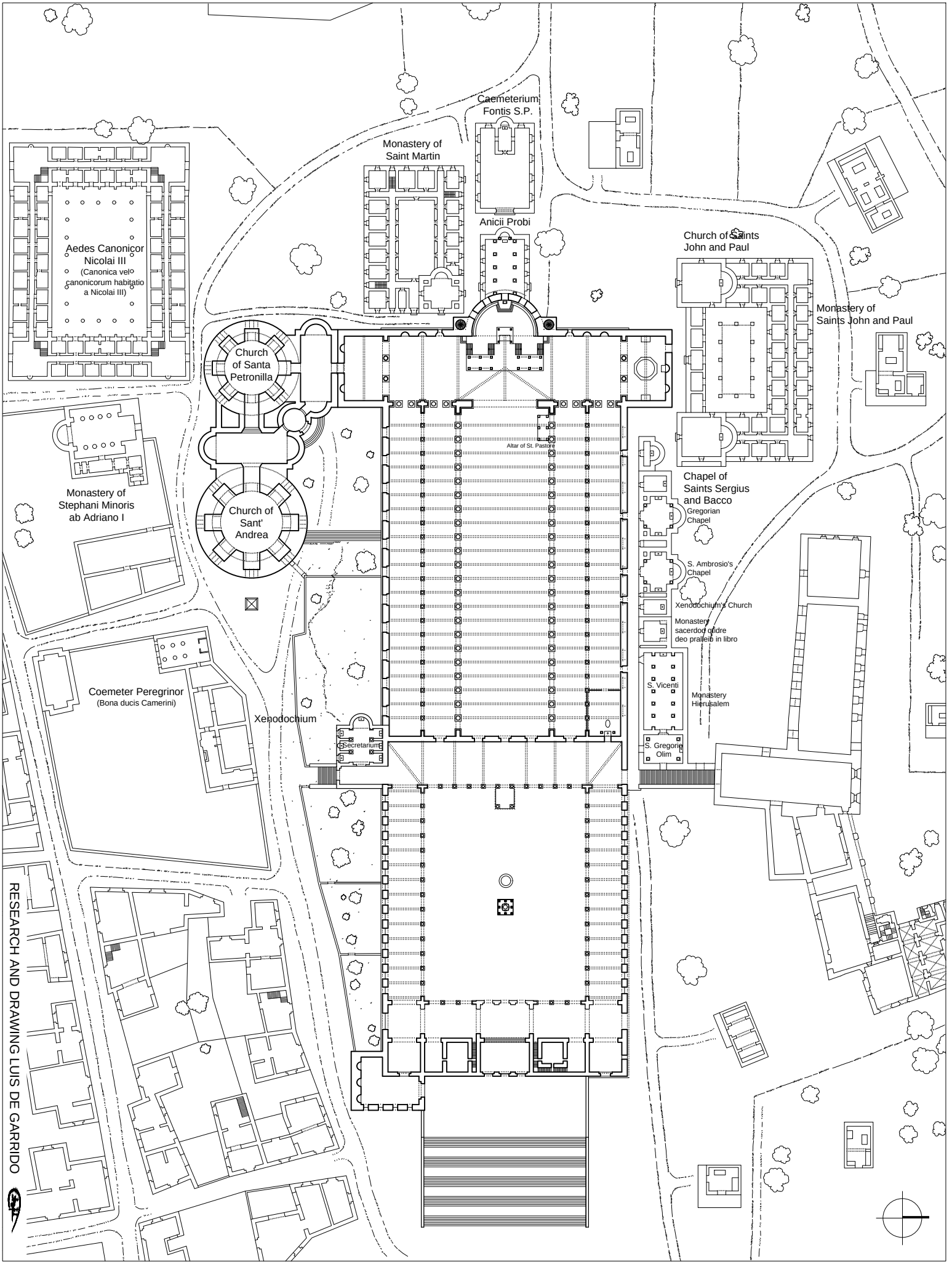
1124 A.C	CALLIXTUS II (1119-1124). CHAIR REFORM	OSP	E5



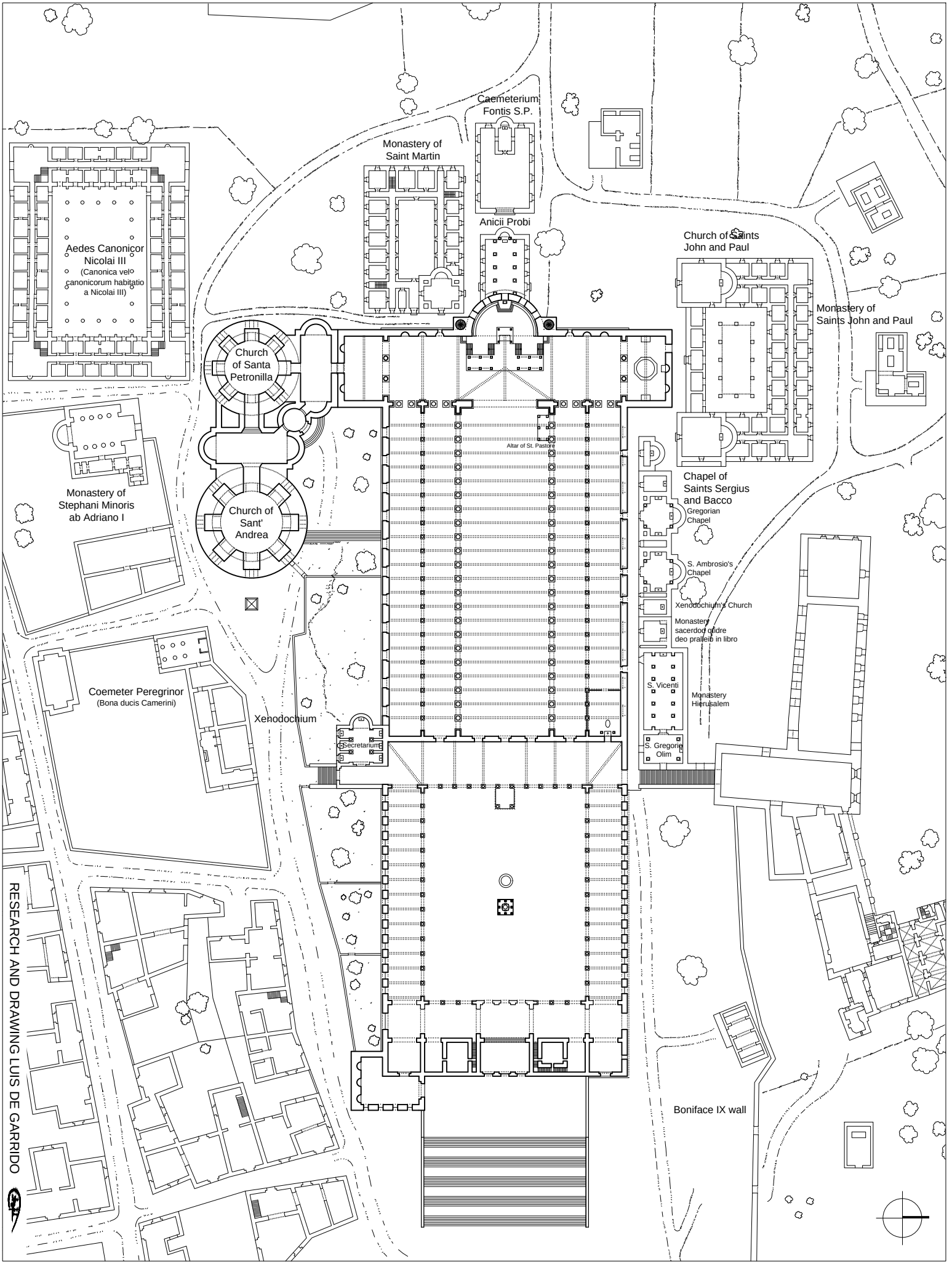
1241 A.C	GREGORY IX (1224-1241). COMPREHENSIVE REFORM AND DECORATION	OSP	E6



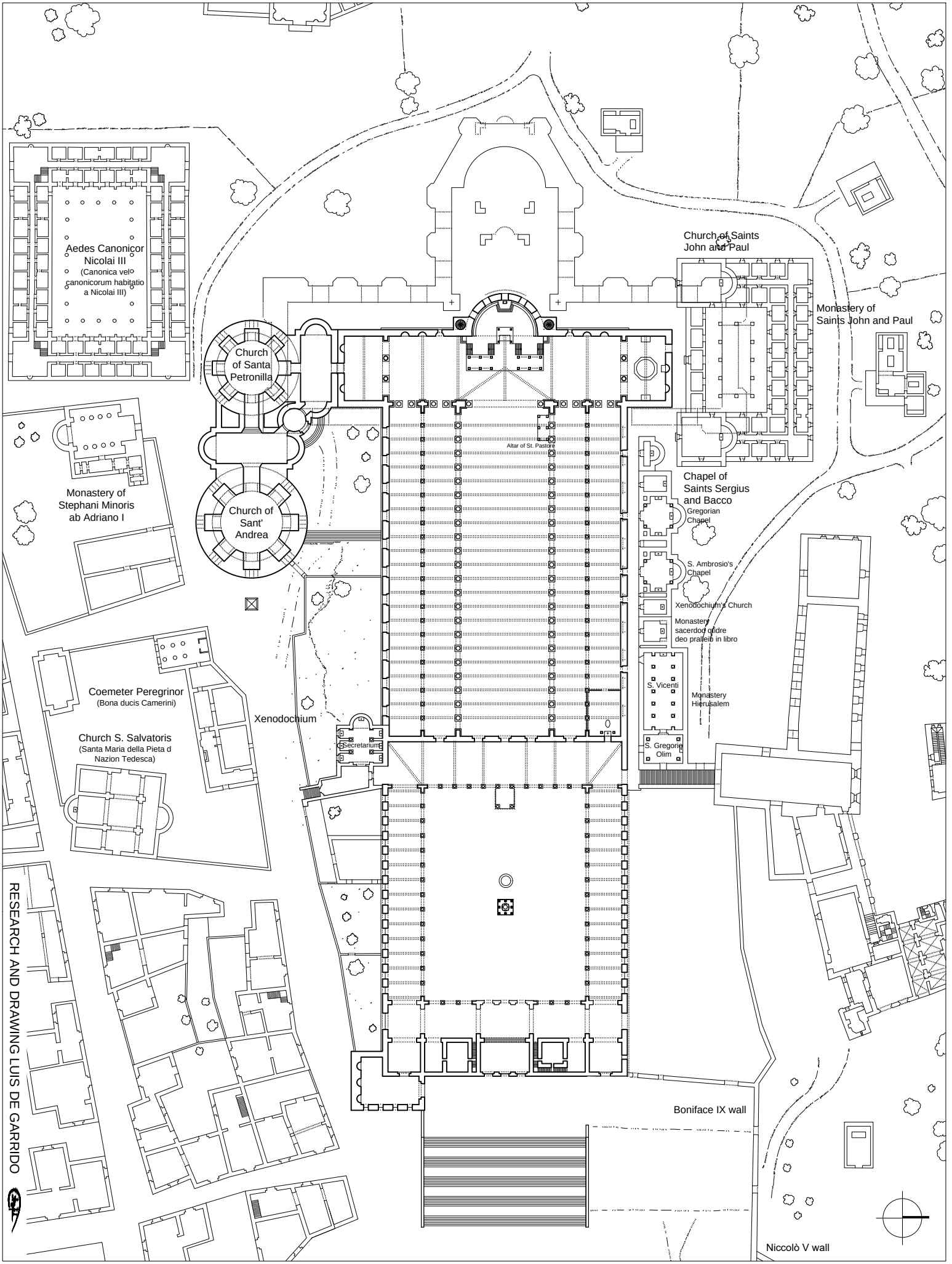
1280 A.C	NICHOLAS III (1277-1280). APOSTOLIC PALACE AMPLIATION	OSP	E7



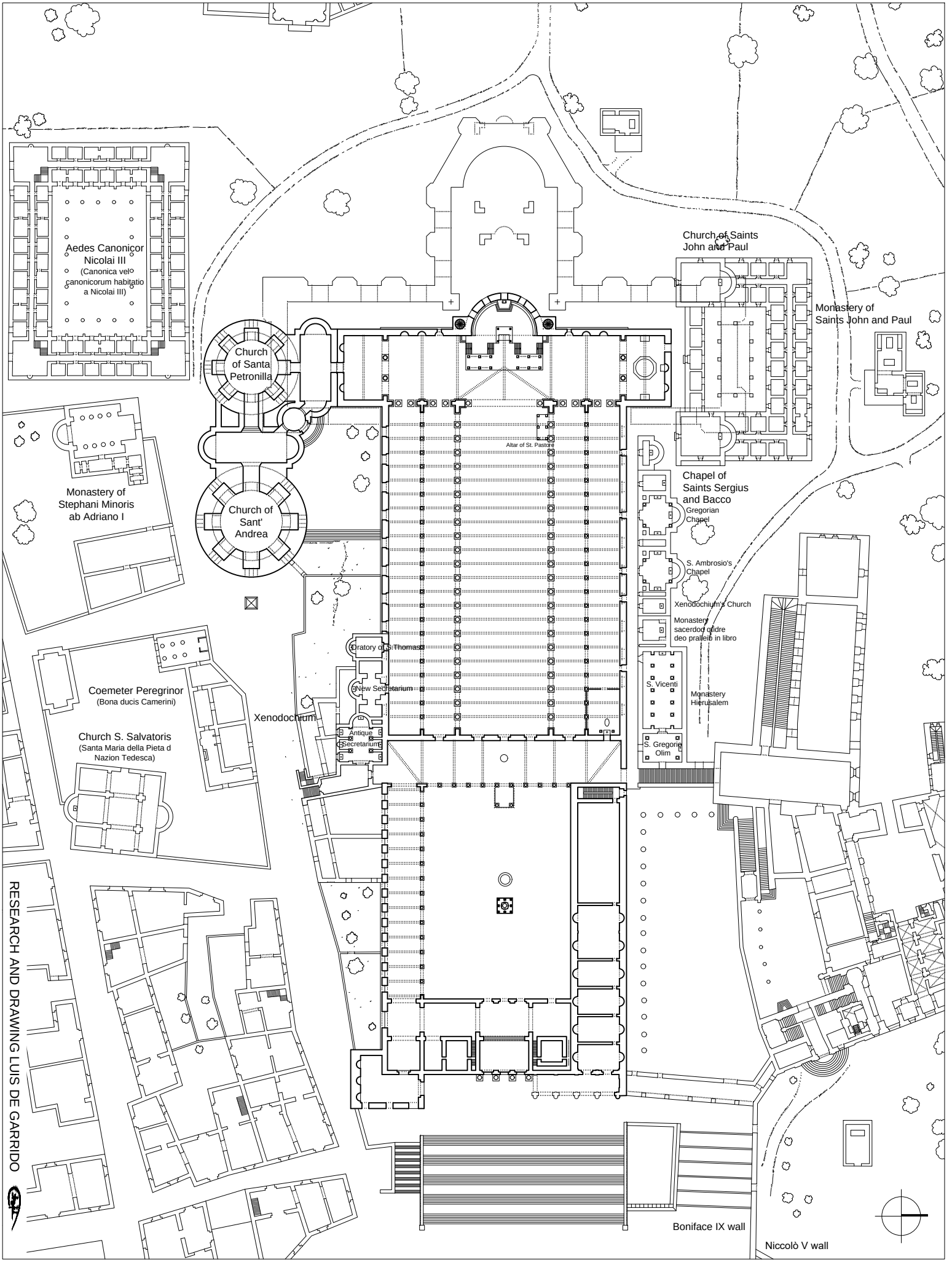
1378 A.C	GREGORIUS XI (1370-1378). NARTHEX TABERNACLE	OSP	E8



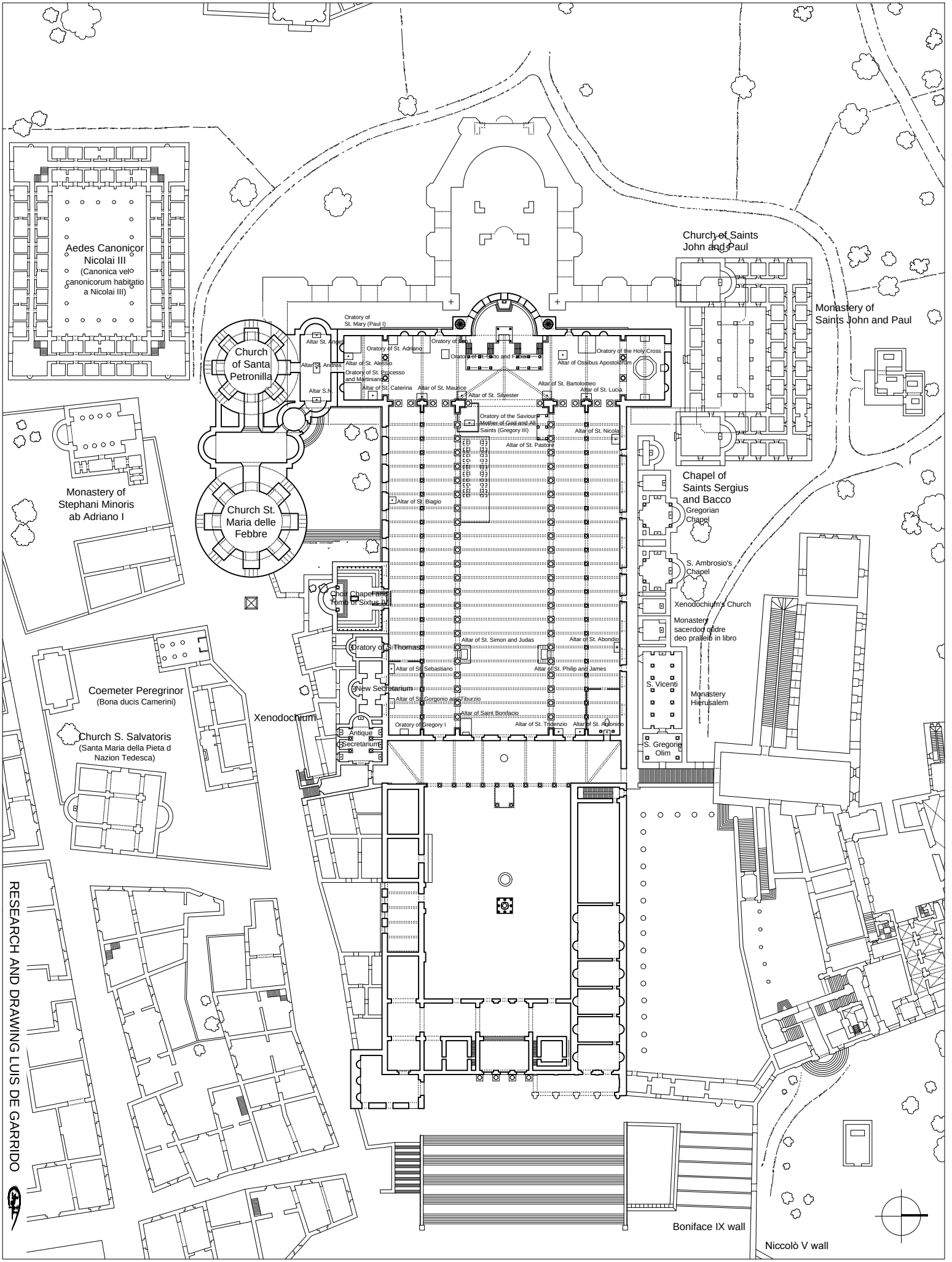
1404 A.C	BONIFACE IX (1389-1404). WALLS OF BONIFACE IX	OSP	E9



1455 A.C	NICOLAS V (1447-1455). START OF THE OLD BASILICA REFORM	OSP	E10

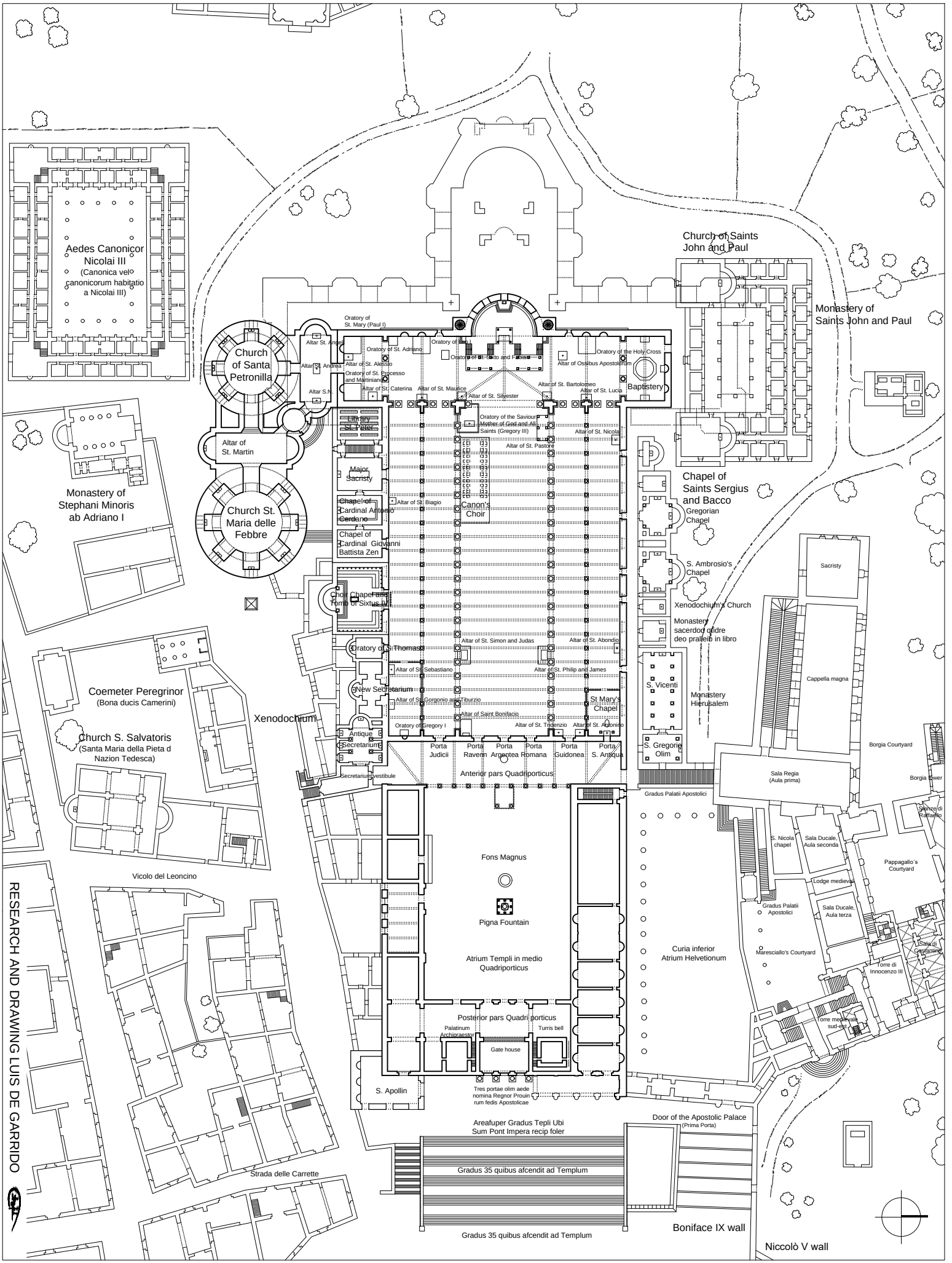


1464 A.C	PIUS II (1458-1464). LODGE OF BLESSINGS	OSP	E11



RESEARCH AND DRAWING LUIS DE GARRIDO

1484 A.C	SIXTUS IV (1474-1484). CHAPEL OF SIXTUS IV	OSP	E12



1503 A.C	JULIUS II (1503-1513). START OF THE NEW BASILICA PROJECT	OSP	E13

Graphic reconstruction of the appearance of the *old basilica of S. Peter*, in the years 514, 1003 and 1505

CHAPTER 6

"*Giudichiamo ottimale quella cosa che di per sé è fatta in modo tale da non poter essere modificata se non peggiorandola*"

Leon Battista Alberti

Chapter 6. Graphic reconstruction of the appearance of the old basilica of S. Peter, in the years 514, 1003 and 1503

6.1. Objectives

This chapter reconstructs the appearance that the old basilica of S. Peter might have had, at three key moments in its history.

1. In the year 514, when it was completely finished, including the atrium, the gate house and its side rooms.
2. In the year 1003, right in the middle of its existence, with a certain state of abandonment
3. In 1503, shortly before starting to be demolished in order to begin the construction of the new basilica of S. Peter.

To give an idea of its appearance in each of these years, the plan, the cross section through the naves, the cross section through the atrium, the longitudinal section, the east elevation, the south elevation and the west elevation have been reconstructed.

In order to carry out the reconstruction of these plans, we will start from the floor plans of the years 514, 1003 and 1503, together with the section in the year 514, reconstructed in the previous chapters. Based on these reconstructed plans and taking into account the available historical information, it is possible to reconstruct -in considerable detail- the appearance that the old basilica of S. Peter could have had in these three representative years of the three most important stages of its existence.

6.2. Reconstruction of the appearance of the old basilica of S. Peter in 514

In the last stage of the reconstructed design process, the most important architectural elements of the section of the old basilica of S. Peter are defined. As can be seen, it coincides enormously with the Letarouilly section, and also the dimensions of the most important architectural elements basically coincide with the dimensions specified in available historical references and by expert historians [1], which proves that the design process identified in this work is correct. Therefore, and based on the architectural structure of the section, and the available historical information, it is possible to reconstruct the other sections and facades.

There is no historical information that describes what the basilica looked like when it was completely finished in 514. However, there is quite a lot of graphic information on how it looked throughout the 16th century. And with this information it is possible to deduce the appearance that it could have had in the year 514.

The methodology followed is based on rationally reconstructing the evolution of the architectural elements of the old basilica in reverse, based on the available historical information.

On the one hand, the geometric and dimensional structure deduced in this work serves to correctly dimension and proportion the available historical graphic information. In this way, it is possible to reconstruct to scale, and quite accurately, what the old basilica looked like before it began to be demolished in 1506 [2].

On the other hand, there is a set of historical references that describe the most important actions that were carried out in the old basilica, as for example, the inclusion of triforiums in the clerestory windows, the closing of the arches of the gate house to create three rectangular doors, etc. Therefore reversing the sequential actions that were carried out throughout history, it is possible to induce the appearance that the basilica could have had in the year 514.

Take, for example, the case of the openings in the main facade of the S. Peter square. The appearance of the three entrance doors is known in various drawings and paintings, and based on the methodology described in chapter 4, they can be dimensioned quite accurately. Once dimensioned, the 4 granite columns and architraves arranged by Nicholas V, in the year 1449 [3] can be eliminated, and in this way reconstruct the appearance that the facade might have had prior to the intervention. Undoubtedly this appearance coincides with what the facade may have had after the times of Hadrian I (772-795), when the old original Roman arches were closed, *tutto sesto*, and an architraved portal, with three bronze doors, was built [4]. In the same way, by eliminating the closing of the arches, the architraved portal and the three bronze doors, the three original Roman arches can be obtained, perfectly dimensioned.

The same can be said regarding the windows of the main facade. Over time the old Roman windows were framed, lengthened, decorated with pediments, etc. So simply by reversing the process, and taking into account the historical references available, the aspect they had to have in 514 can be deduced.

As a result of applying this methodology, it has been possible to reconstruct the appearance that the old basilica had in 514, and which basically coincides with the appearance that the architectural project might have.

6.2.1. Floor Plan of the old basilica of S. Peter (Layout FP-514)

The plan layout of the old basilica of St. Peter and its surroundings, in the year 514, was already reconstructed in *stage 13* of the previous chapter. It is included here again in order to have an overview of the appearance that the old basilica of St. Peter could have had in this year. In order to be able to measure properly in the deduced planes, the conversion factor between *roman feet* (*pes*) and *palmi* must be taken into account.

6.2.2. Cross section of the old basilica of S. Peter (Layout CS-514)

In the section the first thing that is appreciated is the complexity of the levels of the terrain around the old basilica of S. Peter. To reconstruct the ground levels, several studies have been taken into account, among which the works of Liverani stand out [5].

As mentioned, the hill on which the foundation platform was built had a gentle upward slope in a westerly direction (Fig. 6.1) and a steeper slope in a north direction (Fig. 6.2). Therefore, the ground level is completely different at each point on the platform. Usually the east face (at the beginning of the great staircase) and the south face (at the height of San Andrea and at the height of the Narthex) are taken as references for the slopes, and reference levels.

To provide an idea of the unevenness of the terrain with respect to the new basilica Liverani provides some important indications, taking as a reference the current Piazza dei Protomartiri Romani (near the old *Severan Mausoleum*). In Caligula's time (37 AD) the terrain was about 9 m. deep. In the time of Caracalla (200 AD) the terrain was filled in to create a flat surface for the circus, so the ground level was about 6 m. deep. In the year 1200 the terrain rises (as a result of the fillings made to consolidate the roads) and it was about 3.5 m. deep. Finally, in the year 1500, the terrain was about 2 meters deep with respect to the current level of the square.

Obviously, the levels will change from one point to another, so the dimensions shown in this chapter (and in the previous chapter) are always approximate, with an estimated error of +/- 3 *palmi*.

The section shows the different levels of the terrain in the years 37, 200, 500, 1000-1200 and 1500. It should be noted that Pope Symmachus (498-514) filled in the terrain in the northern part of the *Severan Mausoleum*, so the section shows the level of the natural terrain in the southern part, and the level of the compacted terrain in the northern part.

In general, it can be said that at the height of the *Severan Mausoleum*, the ground was at a depth of 41.60 *palmi* (+/- 3 *palmi*) with respect to the level of the foundation platform. To build the circus, in the year 200, a filling of about 13 *palmi* thick was made, so the level of the circus was about 28.60 *palmi* below the level of the foundation platform.

Around the year 514, the ground level rose by 8.60 *palmi*, as a result of the demolition of the circus and the compaction of the ground. Therefore in the year 514 the ground level was about 20 *palmi* below the level of the foundation platform.

In the year 1000-1200, the ground level rose again by 2.60 *palmi* (as a consequence of the removal of compaction actions from the roads), so that its level was 17.40 *palmi* below the level of the foundational platform.

In 1505 the land had risen by about 6.60 *palmi* (as a consequence of the repeated compaction and paving actions of the roads), so its level was about 10.80 *palmi* below the level of the foundational platform.

It should be taken into account that the ground level rose in a north direction, so the walls of the foundational platform had a variable height, as well as its foundations. The highest wall was the south wall, which had its greatest height in the eastern part, projecting about 35 *palmi* from the ground, and with a foundation about 6 *palmi* deep, so the wall would have a total height of 41 *palmi*.

Once the cross section of the old basilica of S. Peter has been reconstructed (chapter 4), it can be completed with all kinds of details to show the exact shape of the foundations, walls, arches, roofs and, in general, the construction technique used.

The section drawing especially shows details of the structure and the foundation, reconstructed taking into account all available historical references. The walls of the foundation platform had a variable thickness, according to measurements made in the excavations of the 1940s. As described in chapter 5, the wall below the south central colonnade was approximately 6 *roman feet* (8 *palmi*) thick, and was expanded to about 7 *feet* (9.33 *palmi*) near the ground. The foundation of the wall under the ground was about 9 *feet* thick (12 *palmi*). The wall below the north central colonnade was about 6 *feet* thick (8 *palmi*), and its foundation under the ground was about 9 *feet* (12 *palmi*). The walls below the side colonnades and the perimeter walls were approximately 9 *feet* thick (12

palmi). These side walls were thicker because they were higher, and had to withstand lateral thrusts. The underground foundation of these four walls has the same thickness, that is, 9 *feet* (12 *palmi*).

Taking into account the dimensions of the perimeter foundation walls, it follows that the foundation platform would slightly protrude from the perimeter of the old basilica, approximately 1.5 *feet* (2 *palmi*) on each side. Therefore, it can be deduced that the platform had an approximate length of 686 *feet* (1.5 + (71 + 306 + 306) + 1.5), that is 914.66 *palmi*; and an approximate width of 227 *feet* (1.5 + 224 + 1.5), that is, 302.66 *palmi*.

The height of the platform at its highest midpoint (on the east side) was approximately 26.25 *feet*, that is, 35 *palmi*, given that the access staircase had 35 risers of 0.75 *foot* each riser (1 *palmo*) [6].

The drawing shows all the details of the foundation and the structure, as well as its dimensions and construction details.

The foundational platform was built based on perimeter walls, and internal longitudinal walls of great thickness and with a variable depth until reaching the ground level. The lowest wall, along the north side of the platform, was at least about 9 *feet* high (12 *palmi*) and would be almost entirely underground. The tallest wall, located along the south side of the platform, reached at least about 30.75 *feet* in height (41 *palmi*), part of which was 4.5 *feet* (6 *palmi*) underground, and 26.25 *feet* (35 *palmi*) above ground, at its southeast end.

The set of walls of the foundational platform would become the foundations of the walls and colonnades of the basilica that would be built on them [7]. The main walls were made in *opus listatum* (using tuffs and bands of bricks) and *opus testaceum* (using only bricks), and many of the secondary walls usually were made in *opus caementicium* (using irregular fragments of marble, tuff and travertine in mortar, using formwork) [8].

Longitudinal walls and transverse walls were built (many of which crossed through the existing tombs in the necropolis (as is the case, for example of the tomb T [9]) creating a grid of walls, and whose compartments were filled in many cases with earth and rubble to increase robustness and stability of the platform.

The existence of various types of walls is due to a chronological sequence in construction, but also to the testing of the best construction technique and the achievement of specific structural objectives, as the work progressed [10].

Finally, on the framework of the walls, barrel vaults were built with the same level that when filled by the upper part, the enormous platform would be formed.

The drawing shows that the platform is not the ground level of the basilica. As Grimaldi points out (who observed in 1608 the dismantling of the basilica's atrium) it would have a simple finish with a filling of stones and mortar (on the barrel vaults made brick-based), a layer of impermeable clay and finally a layer of *lithostratum*. It is therefore possible that as the basilica was being built the final floor was made based on a leveling stone filling with mortar and marble slabs. The cleric also provides specific references: a layer of clay on which the lithostrat rests, and finally a filler and the marble slabs [11]. Grimaldi thought that the *lithostrat* was from the time of Constantine, and therefore belonged to the superior finish of the platform. On the other hand, other authors think that they probably belonged to the works of beautification of the atrium by Pope Symmachus (498-514) [12]. Alfarano in his writings also observes that under the marble slabs there were “some palmi“ of filler and under which a modest original layer of white stones from platform [13].

Based on this description, it can be estimated that the filler layer and the marble slabs together would have an approximate thickness of about 3 *feet*, so that the floor of the basilica would be about 4 *palmi* above the platform. Therefore, when the building of the basilica was completed (approximately 352) and the narthex did not yet exist, the basilica should be accessed by means of 4 steps (that is, 4 risers of 0.75 *foot* each riser).

In the cross section the old Christian necropolis can be seen, which was just below the foundation platform. For this, all the roofs of the small mausoleums had to be dismantled and only the walls were left standing, which were now crowned by the foundation platform.

The section also shows also the decapitated base of the old *Severan Mausoleum*, originally built between the years 212 and 217, centered on the old *spina* of circus [14]. The mausoleum was circular in shape and was built with thick laterizium walls, and had an outer diameter of about 116 *feet* (154.66 *palmi*), and an inner diameter of about 90 *feet* (120 *palmi*). The height of the perimeter walls should presumably be about 90 *feet* (120 *palmi*), equal to the internal diameter, and would be crowned with a large dome [15]. The entrance to the mausoleum must have been on the north side, adjacent to the only path that was created in the 4th century on the north street of the circus, more or less parallel to the *spina*. The ground level of the mausoleum must have been a little above the ground level of the circus in order to preserve it from the rising waters, so presumably its northern access should have had a few steps. The *Severan Mausoleum* was built above the ground

level of the circus, so it follows that in the early 3rd century the circus was in disuse but had not yet been demolished. The *Severan Mausoleum* was modified just when the construction of the basilica was finished, that is, in the middle of the 4th century, as it was partially buried. Over time, from the beginning of the 3rd century to the middle of the 4th century, due to the gradual deterioration and demolition of the circus, the consequent accumulation of its debris, and the natural compaction of the terrain over the years, the ground level was recovering the natural slope that it had before the construction of the circus. For this reason, the mausoleum gradually fell below ground level, ceased to be functional, and had to be renovated. The part that protruded from the ground was demolished, but the thick walls that remained under the ground were preserved, cutting it to the ground level (the ground level at that time).

Its interior was filled, and a new mausoleum was built on this compacted platform, by means of a circular wall with a diameter of about 102 *feet* (136 *palmi*), that is, about 14 *feet* (18.66 *palmi*) less than the previous mausoleum, so that the circular wall was set back about 7 *feet* from its foundation base.

This new mausoleum was formed by a circular wall of variable section, since it was formed by a sequence of niches and low walls inside, and had an internal diameter of 86 *feet* (114.66 *palmi*) from the bottom of the niches, and a free internal diameter 57 *feet* (76 *palmi*). The wall rose about 25.5 *feet* (34 *palmi*) above the level of the basilica (that is, about 28.5 *feet* (38 *palmi*) above the level of the founding platform) [16], and a circular clerestory with a smaller diameter was built on it. Due to increased ground level, the obelisk was also gradually buried from the 3rd century to the 15th century.

To reconstruct the external appearance of the mausoleum, several drawings (listed in chapter 5) have been taken into account.

The most important drawing is the one made by Carlo Fontana "Section of Madonna della Febbre" (Royal Collection Trust, RCIN 909784), since approximate dimensions are provided (in *palmi*), based on which the whole dimensions have been deduced (in *feet*) with which the building was designed and constructed (Fig. 6.3).

It has also been especially taken into account the drawing made by Maarten van Heemskerck's, “View of the basilica from the southeast, showing the buried obelisk and the Church of S. Andrea (Santa Maria della Febbre)”, Staatliche Museen zu Berlin, Kupferstichkabinett, Heemskerck-Alben, n.79, D.2a, fol. 22v) (Fig. 4.9).

To reconstruct the interior of the basilica, including the Arch of Constantine, several drawings and paintings have been taken into account, and especially: the painting by the

Scuola di Raffaello (Gianfrancesco Penni, or Giulio Romano), "The Donation of Costantino" (Musei Vaticani. Sala di Costantino) (Fig. 4.26); and the painting of Jean Fouquet, “The coronation of Carlo Magno in S. Pietro” (in Grandes chroniques de France, 1455-60, Bibliothèque Nationale de France, Fr. 6465, f. 89v.) (Fig. 6.4). The lateral columns to the docks of the Arch of Constantine have not been rebuilt, as there are no direct historical references to their existence.

To reconstruct the appearance of the apse mosaic, two drawings have been taken into account: the drawing of the Biblioteca Apostolica Vaticana, Barb. Lat. 4410, fol. 26r. (Fig. 6.5); the drawing made by the notary Quintiliano Gargario, en 1592, Biblioteca Apostolica Vaticana, Arch. Cap. S. Pietro A. 64 ter, f. 50 (Fig. 6.6); and the drawing made by Giacomo Grimaldi in 1594, Biblioteca Apostolica Vaticana, Barb. Lat. 2733, fols. 158 v and 159 r (Fig. 6.7)

6.2.3. Longitudinal section of the old basilica of S. Peter (Layout LS-514)

In the longitudinal section, the appearance of the Vatican necropolis, covered by the founding platform and by the elevated floor of the basilica, is particularly appreciated. The Constantine Canopy is also appreciated, framing the open niche in the eastern part, built in order to be able to observe, from the basilica, the entrance to Peter's tomb, located at the western end of the necropolis.

The section shows the *Tropaion* just below the Constantine Canopy.The *Tropaion*, immediately before the start of the construction of the great horizontal foundational platform, was isolated on the tomb of the Apostle Peter and a protective casing was built for it [17].

The immediately surrounding structures were demolished and transforming the remaining masonry into a monument covered in marble, with an open niche on its east side. Immediately afterwards a new marble-paved podium was placed around the monument, on which, later, the Canopy of Constantine was erected, to improve the tomb as an object of devotion [18].

The Canopy of Constantine was built on marble slabs and was composed of four Solomonic columns whose axes are 22.5 *roman feet* apart, and with an approximate diameter of 2.25 *feet* in its widest part. On the columns rested an entablature based on two cross arches, and at its intersection hung a large lamp [19].

The section drawing also shows the naves' floor level 3 *feet* (4 *palmi*) higher than the atrium floor level, which at this time coincided with the level of the platform. Therefore there were about 4 steps (4 risers) between the narthex and the naves.

To reconstruct the internal appearance of the exedras, the drawing of Maarten van Heemskerck “View of the interior towards the south transept” (Stockholm, Nationalmuseum) (Fig. 4.10) has been taken into account. To reconstruct the interior appearance of the naves various historical drawings and paintings have been taken into account, especially: the drawing of Maarten van Heemskerck “Interior of the old basilica, showing the new building” (Staatliche Museen zu Berlin, n. 79, D.2a fol. 52r) (Fig. 4.13); the painting by the Scuola di Raffaello "The Donation of Costantino" (Fig. 4.26); the painting of Jean Fouquet “The coronation of Carlo Magno in S. Pietro” (Fig. 6.4), in which a huge amount of details can be seen, including the "rotae" that adorned the pavement of the old basilica).

6.2.4. South facade of the old basilica of S. Peter (Layout SF-514)

On the south facade the upward slope of the ground, from east to west, can be seen. Initially the ground had more or less this same slope, but when the circus was built the hill had to be partially excavated to create a flat surface. When the circus fell into disuse (perhaps in the middle of the 2nd century) the area regained its funerary character, and for this reason a laterizio-based mausoleum would be built between the years 212 and 217, in the Severan dynasty. For this reason it could be called *Severan Mausoleum*.

Over time the circus was deteriorating, and it began to collapse little by little. It is conceivable that it would be dismantled progressively and its materials would be reused in other buildings, especially in the closest ones, especially dedicated to the construction sector. The area located to the east of the circus, the most accessible, would be the most looted, while the western area of the circus, which was partially buried in the hill, would collapse and become a pile of rubble that, with the passing of time would be compacting. In this way, when the foundational platform of the basilica began to be built in 324, the original slope of the land had been recovered, which facilitated the creation of access trails. The *Severan Mausoleum* was partially buried, which prompted the construction of a new mausoleum. For this, the part that protruded from the floor of the old mausoleum was demolished, and the buried part was filled in with the purpose of becoming the base of a new mausoleum.

To reconstruct the appearance of the southern facade and the southern exedra of the old basilica and the *Severan Mausoleum*, the drawings of Maarten van Heemskerck ("View of the works of the new basilica from the south-east, showing the choir of Bramante, remains of the southern exedra of the old basilica, the south arm of the new basilica under construction, the obelisk and the rotunda of Santa Maria della Febbre", Staatliche Museen zu Berlin, Kupferstichkabinett, Heemskerck-Alben, n. 79, D.2a, fol. 13 recto (Fig. 6.8); "View of the basilica from the southeast, showing the buried obelisk and the Church of S. Andrea (Santa Maria della Febbre)", Staatliche Museen zu Berlin, Kupferstichkabinett, Heemskerck-Alben, n.79, D.2a, fol. 22v (Fig. 4.9); "View from the southeast of the old basilica and the works of the new basilica", Berlin, Stftung Preussicher Kulturbesitz, Kupferstichkabinett, Berliner Skizzenbücher, II, 51 recto (Fig. 6.9); the drawing made by Pieter Coecke van Aelst "View of the basilica from the southwest", Biblioteca Apostolica Vaticana, coll. Ashby 329 (Fig. 4.14), and the drawing made by Heemskerck in 580, "View of the construction of the new basilica from the southeast", Frankfurt, Staedelsches Kunstinstitut, 814 (Fig. 6.10). Anonymous drawing has also been taken into account "View of San Peter da Borgo Santo Spirito", late 1544, Biblioteca Apostolica Vaticana, coll. Ashby 330) (Fig. 6.11).

The west side of the platform was flush with the ground of the hill, while the east side protruded about 26.25 *feet* (35 *palmi*), with respect to the height of the circus floor (the wall had to be excavated about 4.5 *feet* (6 *palmi*) to reach firm ground, so its total length was about 30.75 *feet* (41 *palmi*) until reaching firm ground), for which a large staircase with 35 risers had to be built.

As mentioned, the level of the reclaimed land at the *Severan Mausoleum* was at this time, about 15 *feet* (20 *palmi*) below the level of the foundation platform. Therefore the staircase made by Pope Symmachus (498-514) should have about 20 steps. Later, during the time of Pope Donus (676-678), the narthex was paved and the steps were moved and located between the narthex and the atrium. For this reason, the floor level of the narthex was raised and, without a doubt, the staircase made in the time of Symmachus had to be extended with about 4 steps, until it remained with about 24 steps.

The *Secretarium*, built by Leo I (440-461) on the outside of the basilica and attached to the south face of the narthex, is also seen on the southern elevation, a kind of sacristy in which the bishop prepared for the access to the basilica. On the south face of the central nave, 11 clerestory windows, as indicated by Alfarano, are shown.

In the western part of the south elevation, the *Honorius Mausoleum*, built around the year 400, is shown [20]. The mausoleum was connected by a small portico to the south exedra of the basilica, had the same ground level as the basilica, and It was almost aligned to the west with the *Severan Mausoleum*, so it had privileged access to the sanctuary and the tomb of Apostle Peter.

Finally, at the western end, the reconstructed drawing of the south facade shows the Anicii Probi mausoleum.

6.2.5. East facade of the old basilica of S. Peter (Layout EF-514)

The exterior facade was characterized above all by the presence of the large staircase leading to the foundation platform seen. The architectural structure of the facade must have been extremely simple, since initially the building was isolated and about 26.25 *feet* (35 *palmi*) emerged from the ground and was not intended to be viewed from the outside, but from the atrium and from the inside. This facade therefore must have been very austere, and consisted basically of five sections, as a reflection of its internal architectural structure. The corner sections of the facade would undoubtedly be the simplest and would hardly have certain windows for the surveillance and custody of the building. The lateral sections would have windows to illuminate and ventilate the rooms on the two internal rooms. The central part, the gate house, with a second higher floor that protruded from the lateral parts, was composed of three large, very slender arches in the lower part, and three smaller rectangular vindows at the height of the protruding second floor. The three arches had a very simple design, and invited to enter the interior of the basilica, through the gate house. The upper floor was an oratory (later called oratory of S. Maria in Turri) [21], and it was accessed by means of the stairs located in the lateral sections.

To reconstruct the appearance of the facade in 514, numerous historical drawings made in the 16th century have been compiled, and the facade has been rebuilt in 1505 taking into account the dimensions deduced in chapter 4. Subsequently, the appearance of the different architectural elements of the facade has been modified, going back - inversely in time - all the constructive actions that have been carried out on the facade over time, until reaching the year 514

6.2.6. East facade to the atrium of the old basilica of S. Peter (Layout EFA-514)

The east facade shows, in the foreground, the narthex colonnade (with 2.25 *feet* diameter columns, and bases with a height just over 3 *feet* (4 *palmi*), and a width of 3.75 *feet* (5 *palmi*) wide, and the ground at the level of the founding platform. It is possible that the bases of the colonnades served as a guide for the elevation of the pavement of the atrium, and also the naves. Initially, therefore, the bases of the columns were larger and after the growth of the pavement they had a minimal expression. Behind the narthex colonnade the five large entrance doors to the naves are shown. The east facade of three windows, one on top of the other, and a round window at the top, as described by Alfarano [22]. The original windows (stripped of interior elements), the mosaics of the facade and the Constantinian cross topping off the roof, are also shown.

6.2.7. West facade of the old basilica of S. Peter (Layout WF-514)

The reconstructed west facade of the basilica shows the Honorius Mausoleum connected to the southern exedra of the transept by means of a small chapel. The apse stairs can be seen on both sides of the apse (whose plan dimensions are defined in Bramante's *GDSU 20 A* drawing), as well as the five windows of the apse, and the logical interconnection details of the different covers of the apse, transept and main nave. The logical articulations of the mausoleum roofs, and the auxiliary constructions are also appreciated.

The ground in this area had recovered its original level and was almost horizontal with a gentle slope to the south, and a significant slope to the east.

The drawing shows in the central part the Anicii Probi mausoleum, that was built attached to the west apse, before 393, by the consul Sesto Petronio Probo, who died in the same year [23]. It had an unusual structure since it was quadrangular in shape and had three naves, with approximate dimensions of 62 *feet* long by 45 *feet* wide, and a central nave of 15 *feet* wide. It was demolished in 1450 due to the expansion works of the basilica of Nicholas V [24].

6.3. Reconstruction of the appearance of the old basilica of S. Peter in 1003

From 514 to 1003 there were not many significant changes in the architectural structure and appearance of the old basilica of S. Peter. Without a doubt the most important was the construction of the bell tower, to the north of the gate house, at the main entrance of the architectural complex. During these years the most important changes took place in the urban structure around the basilica.

6.3.1. Floor plan of the old basilica of S. Peter (Layout FP-1003)

The plan layout of the old basilica of St. Peter and its surroundings, in the year 1003, was already reconstructed in (stage 17) of the previous chapter. It is included here again in order to have an overview of the appearance that the old basilica of St. Peter could have had in this year.

6.3.2. Cross section of the old basilica of S. Peter (Layout CS-1003)

The most important changes that can be seen in the cross-section of the naves with respect to the year 514 is the enlargement of the podium area, carried out at the time of Leo III (795-816), possibly in the year 800, on the occasion of the coronation of Charlemagne, eliminating the frontal accesses and building perpendicular stairs to the axis of the confessional [25]. The resulting structure was practically preserved in its entirety throughout the Middle Ages [26].

Also visible are the six columns added during the pontificate of Gregory III (731-741), donated by the governor of Ravenna, in front of the six Constantinian *vitinee* columns of the Gregorian baldachin [27]. These new six columns were finished off by means of a coated beam of a silver sheet, thus creating, with this new canopy, a double pergola according to its current conception. In this way, a very special architectural structure was created and it was renamed "*Presbyterium*", meaning a fenced area reserved for the lower choir, or for the lower clergy and singers [28].

In the southern part of the old basilica you can see the common entrance to the two old imperial mausoleums (now called Chiesa di Sant'Andrea and Chiesa di Santa Petronilla), which were joined in the late 7th or early 8th century. The single entrance allowed independent access to each church, and at the same time to the southern exedra of the old basilica of St. Peter.

6.3.3. Longitudinal section of the old basilica of S. Peter (Layout LS-1003)

The longitudinal section shows the semi-annular passage to the crypt, made by Gregory I, called Gregory the Great (590-604), and which allowed pilgrims to venerate Peter without interrupting the services of the upper altar. The ground was lowered about 2 *feet* (it could not be lowered further since the Constantinian platform would be drilled) and a raised podium was built about 5 *feet* above the ground, thus creating an intermediate space of about 7 *feet*, enough to walk upright, and in this way the area inscribed in the apse was doubled [29]. The upper part of the historical memory of the apostle continued to emerge

on the new floor the transept a perfect height to place a fixed altar on top, with dimensions of approximately 8 3/4 *feet* long, 5 *feet* wide, and 4 1/5 *feet* high.

The section also shows the new flooring added in the atrium, in the early eighth century, unifying its level with that of the narthex and with that of the interior of the basilica. The steps between the atrium and the narthex (possibly four risers and three treads) were moved to the gate house to the atrium. Already in the days of Donus (676-678) the narthex was paved, so the steps were moved and were located between the narthex and the atrium [30]. There are historical references that until the pontificate of Hadrian I (772-795) the narthex was accessed through "some steps" [31].

The longitudinal section also shows the *cantharus* of atrium [32], reformed and embellished by Stephen II (752-757), a large *spoglio* bronze pinecone, from which multiple jets of water flowed. The fountain was covered by a fanciful bronze pavilion, about 13.5 *feet* high (18 *palmi*), crowned by a cristogram and supported by 8 *porphyry* columns, two of which with an imperial bust as relief. Assembled with ancient semicircular grids attached to the marble entablatures, the pavilion was decorated with leaves, dolphins and a pair of gilt bronze peacocks [33]. The fountain acquired the appearance shown in the drawings by Simone del Pollaiolo detto il Cronaca (*GDSU Santarelli, 157v.*) (Fig. 5.29) and Francisco d'Olanda and was preserved in over time, until it finally had to be dismantled when the new basilica was built in 1608 [34].

6.3.4. South facade of the old basilica of S. Peter (Layout SF-1003)

The south facade shows a subtle rise in ground level (which at the height of the *Severan Mausoleum* was about 2.6 *palmi*) due to the successive compaction and paving works of the roads over time.

The drawing also shows the two imperial mausoleums (now called Chiesa di Sant'Andrea and Chiesa di Santa Petronilla) joined since the beginning of the 8th century, or perhaps the end of the 7th century. Based on the plan structure of the access chapels to the churches, it has been possible to rebuild the appearance of the elevated construction.

A little further east is the access staircase built by Symmachus (498-514). The staircase now has 4 new steps due to the elevation, of about 3 *feet* (4 *palmi*), of the narthex pavement, made in the time of Donus (676-678). The original staircase built by Symmachus had approximately 20 risers, so after Donus it had about 24 risers. However at this time, and due to the rise in ground level, the access ladder to the narthex happened to have about 20 or 21 raisers.

To reconstruct some details of the southern facade of S. Pietro, and especially the appearance of the exterior of the southern exedra, the following drawings have been taken into account: drawing of Hieronymus Cock, “View from the north to the works of the new basilica showing the already built Bramante choir, and the north exedra of the transept of the old basilica” (Herzog Anton Ulrich Museum, cod. No. HCock-Verlag WB 3.91) (Fig 6.12), and drawing of Maarten van Heemskerck, "View of the construction of the new basilica from the northwest, showing the remains of the old basilica" (Staatliche Museen zu Berlin, n.79, D.2a fol. 15v) (Fig 4.12). These drawings show the north facade, however with this information the south facade can be reconstructed.

6.3.5. East facade of the old basilica of S. Peter (Layout EF-1003)

The drawing of the east facade stands out for the two large towers, although it is only certain that the north tower existed. The north tower was built in the middle of the 8th century, perhaps in the times of the popes Gregory III (731-741) or Zacharias (741-752), and in any case before the year 752, when there is news that the Pope Stephen II (752-757) decorated the existing bell tower, and endowed it with 24 bells. However, it cannot be ruled out that two towers were built, in both lateral rooms to the gate house, symmetrically about the axis of the basilica [35].

In the drawings of the Alfarano, quadrangular stays with large walls are observed inside the two collateral rooms to the gate house to the atrium. The quadrangular stay located to the north corresponds to the base of the known bell tower, while the quadrangular body located to the south corresponds to the *Casa dell’Arciprete*, whose strange design suggests that it was perhaps built taking advantage of the base of an earlier southern bell tower. This suggests two possibilities, either two bell towers were built, and the south bell tower collapsed before the 12th century [36], or the north bell tower was built and the south bell tower was started, but never finished (which, in my opinion understand, it is less likely).

The Romanesque architectural structure of the bell towers has been rebuilt taking into account specially the fresco “Coronation ceremony of Pope Sixtus V Peretti, 1585, Palazzo Apostolico Vaticano, Salone Sistino (Fig. 6.13); and also the fresco made by Giovanni Guerra, "View of the new basilica of S. Peter at the time of the beginning of the transfer of the obelisk", 1586, Palazzo Apostolico Vaticano, Biblioteca Sistina, sala II (Fig. 4.28), as well as the design of similar towers built around this time and that have survived to this day. The drawings proposed by Letarouilly (Le Vatican et la Basilique de

Saint-Pierre de Rome, vol. 1, Cap. Ancienne Basilique de Saint Pierre, planche 6 (Fig. 4.32), and planche 8 (Fig. 4.33)) of the two towers are quite distant from these historical references, so they have no historical validity.

The drawing shows the original access arches to the gate house, already closed, a tutto sesto, in the time of Hadrian I (772-795). The arches were converted into architrave portals and three bronze doors [37]. Between 774 and 776 the main staircase was restored [38]. For this reason, it is to be assumed that it was at this time that the facade was reformed, probably a few years after the two bell towers had been built [39].

In the foreground, on the left side of the main facade, the drawing also shows the Chiesa di S. Apollinare, built in times of Honorius I (625-638) around the southeast corner of the old basilica.

6.3.6. East facade to the atrium of the old basilica of S. Peter (Layout EFA-1003)

The east facade to the atrium barely had any modifications over time. The access doors to the naves were subtly modified, and the mosaics on the facade were repaired. Furthermore, as the paving of the atrium was raised, the columns of the atrium were left without bases.

To reconstruct the appearance of the facade to the atrium, the anonymous drawing, made in the last quarter of the 11th century, has been taken into account (Windsor, Eton College, Cod. Farf. 124, f. 122r.) (Fig. 5.30). This drawing shows the Constantinian facade in the state it had before the reforms carried out by Gregory IX (1227-1241).

6.3.7. West facade of the old basilica of S. Peter (Layout WF-1003)

The west facade of the old basilica did not have important alterations either, with the exception of the union of the two imperial mausoleums to the southern exedra.

6.4. Reconstruction of the appearance of the old basilica of S. Peter in 1505

The most important changes in the architectural structure and appearance of the old basilica of St. Peter took place in the old atrium, now converted into a square surrounded by buildings that were built throughout the late Middle Ages. Important changes were also made to the east facade, especially with the construction of the Lodge of Blessings. On the other hand, in the western part of the old basilica there were the foundations and the lower part of the walls of a new western arm, whose works began in the time of Nicholas V (1447-1455), and were interrupted after his death.

6.4.1. Floor plan of the old basilica of S. Peter (Layout FP-1505)

The plan layout of the old basilica of St. Peter and its surroundings, in the year 1503, was already reconstructed in (stage 23) of the previous chapter. It is included here again in order to have an overview of the appearance that the old basilica of St. Peter could have had in this year.

6.4.2. Cross section of the old basilica of S. Peter (Layout CS-1505)

The section drawing shows, inside the basilica, the modernization changes made to the apse in the time of Innocent III (1198-1216).

The section also shows the two columns to support the Arch of Constantine, badly damaged after a seismic movement, and built in the time of Nicholas V. There is, at the moment, no historical graphic reference to its possible appearance, and in fact neither Alfarano he places them in his drawings. However, Alfarano clearly mentions them in his writings: "*... parastatas duabus etiam magnis columnas ipsis parastatis adhaerentibus suffulciebatur, quem quidem fornicem antiqui arcum triumphalem vocabant…".* The Arch of Constantine was demolished between the years 1544-1545, when Alfarano (1525-1596) was 19 years old, so he had previously been able to personally see the columns of Nicholas V.

There is no news of what kind of damage the Arch of Constantine suffered, but if the solution was to place some columns, it is most likely that the arch needed a better base of support. It is possible that the arch piers were damaged, so the solution would consist of replacing the inner part of the two piers of the arch with two robust columns, similar to the columns of the central nave. These columns would only replace part of the piers in order to make them more robust and with greater load capacity. Therefore, the piers would cut about 8 palmi in their internal part, and in their place the columns attached to the pier would be located. This is why Alfarano would not draw the columns, since their bases were immediately attached to the surviving part of the piers, forming a compact set. These columns of the arches can be clearly seen in the Fresco made by Giulio Romano (Scuola di Raffaello), "Donazione di Costantino", in 1520-1524, Musei Vaticani, Stanze di Raffaello (Fig. 4.26).

The drawing also shows the section of the winter choir attached to the south wall of the basilica (built in the 15th century).

Outside the basilica, in the southern part, the drawing shows the internal changes of the Church of Santa Maria delle Febbre (Cappella di Sant'Andrea), reformed in the 13th

century, and perhaps by Innocent III (1198-1216). The renewed appearance of its interior, with a clear Gothic style, can be clearly seen in the fresco “Veduta della Fabbrica nuova e dell’antico S. Pietro al tempo del trasferimento dell’obelisco”, made by Giovanni Guerra (Palazzo Apostolico Vaticano, Biblioteca Sistina, sala II, made in the year 1586) (Fig. 4.28). The drawing also shows the entrance to the Santa Petronilla and Santa Maria delle Febbre churches.

Sant'Andrea was renamed Santa Maria delle Febbre in the time of Pius II (1458-1464) during whose pontificate the image of the Madonna della Febbre was introduced, to protect the population from malaria, which was a serious threat for the health of the inhabitants of the city from this time to the 19th century. In 1450, the church changed its functions again and became the sacristy of the basilica, a role it played for almost two centuries.

Shortly before the demolition of the Church of Santa Petronilla on the occasion of the beginning of the construction of the new basilica, the rotunda was isolated for a time. In 1575 the building was used as a sacristy by Gregory XIII (1572-1585), who ordered the construction of a corridor that connected the rotunda with the basilica. In 1592-1605 Clement VIII (1592-1605) ordered to connect the sacristy directly to the new basilica through the Clementine Chapel. Michelangelo was very interested in preserving this construction and not demolishing it, and requested that his masterpiece, *La Pietà*, be on this site. Finally, in 1777, Pius VI (1775-1799) decided to demolish the building due to the impossibility of adapting it to new needs.

6.4.3. Longitudinal section of the old basilica of S. Peter (Layout LS-1505)

The longitudinal section shows on the left side the walls of the western arm made by Nicholas V, and inside the basilica, the modernization changes made in the apse in the time of Innocent III (1198-1216). To reconstruct the final appearance of the presbytery has taken into account the drawing of the apsidal hemicycle of the pilgrim Sebastian Werro, en 1581, Friburg, Bibliothèque Cantonale et Universitaire (Fig. 5.26).

To reconstruct the appearance of the interior colonnade, and the north clerestory, has been taken into account the drawing of Domenico Taselli da Lugo (plate 13 and plate 15, Biblioteca Apostolica Vaticana, Arch. Cap. S. Pietro A. 64 ter.) (Figs. 4.45 and 4.46). These drawings show the 11 arches, and the 11 oriental columns (attached to the east counter facade) of the old basilica, the frieze with the clip-on portraits of the popes, the Old Testament paintings, Giotto's angel and the figures of prophets between the windows

with Gothic clerestory. Also has been into account the drawing made by Domenico Taselli da Lugo, in 1600-1610, Biblioteca Apostolica Vaticana, Barb. Lat. 2733, fols. 108 v and 109 r (Fig. 6.14).

In the atrium the Palace of Innocent VIII (1484-1492) is shown, built surpassing the old north wing of the atrium. To reconstruct the appearance of this building, the following drawings have been taken into account: Pieter Coecke van Aelst, “View of the basilica from the southwest” (Biblioteca Apostolica Vaticana, coll. Ashby 329) (Fig. 4.14); Domenico Taselli da Lugo (plate 10, Biblioteca Apostolica Vaticana, Arch. Cap. S. Pietro A. 64 ter.) (Fig. 4.15); Giovanni Antonio Dosio ("Construction of the dome of the new S. Peter, and view of the facade to the atrium of the old basilica (XVI-XVII century)", *GDSU 2555 A* (Fig. 4.19); "View of the obelisk from the east", *GDSU 2536 A* (Fig. 4.20); and Giacomo Grimaldi, “The front of S. Maria in Turri and the access doors to the atrium of S. Peter” (Biblioteca Apostolica Vaticana, Arch. Cap. S. Pietro, H.2, f. 62r (Fig. 4.21), and “Atrium of Old S. Peter”, (Barb. Lat. 2733, 133v and 134r, Biblioteca Apostolica Vaticana) (Fig. 4.22). Finally the anonymous drawing “Detail with atrium of St. Peter, made in 16th century (Palazzi Vaticani, apartment of Giulio III) has been taken into account (Fig. 6.15).

Of course, Letarouilly drawings have also been taken into account, showing the appearance of the basilica between the 4th and 16th centuries (Le Vatican et la Basilique de Saint-Pierre de Rome, vol. 1, Cap. Ancienne Basilique de Saint Pierre, planche 6 (Fig. 4.32), and planche 8 (Fig. 4.33)). Although when comparing with the previous historical references it is confirmed, again, that Letarouilly's drawings are very fanciful and have little historical value.

In the atrium the *cantharus* is shown, as it was represented by Simone Pollaiolo detto il Cronaca, en 1480 (*GDSU Santarelli, 157v*) (Fig. 5.29).

In the area of the facade, the drawing shows the different levels of the Lodge of Blessings, the raised floor of the gate house, and the access stairway, once renovated, with the statue of Saint Paul at the beginning of the north parapet.

6.4.4. South facade of the old basilica of S. Peter (Layout SF-1505)

The south facade shows a subtle rise in ground level (which at the height of the *Severan Mausoleum* was about 6.6 *palmi*) due to the successive compaction and paving works of the roads over time. Thus, the access stairway to the narthex, whose configuration has changed over time, now has about 14 steps.

The drawing also shows the Roman windows of the basilica, with the Gothic clerestory added in the 13th century [40].

In the lower part of the drawing can be seen the conglomeration of buildings that were attached and accumulated around the south wall of the old basilica, throughout the late Middle Ages. Near the obelisk the drawing shows the arch through which the pilgrims accessed to visit the two imperial mausoleums, before entering the basilica through the southern exedra. It has been possible to reconstruct the appearance of these buildings taking into account the fresco made by Giovanni Guerra, "View of the new basilica of S. Peter at the time of the beginning of the transfer of the obelisk", 1586, (Palazzo Apostolico Vaticano, Biblioteca Sistina, sala II) [41] (Fig. 4.28), and also the engraving that he made previously, in the same year 1586, together with Natale Bonifacio da Sebenico, "The transport of the Vatican obelisk" (The British Museum, nº 1892,0714.41) [42] (Fig. 4.25).

The elevation design of these buildings corresponds to the reconstructed plan design in the previous chapter, and which has been based mainly on the precise measurements of the drawing made by Domenico Fontana "Della transportatione dell´obelisco vaticano e della fabriche di nostro signore Papa Sisto V", libro primo, engraver Natale Bonifacio, Roma (1590), f. 15 recto (Fig. 5.46).

To complete details, have also been taken into account the anonymous drawing edited by Lafréry in the 16th century (Metropolitan Museum of Art, cod. 41.72(1.111) (Fig. 6.16); Carlo Fontana's drawing "Templum Vaticanum et ipsus origo", Roma 1694, f. 93 (Fig. 6.17) [43,] and the drawing made by Domenico Fontana "Della transportatione dell´obelisco vaticano e della fabriche di nostro signore Papa Sisto V", libro primo, engraver Natale Bonifacio, Roma (1590), f. 8 recto (Fig. 6.18).

To rebuild the south facade of the basilica it has been very useful the drawing made by Maarten van Heemskerck's "View of the works of the new basilica from the southwest, showing the obelisk and Saint Andrea" (1532-1536) (probably 1534-1535) (Staatliche Museen zu Berlin, n. 79, D.2a fol. 7 r) (Fig. 6.19). In this drawing, the possible common entrance to the two imperial mausoleums (now converted into churches) is clearly appreciated, as well as the chaotic buildings that were attached to the south face of the basilica throughout the Middle Ages. The new and old ruins of this drawing inspired the Painter Pieter Jansz Saeredam to make a painting, almost exact to the drawing, in the year 1629 (National Gallery of Art, cod. 1961.9.34 (Fig. 6.20). To reconstruct the perimetral shape of the attached buildings to the south of the basilica, it has been of special importance the drawing made by Carlo Fontana "Pianta e situatione dell'argani serviti a

l'evare d'opera l'obelisco (Il Tempio Vaticano e sua Origine. Rome, 1694, f. 131) (Fig. 6.21).

6.4.5. East facade of the old basilica of S. Peter (Layout EF-1505)

To reconstruct the appearance of the east facade, the following drawings of Maarten van Heemskerck have been taken into account: "View of S. Peter Square" (Vienna, Albertina, n. 31681) (Fig. 4.8), and "St. Peter's Square with the statue of Marco Aurelio (1532-1536)" (Staatliche Museen zu Berlin, n. 79, D.2a fol. 53r) (Fig. 4.11). It has been very important the fresco painted by Giorgio Vasari "Ritorno di Gregorio XI da Avignone, in 1377 (in 1571-1574) (Fig. 6.22); and the drawing made by Giacomo Grimaldi in 1619 "Old St. Peter façade" (Biblioteca Apostolica Vaticana, Barb. Lat 2733, f. 152v, and 153r) (Fig. 6.23).

The left part of the east facade shows the set of chaotic buildings that were attached to the southern part of the old basilica throughout the Middle Ages.

In the foreground, on the left side of the main facade, the drawing shows the Palace of cardinal Ippolito d'Este, which was built on the Chiesa di S. Apollinare, built in times of Honorius I (625-638) around the southeast corner of the old basilica. This privileged situation for a palace is due to the power that was accumulating over the years. Alexander VI appointed Hippolytus, just 12 years old, cardinal deacon in 1493. Years later, in 1498 he was appointed Archbishop of Milan, in 1502 Archbishop of Capua, and in 1503 Bishop of Ferrara.

In the central part of the facade, granite columns are shown framing the three portals that had previously been built within the three original Roman arches of the basilica in the time of Hadrian I (772-795). The columns were arranged in 1449, because of the Jubilee of Nicholas V (1447-1455).

The drawing also shows four of the eleven sections of the Lodge of Blessings designed by Francesco del Borgo, and whose works began in the time of Pius II (1458-64). The second floor of these sections began in the time of Alexander VI (1492-1503). In 1505 Bramante built the third floor of these four sections, which remain isolated, since due to the beginning of the construction of the new basilica, it was decided to stop the renovation works of the old basilica and not continue with the construction of the loggia.

The drawing shows in the foreground the recently renovated staircase. In 1462 it was completed, and two colossal statues of the apostles Peter and Paul were placed at its sides [44], the statue of Saint Peter on the left and the statue of Saint Paul on the right. The upper

part of the pedestal of the sculptures has a width of respectively 1.37 m and 1.38 m, and a depth of 0.81 m and 0.865 m [45].

At the top of the facade also can be seen the bell tower, recently renovated in 1464, with the new 8-sided pyramid-shaped roof, with a ball, a cross and a gilt-iron flag pole.

6.4.6. East facade to the atrium of the old basilica of S. Peter (Layout EFA-1505)

The east facade shows a pediment with a rose window, and the tympanum renewed to have a prominent cavetto under the cornice frame to protect the mosaics from the rain [46]. The facade reform was carried out in the days of Gregory IX (1227- 1241).

The drawing also shows the *protyrus*, between the central white marble columns of the narthex. Inside the *protyrus* was placed the statue of Saint Peter, made at the end of the 13th century, or the first years of the 14th century. This sculpture was made using the bust of an ancient philosopher to which and added the head of Apostle Peter. The sculpture occupied an elevated position in the protrusion of the narthex, aligning itself with the porta Argentea, located in the center of the main facade to the atrium [47].

The drawing also show, attached to the south perimeter wall of the atrium, a chaotic group of houses and precarious constructions had been built, with direct access to the path that went from San Pietro square to the obelisk

To rebuild the appearance of the south facade to the atrium, several historical drawings have been taken into account, among which the following stand out: the drawing of Giovanni Antonio Dosio ("Construction of the dome of the new S. Peter, and view of the facade to the atrium of the old basilica, XVI-XVII century", *GDSU 2555 A*) (Fig. 4.19); the drawing of Domenico Taselli da Lugo (plate: 10, Biblioteca Apostolica Vaticana, Arch. Cap. S. Pietro A. 64 ter.) (Fig. 4.15); and the drawing Giacomo Grimaldi “Atrium of Old S. Peter” (Barb. Lat. 2733, 133v and 134r, Biblioteca Apostolica Vaticana) (Fig. 4.22).

6.4.7. West facade of the old basilica of S. Peter (Layout WF-1505)

The drawing of the west facade shows the low walls made in the time of Nicholas V, for the construction of a new western arm. The works were interrupted on the death of the Pope, although it is possible that they were resumed briefly in the time of Paul II (1464-1471), probably on the occasion of the Jubilee year of 1475.

Julius II wanted to take advantage of these walls, and especially the foundations, in order to quickly build the western arm of a new building and locate his tomb there. Bramante

finally built an apse following the shape of the walls already built at the same time as the "central nucleus" of a new building with an architectural structure incompatible with it. This was the origin of a tortuous design process, trying ways to integrate both constructions. Given the impossibility of this task, finally the apse of Bramante was demolished by Sixtus V, in 1585.

Notes 6

[1] Some dimensions have been extrapolated by measuring the remains of archaeological excavations from the 40s of the last century. Other measurements are probable conjectures based on Alfarano's writings, and direct measurements on Letarouilly's drawings. The most important dimensions proposed can be found in: Jürgen Christern, 'Der Aufri*ß von Alt-St. Peter', pp. 133-183;* Jürgen Christern and Katharina Thiersch, 'Der Aufri*ß von Alt-St. Peter II',* Richard Krautheimer CBCR V, vol. V, pp, 251-256; Achim Arbeiter, *Alt-St. Peter in Geschichte und Wissenschaft. Abfolde der Bauten, Reconstruktion, Architekturprogramm*, pp. 144-166

[2] In a previous work (and in a previous chapter) it has been possible to reconstruct to scale, and with great precision, the project of the *old basilica of S. Peter*: Luis De Garrido, *Reconstruction of the stages of the design process and architectural definition of the project of the old basilica of Saint Peter in Vatican*. 2020. Submitted and under review.

[3] These columns were removed in 1612 as the construction of the new basilica was extended eastward. See: Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', in *San Pietro. Storia di un Monumento* (Milano: Jaca Book, 2015), p. 45

[4] *Le Liber Pontificalis. Texte, introduction et commentaire par L. Duchesne*, I-II t., Paris 1886-1892 e III t., Additions et corrections de Mgr L. Duchesne, C. Vogel ed. (Paris: Boccard, 1955-1957), p. 97 c. 96; Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', in *San Pietro. Storia di un Monumento*, p. 46

[5] Paolo Liverani, 'La basilica di San Pietro e l'orografia del colle Vaticano', in *Acta Congresus Internationalis XIV Archaeologie Christianae* (Vienna and Vatican City, 2006), pp. 502-503

[6] Christoph Luitpold Frommel, *Architettura e Committenza, Da Alberti a Bramante* (Mantova: Leo S. Olschki, 2006), p. 117

[7] Hugo Brandenburg, 'L'antica basilica constantiniana di S. Pietro', image in page 90; Richard Gem, 'From Constantine to Constans. The chronology of the construction of Saint Peter's basilica', in Rosamond McKitterick; John Osborne; Carol M. Richardson and Joanna Story (eds.), *Old Saint Peter's, Rome* (Cambridge: Cambridge University, 2013), p. 50

[8] Bruno Maria Apollonj Ghetti, Antonio Ferrua, Enrico Josi, Engelbert Kirschbaum, *Esplorazioni sotto la confessione di San Pietro in Vaticano eseguite negli anni 1940-1949*, pp. 33-4, 79-81, 153; Richard Krautheimer CBCR V, vol. V, pp. 187-8; Richard

Gem, 'From Constantine to Constans. The chronology of the construction of Saint Peter's basilica', p. 50

[9] Patrick M. Bruun, 'Constantine and Licinius, AD 313-337', in C.H.V. Sutherland and R.A. G. Carson (eds.), *The Roman Imperial Coinage, VII* (London, 1966), p. 249 nº 148; Bruno Maria Apollonj Ghetti, Antonio Ferrua, Enrico Josi, Engelbert Kirschbaum, *Esplorazioni sotto la confessione di San Pietro in Vaticano eseguite negli anni 1940-1949*, relazione a cura di Bruno Maria Apollonj Ghetti, Antonio Ferrua, Enrico Josi, Engelbert Kirschbaum, Prefazione di Mons, L. Kaas, Appendice numismática di C. Serafini, 2 vols. (Vatican City: Tipografia Poliglotta Vaticana, 1951), vol. 1, pp. 55-148

[10] Bruno Maria Apollonj Ghetti, Antonio Ferrua, Enrico Josi, Engelbert Kirschbaum, *Esplorazioni sotto la confessione di San Pietro in Vaticano eseguite negli anni 1940-1949*, pp. 156, 157-8; Richard Gem, 'From Constantine to Constans. The chronology of the construction of Saint Peter's basilica', p. 54

[11] Giacomo Grimaldi, *La Descrizione della basilica antica di S. Pietro in Vaticano, Codice Barberini latino 2733*, Giacomo Grimaldi and edited by Reto Niggl (Vatican City: Biblioteca apostólica Vaticana, 1972); BAV, Barb. Lat. 2733, f. 149v, Reto Niggl (ed.), *Giacomo Grimaldi. Descrizione della Basilica Antica di S. Pietro in Vaticano (1619). Codice Barberini Latino 2733, Vatican City, 1972*, p. 185; Richard Krautheimer CBCR V, vol. V, pp. 171-285

[12] Federico Guidilbaldi and Alessandra Giuglia, *Pavimento marmorei di Roma dal IV al IX secolo*, Pontificio Istituto di Archeologia Cristiana (Vatican City, 1983), pp. 199-201

[13] Tiberio Alfarano, m. 1596, and Michele Cerrati, *Tiberii Alpharanii. De Basilicae Vaticanae Antiquissima et Nova Structura*

[14] Ralf Biering and Henner von Hesberg, 'Zur Bau und Kultgeschichte von St. Andreas apud S. Petrum. Vom Phrygianum zum Kenotaph Theodosius d. Gr.?', in *Römische Quartalschrift*, 82 (1987), pp. 145-182; Ferdinando Castagnoli, *II Circo di Nerone in Vaticano*, Atti della Pontificia Accademia Romana di Archeologia. Rendiconti 32 (1959-60), pp. 97-121

[15] *Le Liber Pontificalis. Texte, introduction et commentaire par L. Duchesne*, I, p. 261; Ralf Biering and Henner von Hesberg, Zur Bau und Kultgeschichte von St. Andreas apud S. Petrum. Vom Phrygianum zum Kenotaph Theodosius d. Gr.?', pp. 145-182; Jens Niebaum, 'Die spätantiken Rotunden an Alt St. Peter in Rom', in *Marburger Jahrbuch für Kunstwissenschaft*, 34 (2007), pp. 101-161; Nancy Rasch, 'Boniface VIII and

honorific portraiture: observations on the halflenght image in the Vatican', in *Gesta*, 26 (1987), pp. 47-58

[16] Hugo Brandenburg, 'L'antica basilica constantiniana di S. Pietro', p. 29

[17] Hugo Brandenburg, 'L'antica basilica constantiniana di S. Pietro', pp. 10-11

[18] Bryan Wards-Perkins, 'The Shrine of St. Peter and Its Twelve Spiral Colums', in *Journal of Roman Studies*, 42 (1952), pp. 21-33; Barbara Nobiloni, 'Le colonne *vitinee* della basilica di San Pietro a Roma', in *Xenia Antiqua* 6 (1997), pp. 81-142

[19] Hugo Brandenburg, 'L'antica basilica constantiniana di S. Pietro', p. 16

[20] Hugo Brandenburg, 'L'antica basilica constantiniana di S. Pietro', p. 29

[21] Jean Charles Picard, 'Les origines du mot Paradisus-Parvis', in *Melanges de l'Ecole Française de Rome. Moyen age, temps moderns*, 83 (1971), pp. 171-72

[22] Tiberio Alfarano, m. 1596, and Michele Cerrati, *Tiberii Alpharanii. De Basilicae Vaticanae Antiquissima et Nova Structura*

[23] Gabriele Bartolozzi Casti, *La Basilica Vaticana tra Medioevo e Rinascimento: la distruzione del Mausoleo degli Anici*, in Atti della Pontificia Accademia romana di archeologia, rendiconti in serie (2010/2011), pp. 427-455

[24] Hugo Brandenburg, 'L'antica basilica constantiniana di S. Pietro', p. 29

[25] *Liber Pontificalis. Texte, introduction et commentaire par L. Duchesne*, I-II t., Paris 1886-1892 e III t., Additions et corrections de Mgr L. Duchesne, C. Vogel ed. (Paris: Boccard, 1955-1957), I, p. 98 c. 28; Vittorio Lanzani, *"Gloriosa Confessio". Lo splendore del sepolcro di Pietro da Constantino al Rinascimento, in La Confessione nella basilica di San Pietro*, a cura di Alfredo Maria Pergolizzi (Milano: Silvana Editoriale, Cinisello Balsamo 1999), pp. 10-41

[26] Sible De Blaauw, *Cultus et decor. Liturgia e architettura nella Roma tardoantica e medievale. Basilica Salvatoris, Sanctae Marie, Sancti Petri*, 2 voll., Biblioteca Apostolica Vaticana (Vatican City, 1994), pp. 579, 659

[27] Liber Pontificalis 1957, p. 34, c. 16

[28] Liber Pontificalis 1957, vol. I, p. 176 (*Silvestro*), p. 312 (*Gregorio Magno*); Richard Krautheimer, *Roma: Profile of a city, 312-1308* (Princeton, 1980), p. 263

[29] Bruno Maria Apollonj Ghetti, Antonio Ferrua, Enrico Josi, Engelbert Kirschbaum, *Esplorazioni sotto la confessione di San Pietro in Vaticano eseguite negli anni 1940-1949*, vol. 1, pp. 173-193

[30] Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', in Hugo Brandenburg, Antonella Ballardini, and Christof Thoenes, *San Pietro. Storia di un Monumento* (Milano: Jaca Book, 2015), p. 47

[31] Liber Pontificalis 1957, p. 97, c. 57

[32] Antonella Ballardini, *La basilica di S. Pietro nel Medioevo*, p. 46

[33] Liber Pontificalis 1957, p. 455; Paolo Liverani, *La topografia antica del Vaticano*, (Vatican City: Edizioni Musei Vaticani, 1999), pp. 5-38

[34] Antonella Ballardini, *La basilica di S. Pietro nel Medioevo*, p. 47

[35] Antonella Ballardini, *La basilica di S. Pietro nel Medioevo*, p. 35

[36] Antonella Ballardini, *La basilica di S. Pietro nel Medioevo*, p. 45

[37] Liber Pontificalis 1957, p. 97 c. 96; Antonella Ballardini, 'La basilica di S. Pietro nel Medioevo', p. 46

[38] Liber Pontificalis 1957, p. 97 c. 57

[39] Antonella Ballardini, *La basilica di S. Pietro nel Medioevo*, p. 46

[40] Eugène Müntz, *Les arts à la cour des papers pendant le XVe e le XVIe siècle*, 3 voll, in 1, Olms Zürich (New York: Hildesheim, 1983), pp. 112-114

[41] Giovanni Guerra made this fresco in the Palazzo Apostolico Vaticano, Biblioteca Sistina, sala II, in the year 1586, faithfully following an engraving that he made previously, in the same year 1586, together with Natale Bonifacio da Sebenico, (which is preserved in The British Museum, nº 1892,0714.41.

[42] Domenico Fontana, *Della transportatione dell´obelisco vaticano e della fabriche di nostro signore Papa Sisto V* (Roma: Domenico Basa, 1590)

[43] The original edition of this book in which this image is: Carlo Fontana, '*Il Tempio Vaticano e sua origine. Con gli edifici più cospicui antichi e moderni fatti dentro, e fuori di esso*' (Roma 1694), Stamperia di Gio, impresor *Giovanni Francesco Buagni*; There is also a recent literal reprint: Carlo Fontana, "*Il Tempio Vaticano e sua origine. Con gli edifici più cospicui antichi e moderni fatti dentro, e fuori di esso*", *Giovanni Francesco Buagni* (Roma 1694), reprinted by Isha Books (New Delhi, 2013); and also a current edition: Carlo Fontana, m. 1694, and Giovanna Curcio, *Il Tempio Vaticano 1694* (Milano: Electa, 2003)

[44] Christoph Luitpold Frommel, *Architettura e Committenza, Da Alberti a Bramante*, p. 118

[45] Vincenzo Forcella, *Iscrizioni delel chiese e d'altri edifici di Roma* (Roma, 1869-1884), XII, p. 143

[46] Antonella Ballardini, *La basilica di S. Pietro nel Medioevo*, p. 48

[47] Angiola Maria Romanini, *Roma anno 1300*, pp. 57-89; Antonella Ballardini, *La basilica di S. Pietro nel Medioevo*, p. 50

FIGURES 6

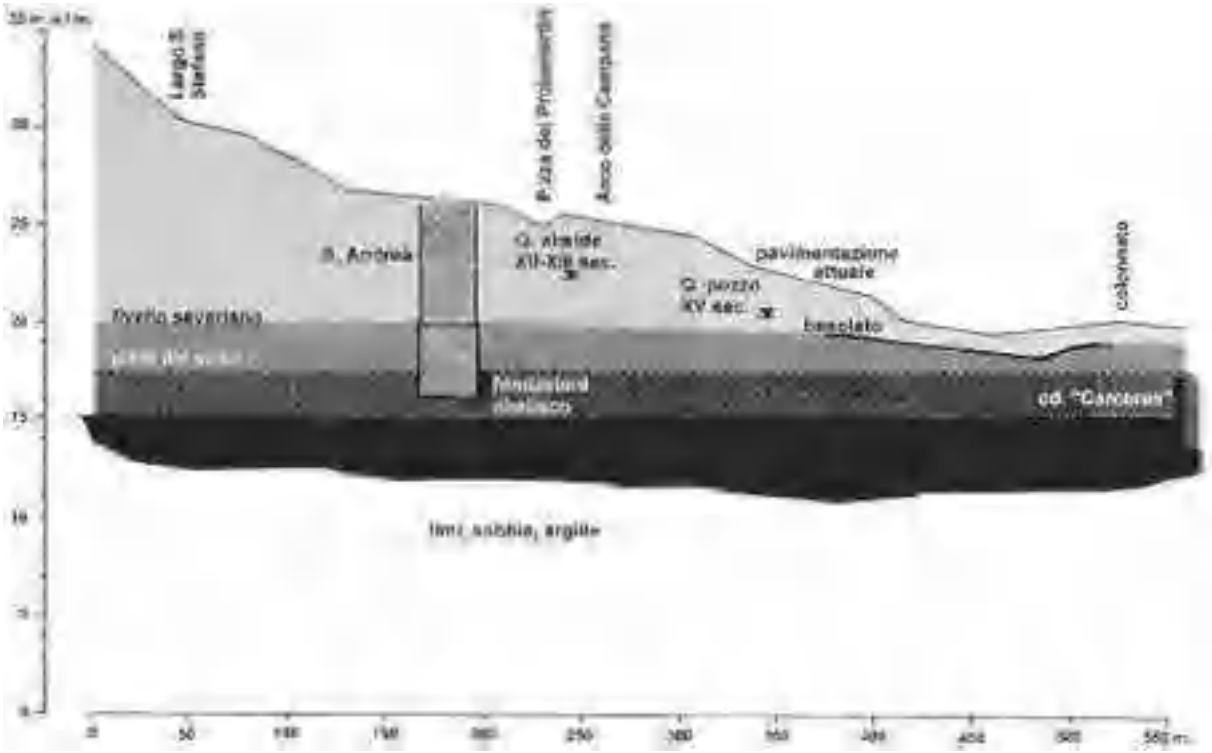


Figure 6.1

Magi section revised and corrected (to highlight the differences in height and the abscissas have different scales)

Paolo Liverani

Liverani, Paolo. *La Basilica di S. Pietro e l'orografia del colle Vaticano*. Vatican City: Monumenti, musei e gallerie pontificie (2006), tafel 173

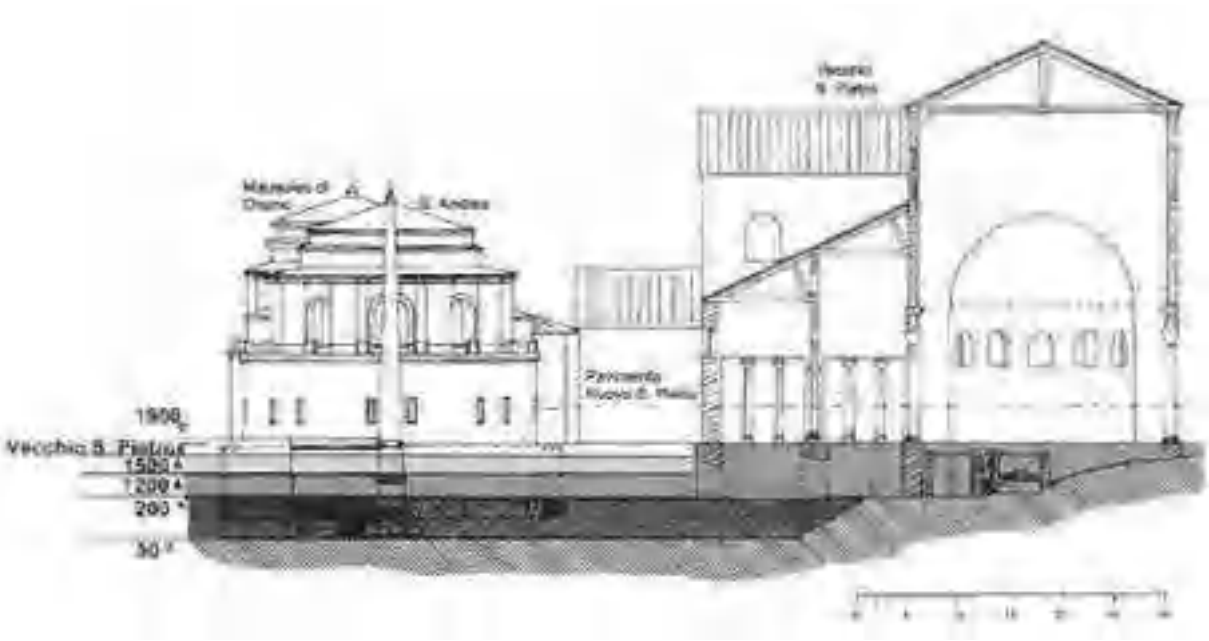


Figure 6.2

Succession of levels downstream of the Basilica

Paolo Liverani

Liverani, Paolo. *La Basilica di S. Pietro e l'orografia del colle Vaticano*. Vatican City: Monumenti, musei e gallerie pontificie (2006), tafel 173

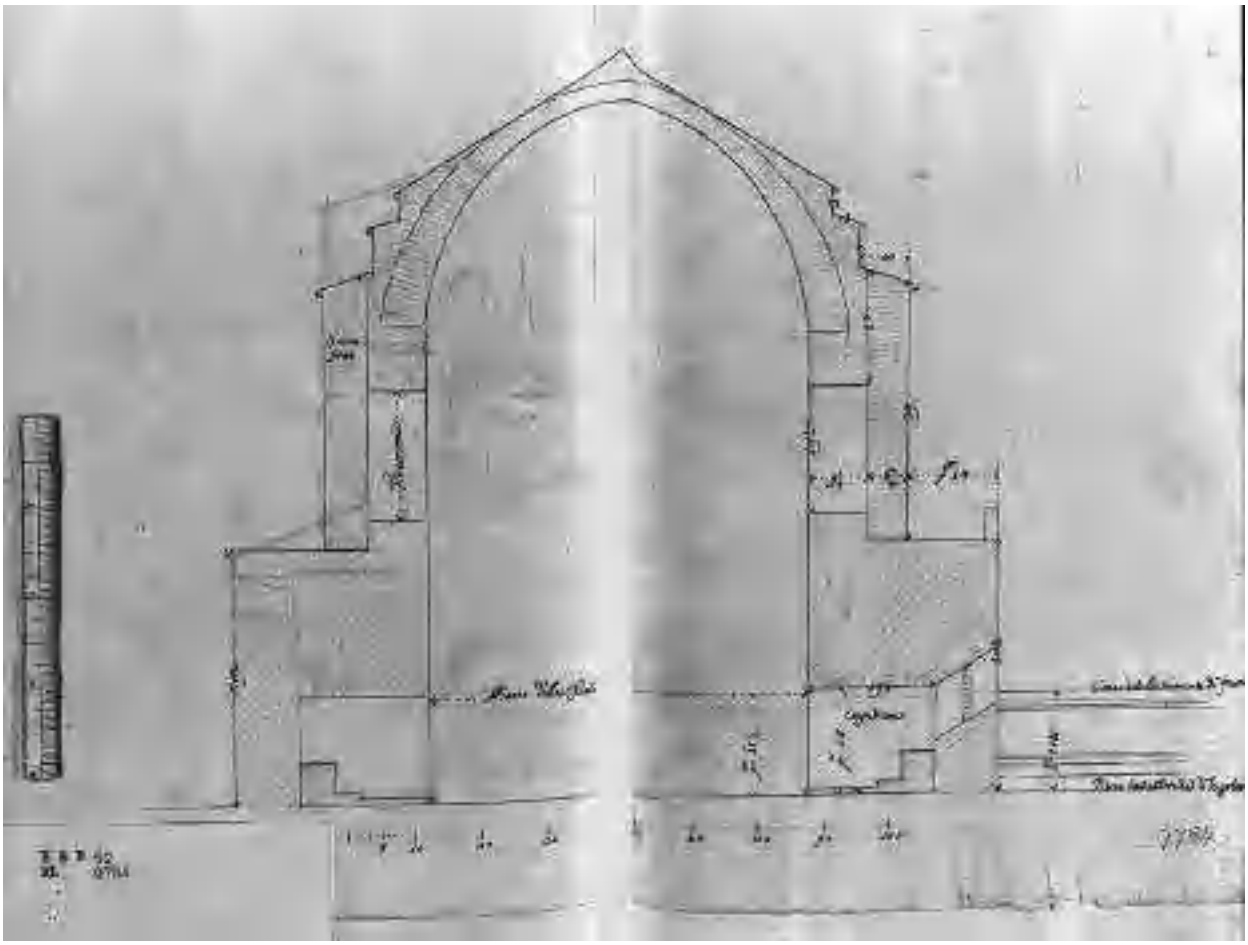


Figure 6.3

Section of *Madonna della Febbre*

Carlo Fontana

Royal Collection Trust, RCIN 909784

Figure 6.4

Sacre de Charlemagne. The coronation of Carlo Magno in San Peter in the 800's, In the medieval conformation of the basilica the rotae that adorned the floor are visible

Jean Fouquet, 1460

Grandes Chroniques de France. Bibliothéque National de France, Fr. 6465, f. 89v

Figure 6.5

Drawing of the mosaic of the Apse of the Old Basilica of S. Peter

Biblioteca Apostolica Vaticana, Barb. Lat. 4410, f. 28r

Figure 6.6

The apse mosaic of S. Peter before its destruction in the parchment signed by the notary Quintiliano Gargario, 1592

Biblioteca Apostolica Vaticana, Arch. Cap. S.Pietro A. 64ter, f.50

Figure 6.7

Apsida veteris Vaticanum ab Inocentio III. Watercolor mosaic of the apse of the Old Basilica

Giacomo Grimaldi, 1594

Biblioteca Apostolica Vaticana, Barb. Lat. 2733, f. 158v and 159r

Figure 6.8

Crossing pillars of new San Peter and the rest of the northern cross arm of the old Basilica

Maarten van Heemskerck, 1532-1536

Staatliche Museen zu Berlin, Kupferstichkabinett, no. 79 D 2, f. 13 recto

Figure 6.9

View of San Peter's Basilica from the left side

Maarten van Heemskerck, 1534-1535

Staatliche Museen zu Berlin, Kupferstichkabinett, nro. 79 D 2 a, f. 51 recto

Figure 6.10

View of S. Peter from the south-east, towards the Cappella del Re and the sacristy, in the summer of 1580 (view of Francoforte)

Attributed to Maarten van Heemskerck (16th century Netherlandish school), 1580-1582

Frankfurt, Städelsches Kunstinstitut, cod. 814

Figure 6.11

View of San Peter from borgo Santo Spirito

Anonymous, Flemish (16th century Netherlandish school), late 1544

Biblioteca Apostolica Vaticana, cod. Ashby 330

Figure 6.12

San Peter in construction

Hieronymus Cock, 1561

Heinrich von Geymüller. *Die ursprünglichen Entwürfe für Sanct Peter in Rom von Bramante, Raphael Santi, Fra Giocondo, den Sangallo's u.a.m*. Wien, (1875). Planche 49, fig 2

Herzog Anton Ulrich Museum, Virtuelles Kupferstichkabinett, cod. HCock-Verlag WB 3.91

Detail

Figure 6.13

Coronation ceremony of Pope Sisto V Peretti. In the image, wich shows the left side of the basilica, is visible the obelisk that will be slowly transported to the front at the behest of Pope Sisto V, Fresco

Giovanni Guerra, 1585

Palazzo Apostolico Vaticano, salone Sistino

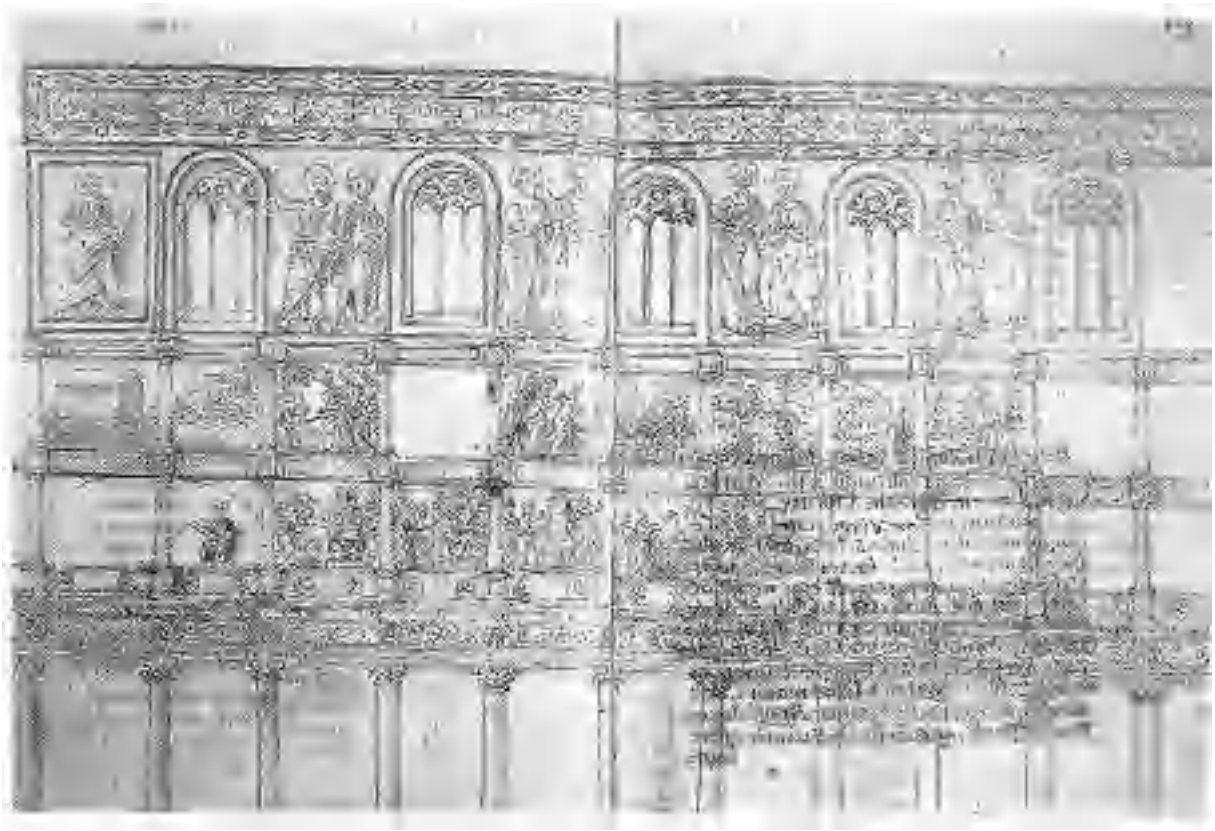


Figure 6.14

The northern colonnade from the eleventh column to the counter-facade; the frieze with the clipeate portraits of the popes; the paintings of the old testament; Giotto's angel and the figures of prophets between the windows with gothic tracery

Domenico Taselli

Biblioteca Apostolica Vaticana, Barb. Lat. 2733, f. 108v y 109r

Figure 6.15

Detail with atrium of St. Peter

Anonymous, 16th century

Palazzi Vaticani, apartment of Giulio III

Figure 6.16

The Vatican obelisk

Anonymous and Antonio Lafréry, 16th century

The Metropolitan Museum of Art, cod. 41.72(1.111)

Figure 6.17

Carlo Fontana

Carlo Fontana. *Il tempio Vaticano e sua origine. Con gli edifice piú cospicui antichi e moderni fatti dentro e fuori di esso.* Rome (1694), p. 93

Figure 6.18

Domenico Fontana

Domenico Fontana. *Della trasportatione dell'obelisco vaticano et delle fabriche di nostro signore Papa Sisto V*, libro primo. Engraver Natale Bonifacio. Roma (1590), p. 8 recto

Figure 6.19

View of the works of the new basilica from the southwest, showing the obelisk and S. Andrea

Maarten van Heemskerck, 1534-1535

Staatliche Museen zu Berlin, Kupferstichkabinett, no. 79 D 2 a, f. 7 recto

Figure 6.20

Church of Santa Maria della Febbre. Saenredam did not paint the state of things in 1629 (then, saint Peter's was completed, and the obelisk had been transferred to the Piazza). He rather used a drawing by Maarten van Heemskerck from about 1532 and unhistorically stressed the romanticism of ruins. Even on the new substruction of Sant Peter's he placed weeds

Pieter Jansz Saenredam, 1629

National Gallery of Art, cod. 1961.9.34

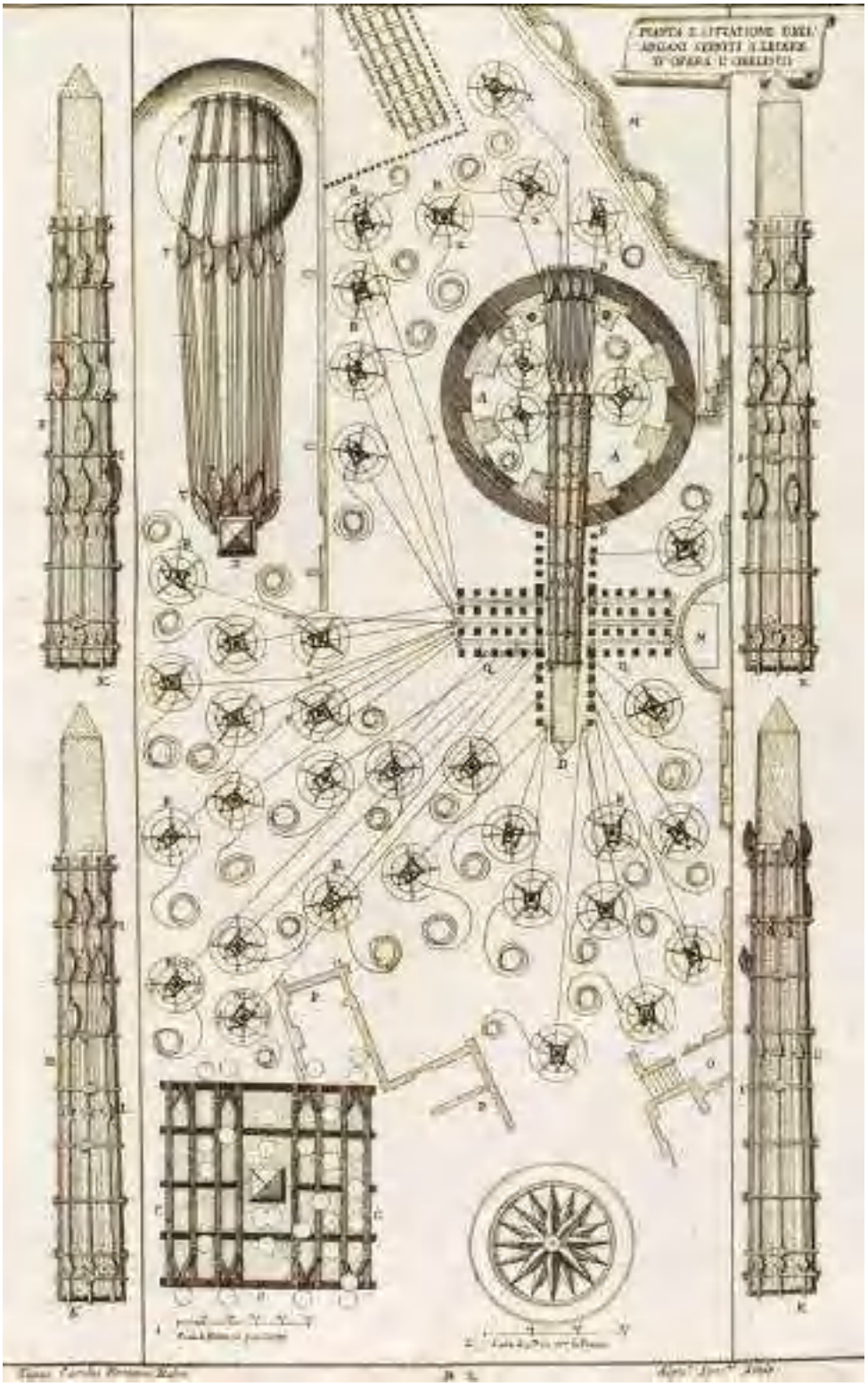


Figure 6.21

Pianta e situatione dell'argani serviti a'levare d'opera l'obelisco

Carlo Fontana e Alessandro Specchi

Carlo Fontana. *Il tempio Vaticano e sua origine. Con gli edifice piú cospicui antichi e moderni fatti dentro e fuori di esso.* Rome (1694). f. 131

Figure 6.22

Ritorno di Gregorio XI da Avignone, in 1377

Fresco by Giorgio Vasari. 1571-1574

Sala Regia, Palazzo Apostolico, Rome

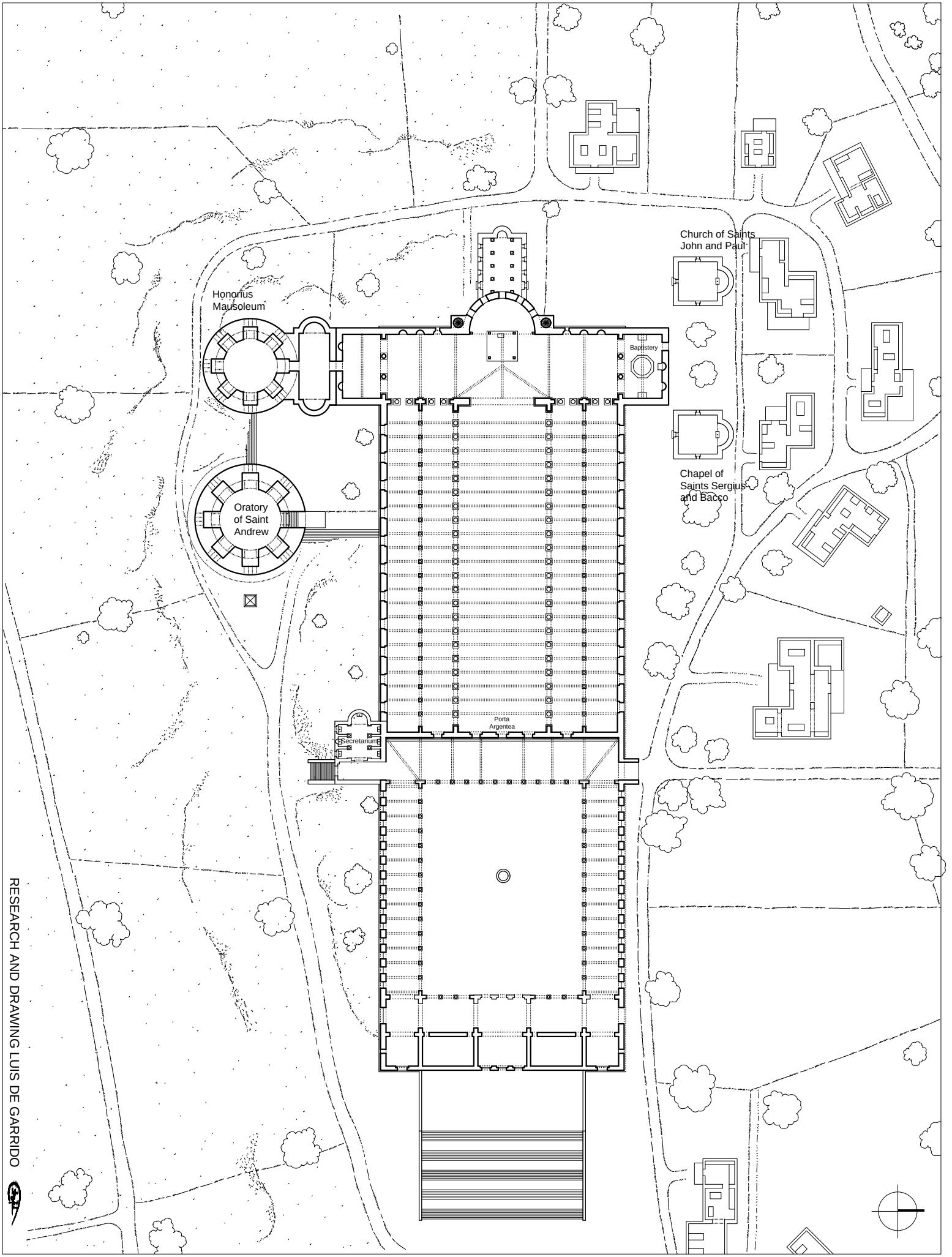
Figure 6.23

Old St. Peter's facade

Giacomo Grimaldi, 1619

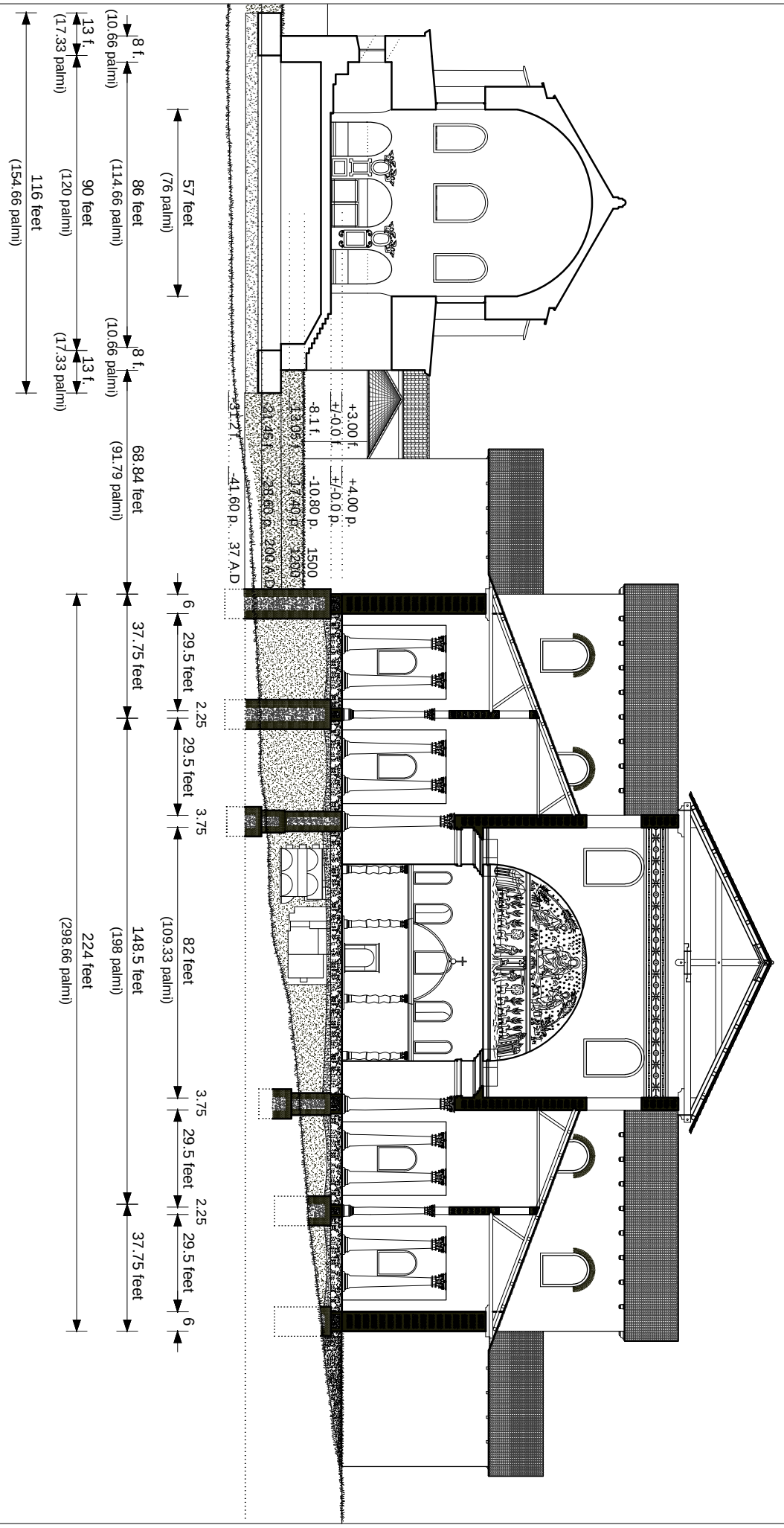
Biblioteca Apostolica Vaticana, Barb. Lat 2733, f. 152 v and 153 r

LAYOUTS 6



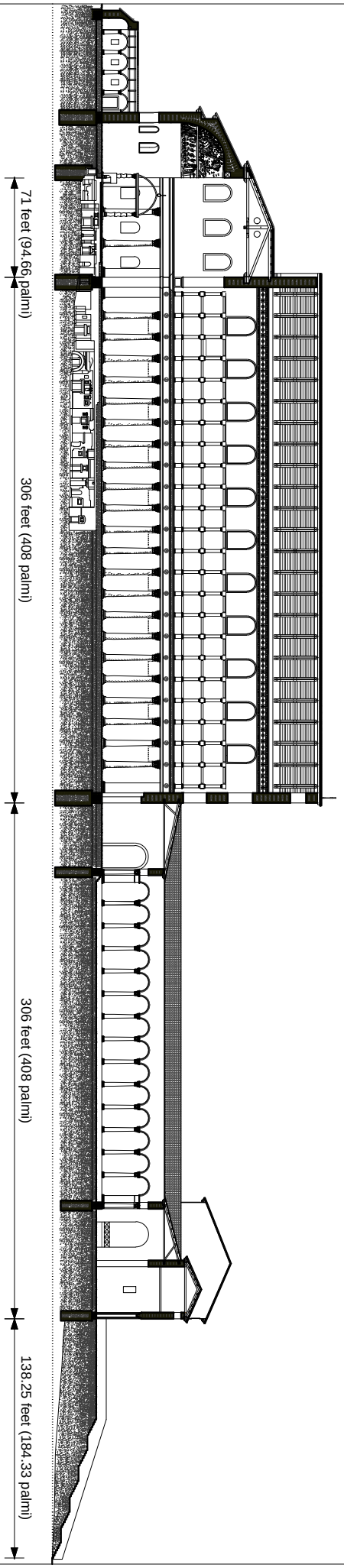
RESEARCH AND DRAWING LUIS DE GARRIDO

514 A.C	SYMMACHUS (498-514). OLD BASILICA OF S. PETER FINISHED	OSP	FP-514



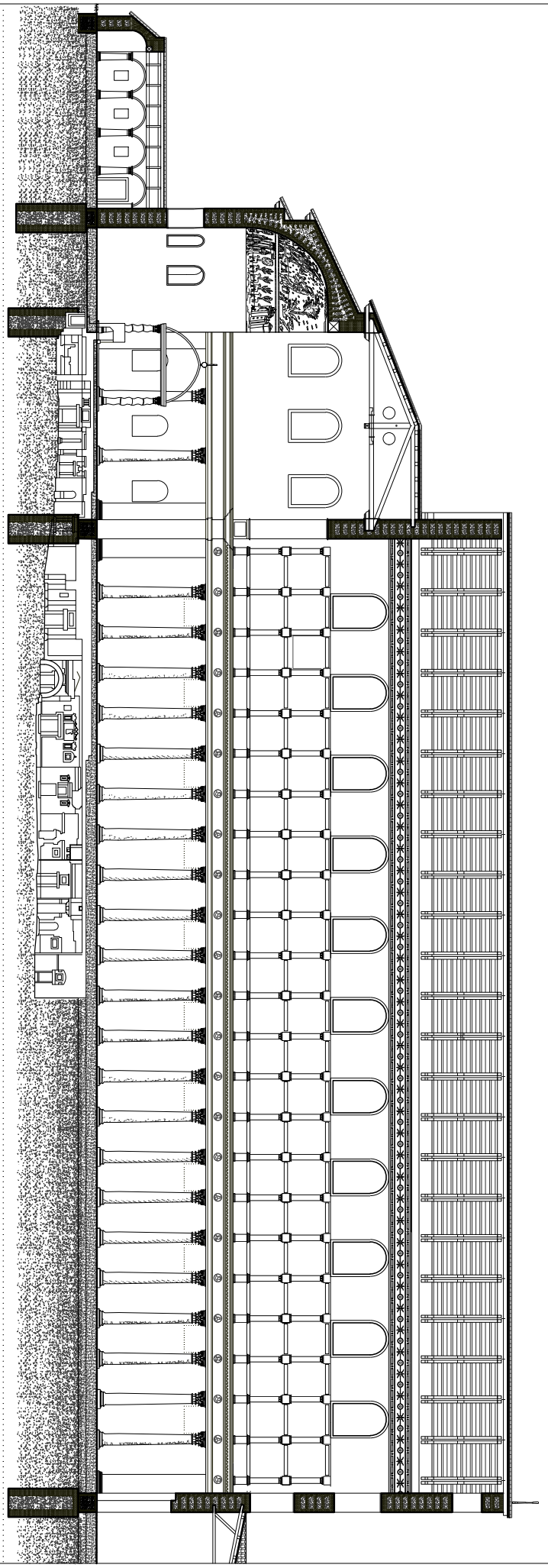
RESEARCH AND DRAWING LUIS DE GARRIDO

514	Cross section of the old basilica of S. Peter	OSP	CS-514

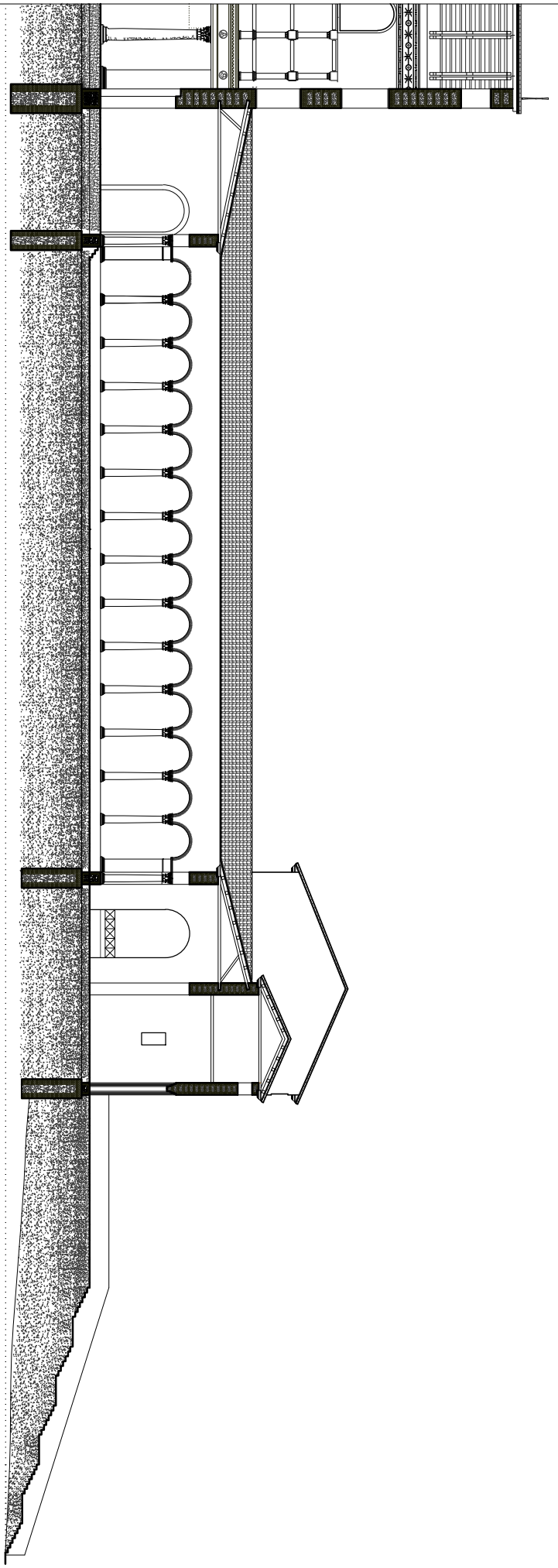


RESEARCH AND DRAWING LUIS DE GARRIDO

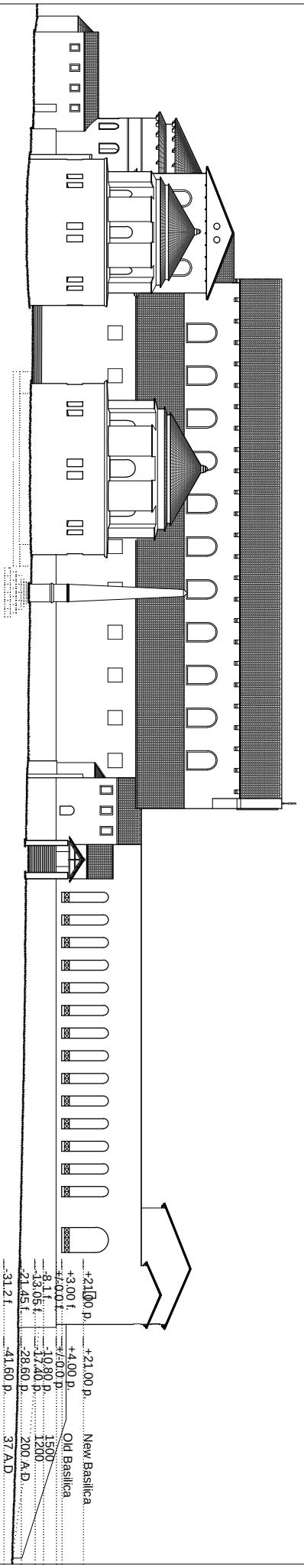
514	Longitudinal section of the old basilica of S. Peter, in 1003	OSP	LS-514



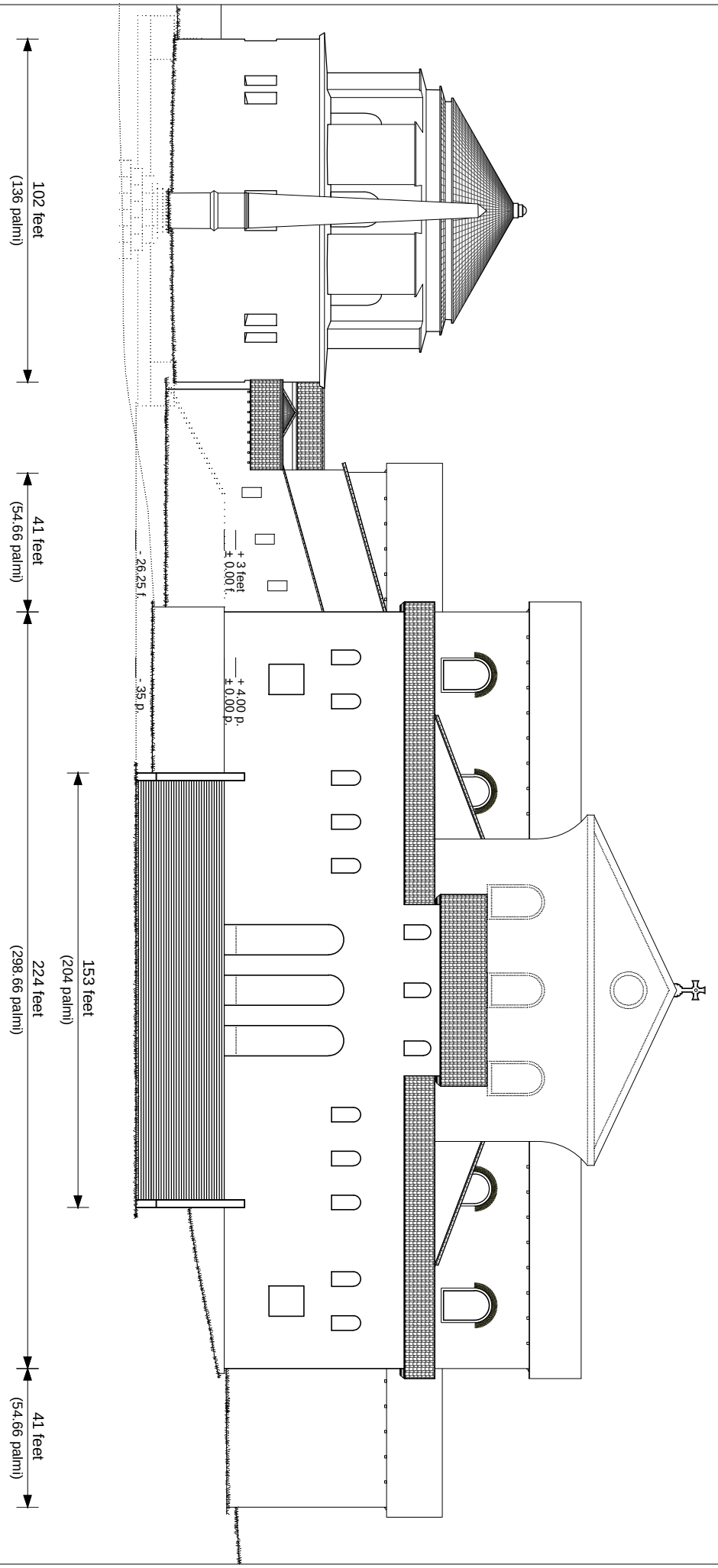
RESEARCH AND DRAWING LUIS DE GARRIDO



RESEARCH AND DRAWING LUIS DE GARRIDO

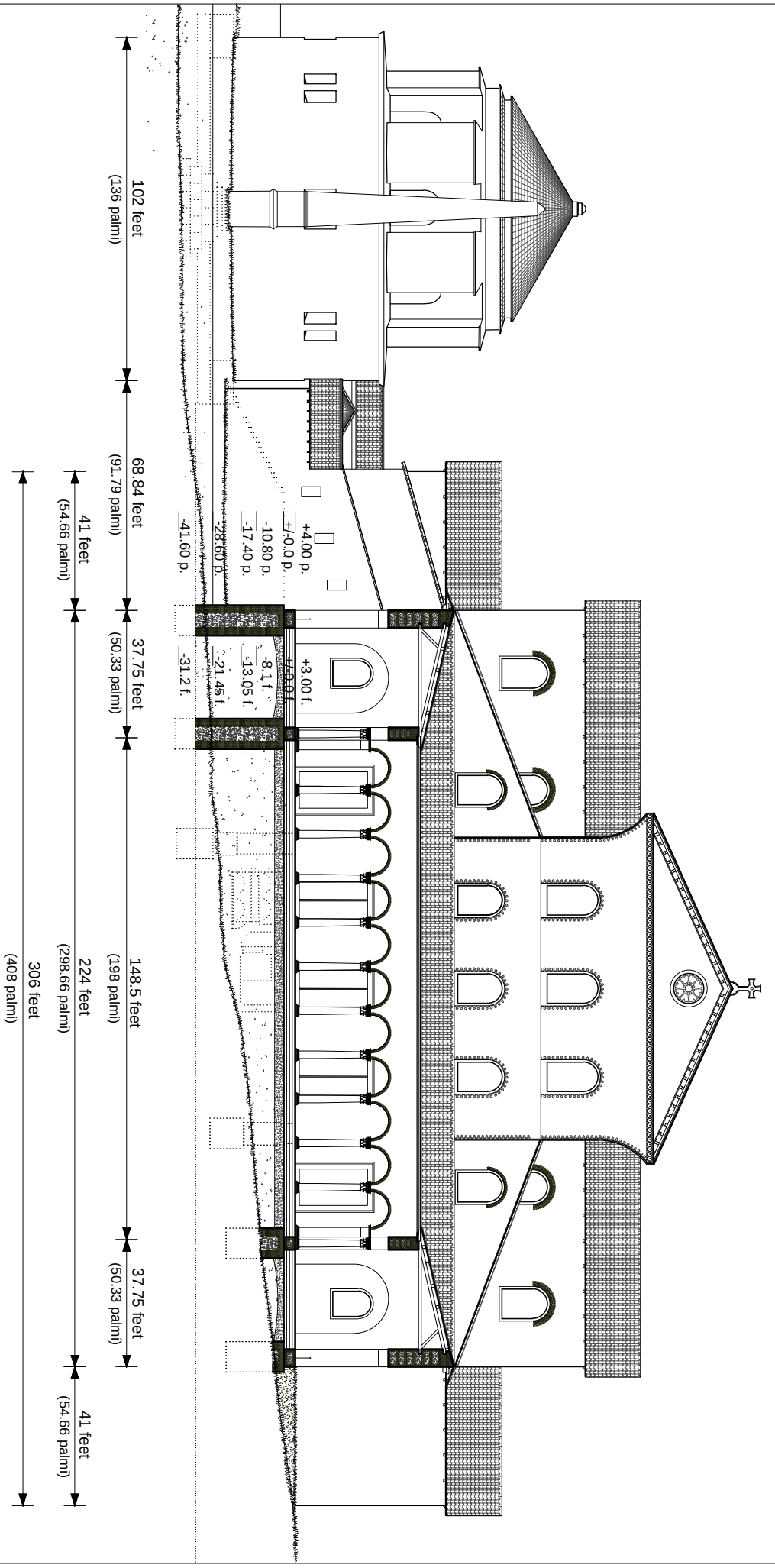


RESEARCH AND DRAWING LUIS DE GARRIDO



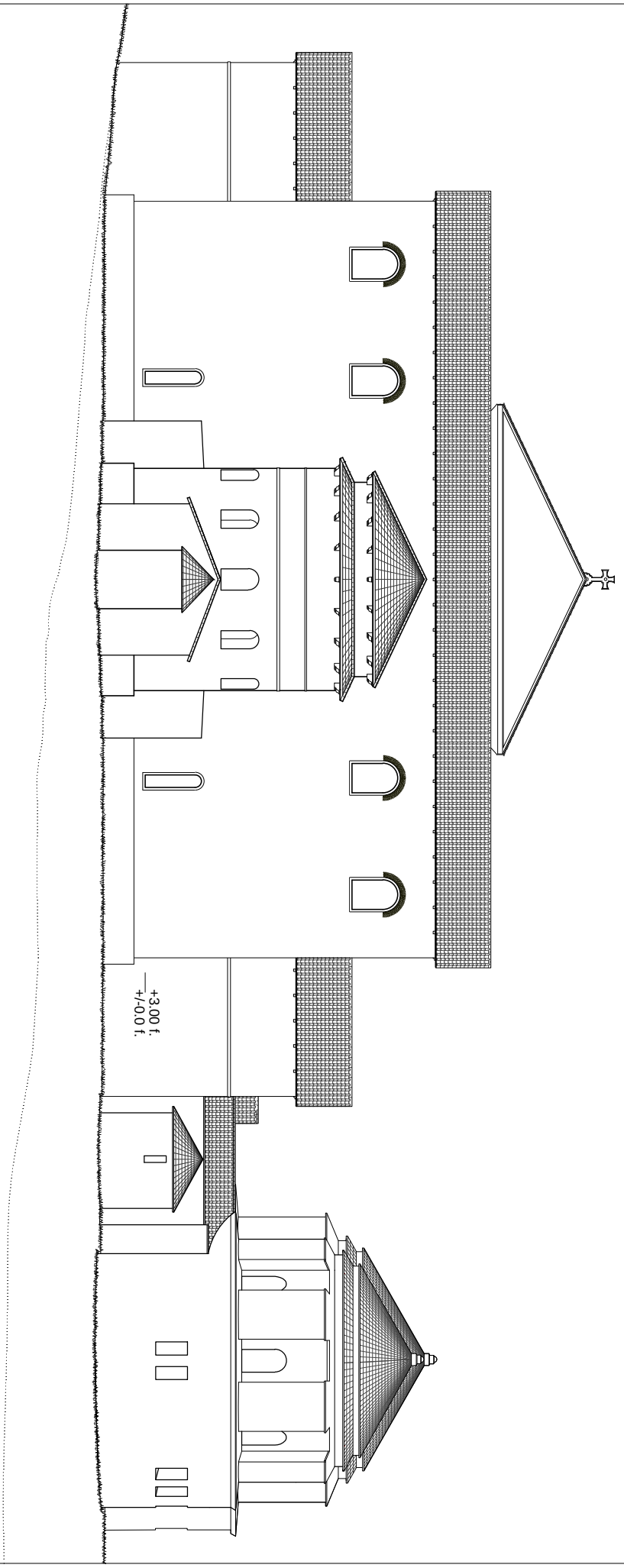
RESEARCH AND DRAWING LUIS DE GARRIDO

514	East Facade of the old basilica of S. Peter	OSP	EF-514



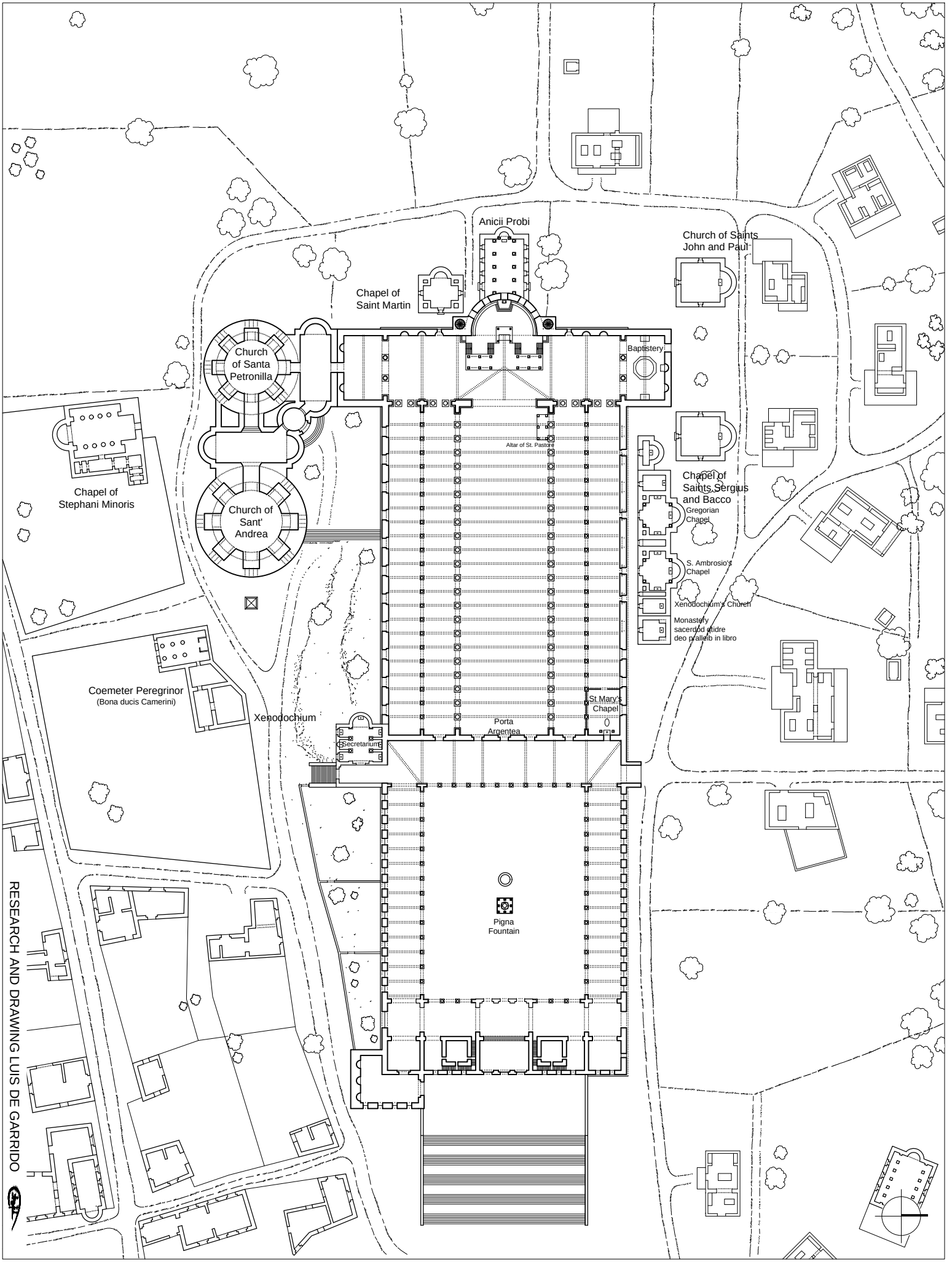
RESEARCH AND DRAWING LUIS DE GARRIDO

514	East facade of the atrium of the old basilica of S. Peter	OSP	EFA-514

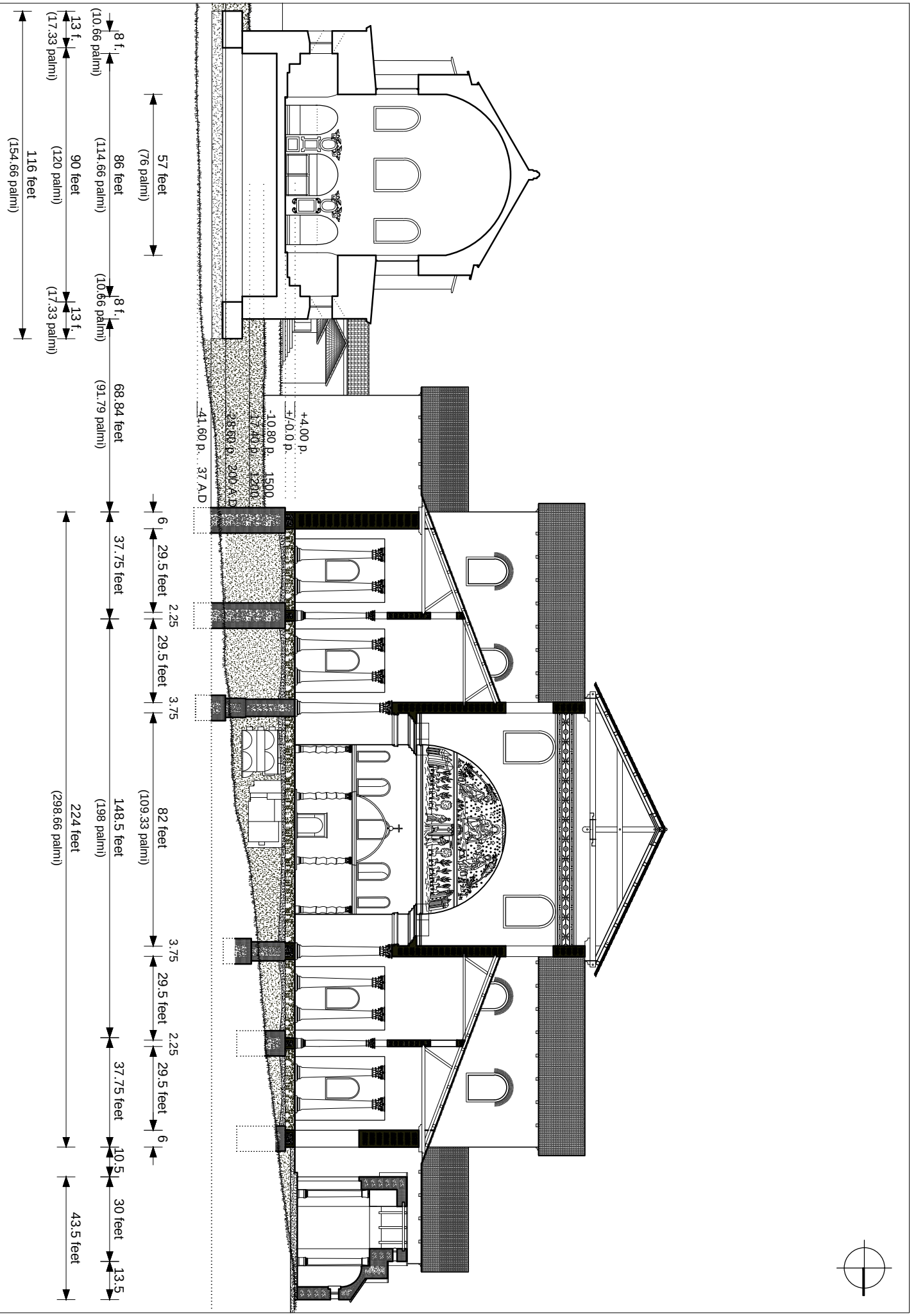


RESEARCH AND DRAWING LUIS DE GARRIDO

514	West Facade of the old basilica of S. Peter	OSP	WF-514

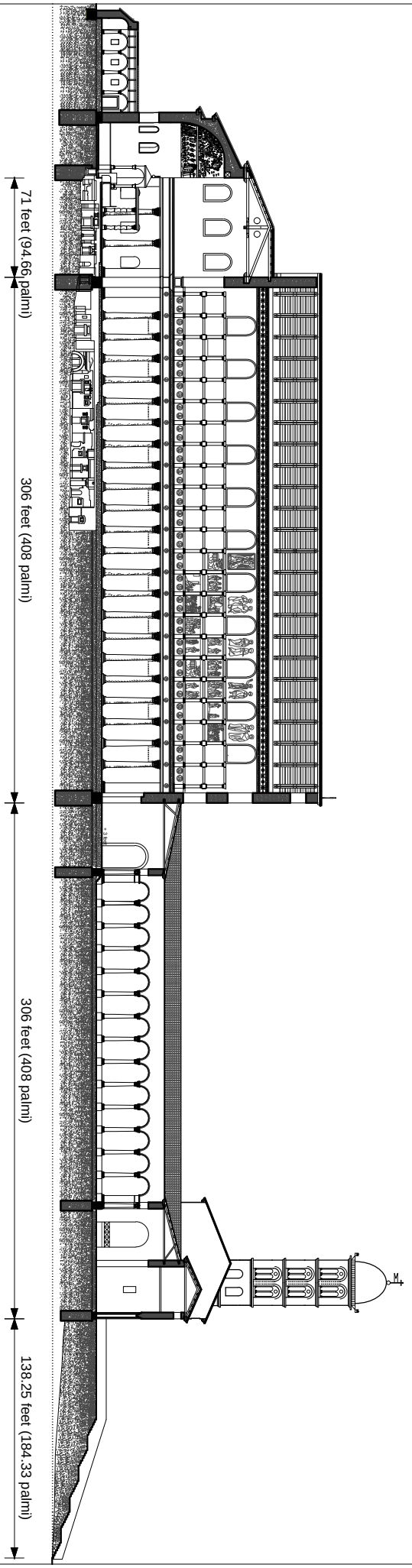


1003 A.C	SILVESTER II (999-1003)	OSP	FP-1003



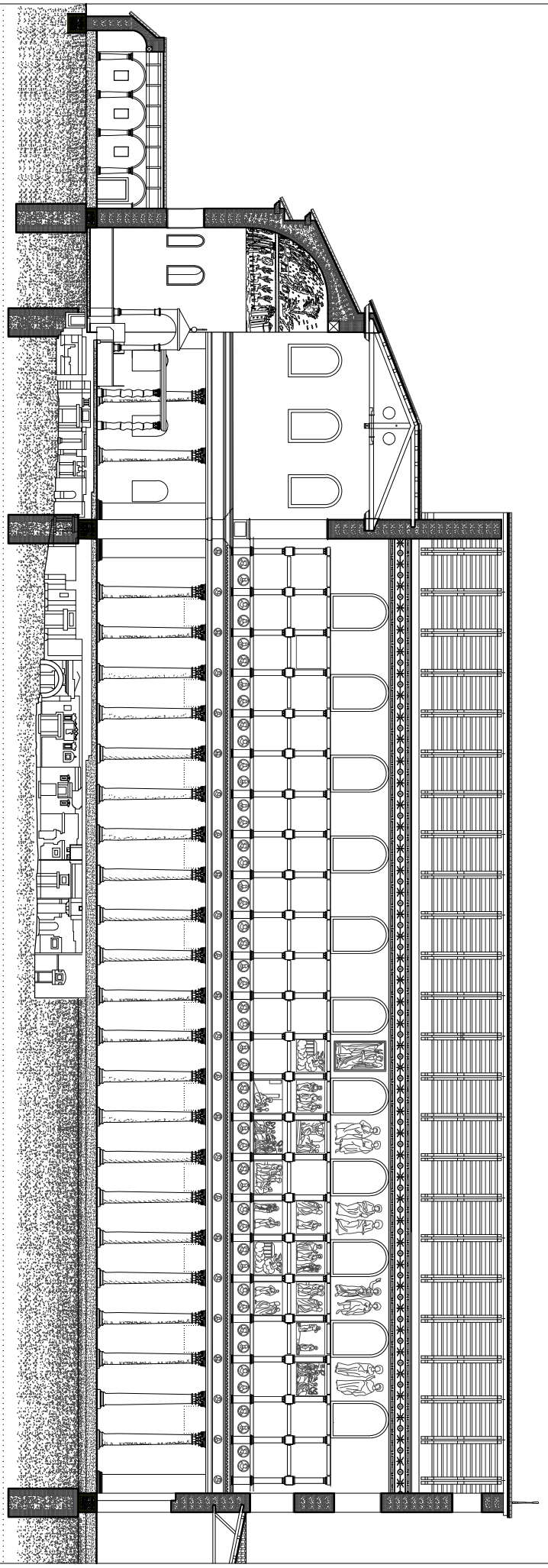
RESEARCH AND DRAWING LUIS DE GARRIDO

1003	Cross section of the old basilica of S. Peter	OSP	CS-1003



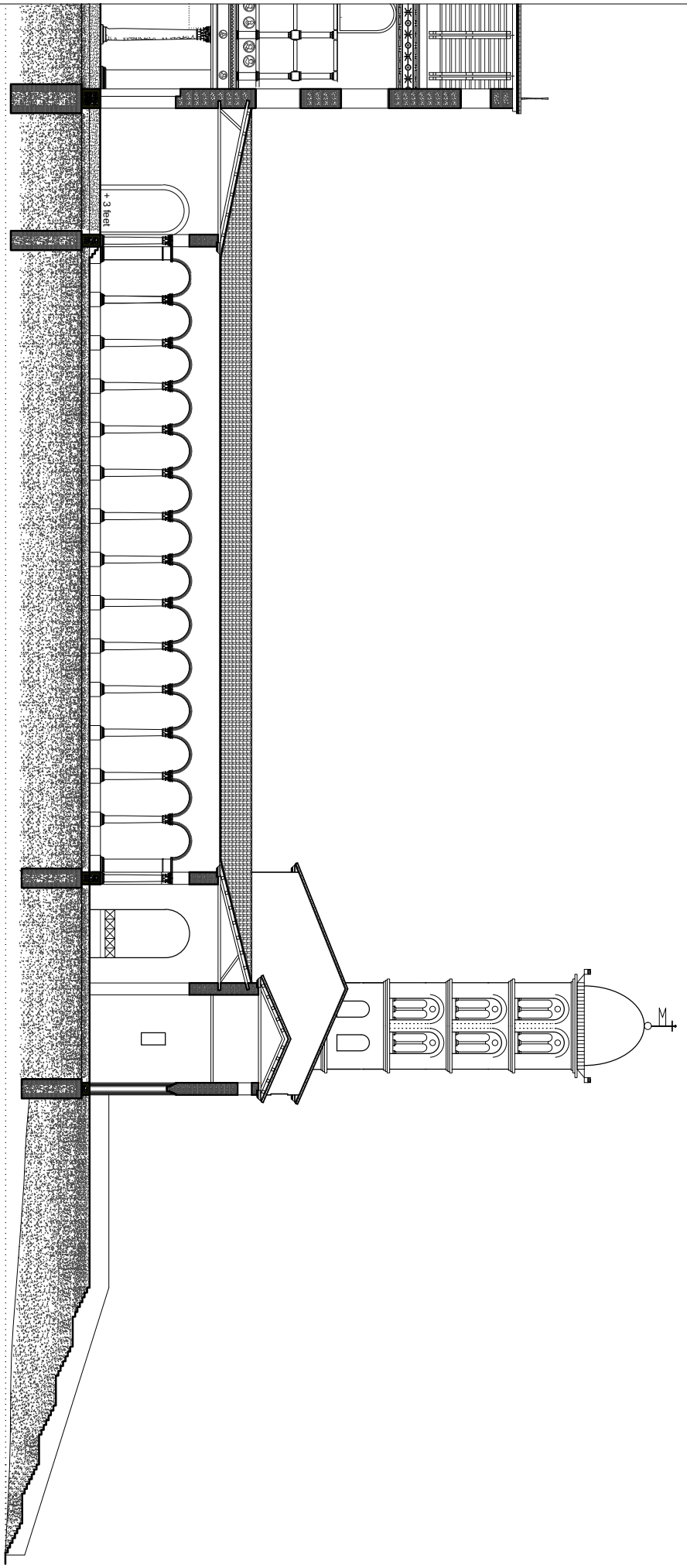
RESEARCH AND DRAWING LUIS DE GARRIDO

1003	Longitudinal section of the old basilica of S. Peter, in 1003	OSP	LS-1003



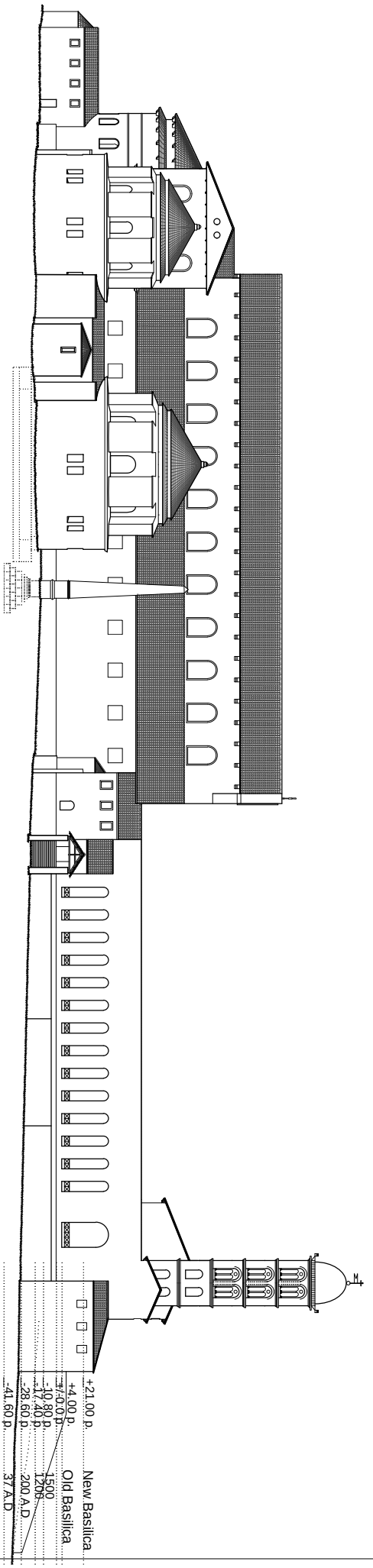
RESEARCH AND DRAWING LUIS DE GARRIDO

1003	Longitudinal section of the old basilica of S. Peter	OSP	LSa-1003



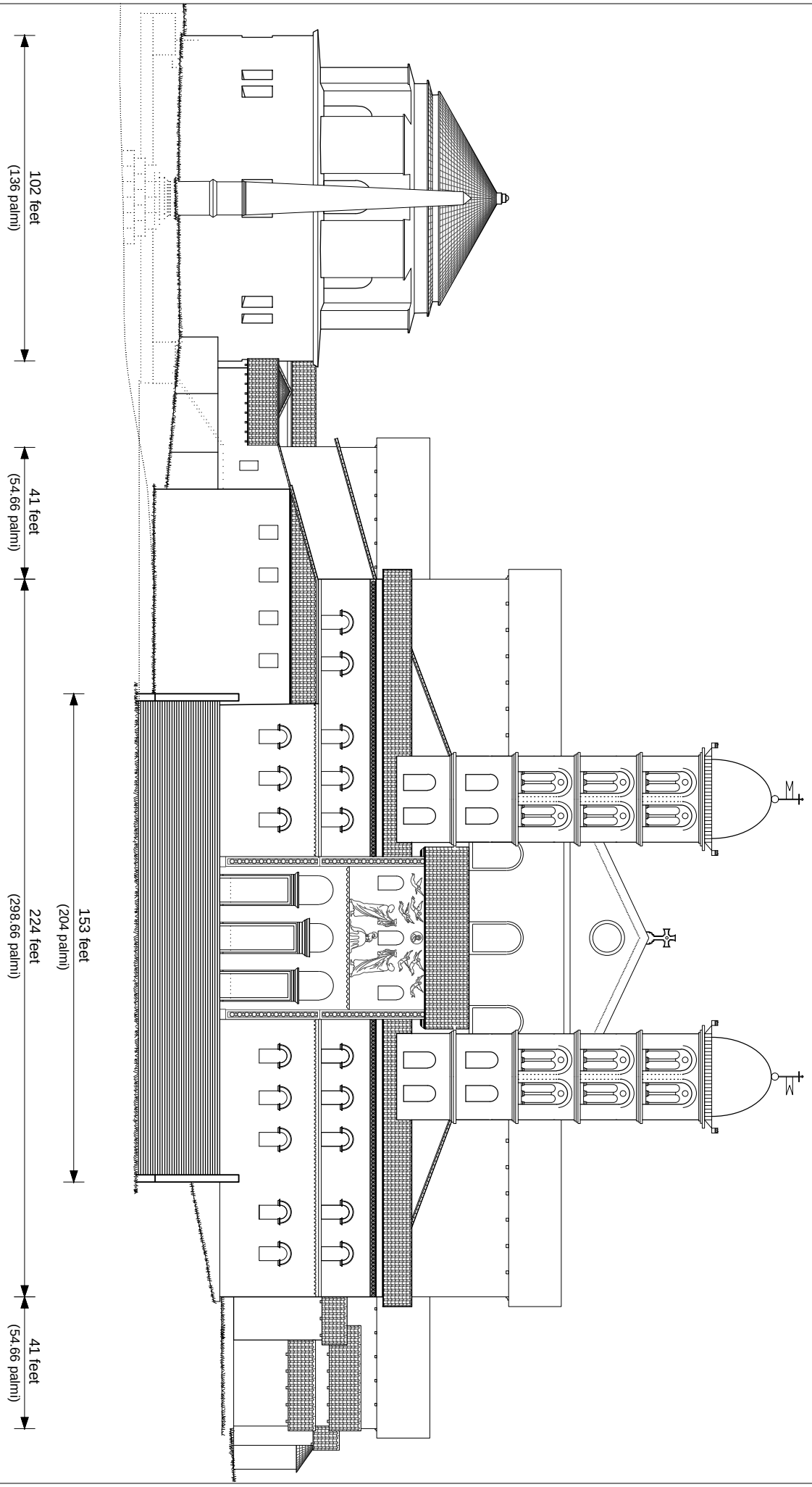
RESEARCH AND DRAWING LUIS DE GARRIDO

1003	Longitudinal section of the old basilica of S. Peter	OSP	LSb-1003



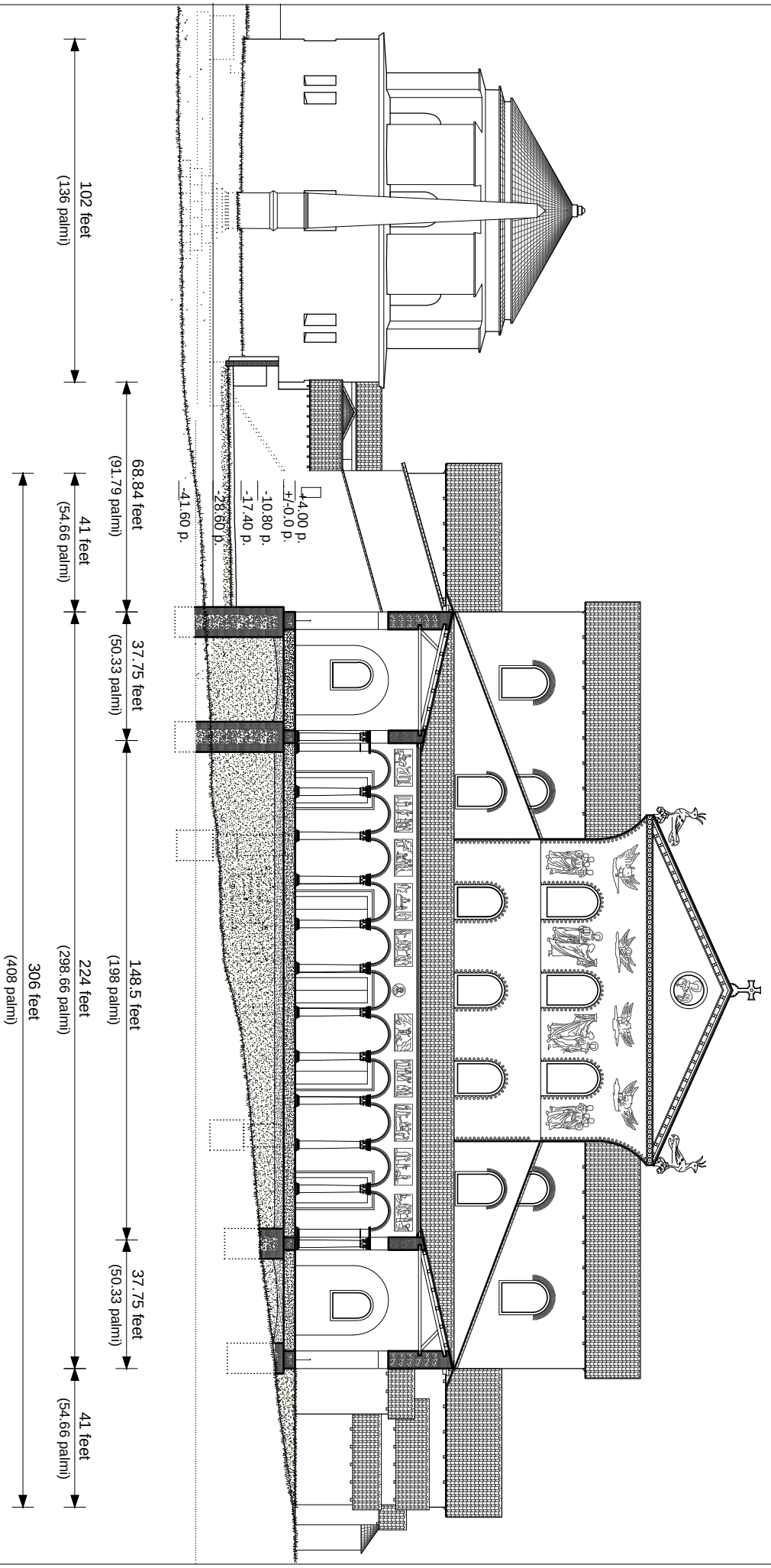
RESEARCH AND DRAWING LUIS DE GARRIDO

1003	South facade of the old basilica of S. Peter	OSP	SF-1003



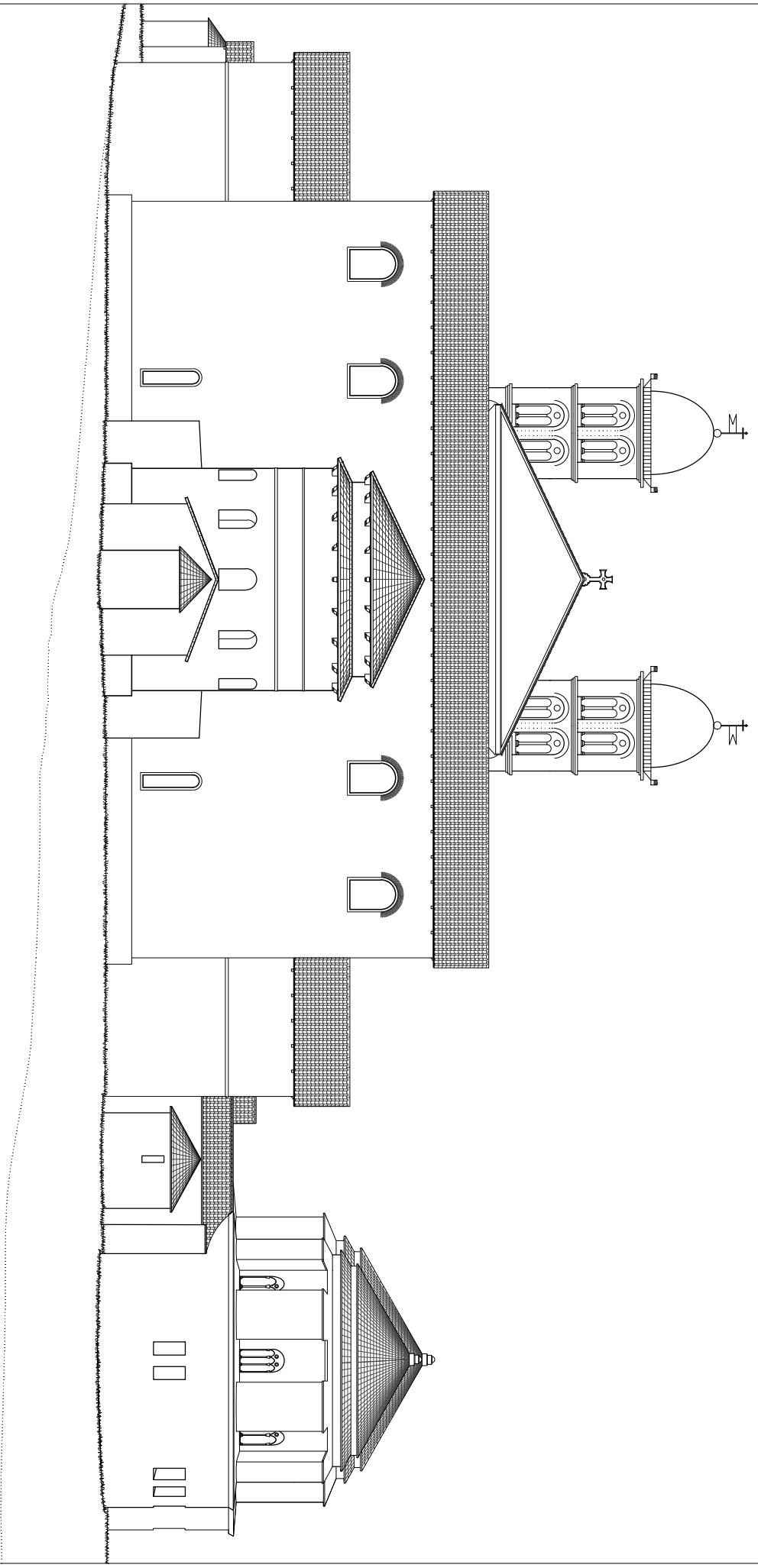
RESEARCH AND DRAWING LUIS DE GARRIDO

1003	East facade of the old basilica of S. Peter	OSP	EF-1003



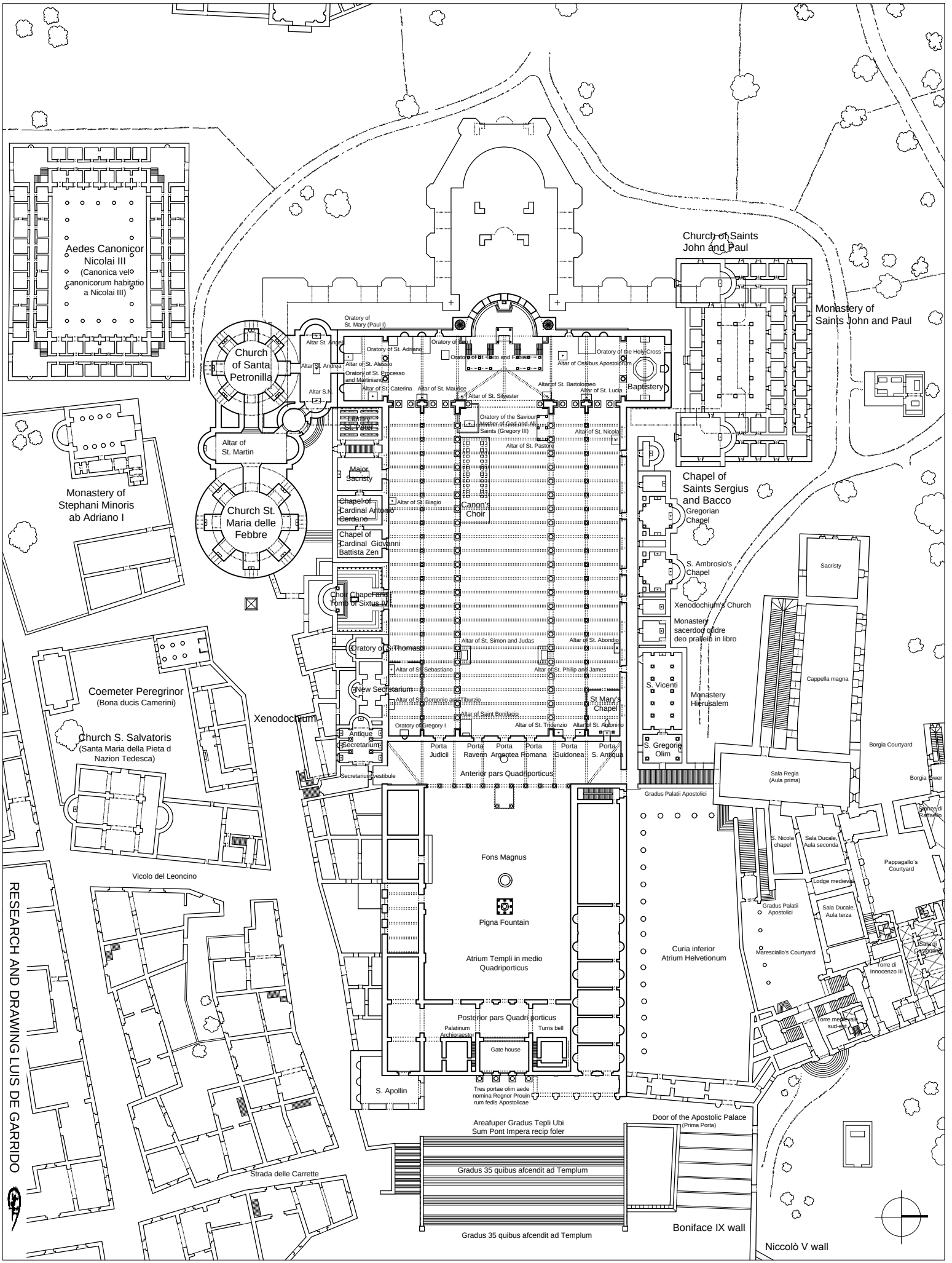
RESEARCH AND DRAWING LUIS DE GARRIDO

1003	East facade of the atrium of the old basilica of S. Peter	OSP	EFA-1003



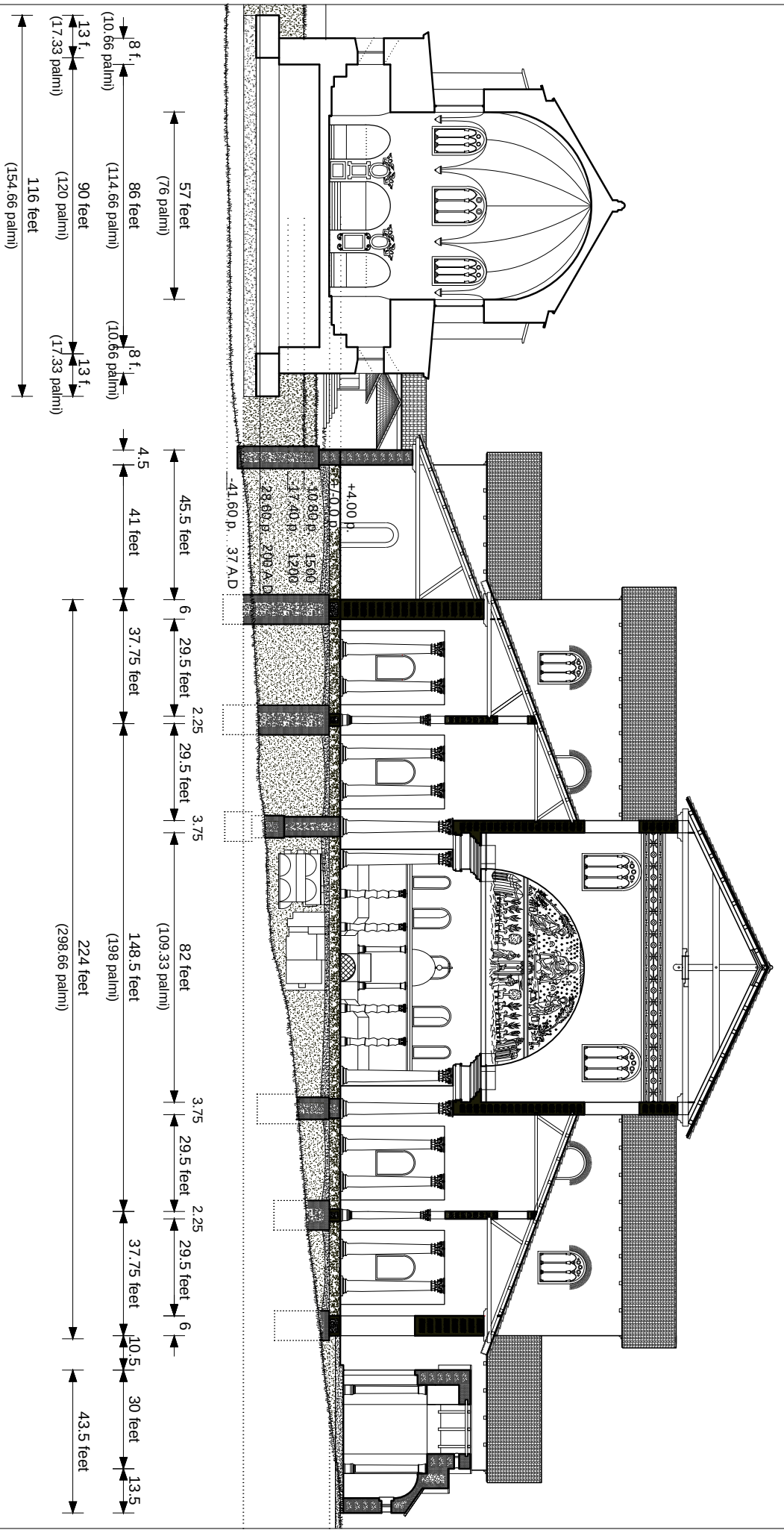
RESEARCH AND DRAWING LUIS DE GARRIDO

1003	West Facade of the old basilica of S. Peter	OSP	WF-1003



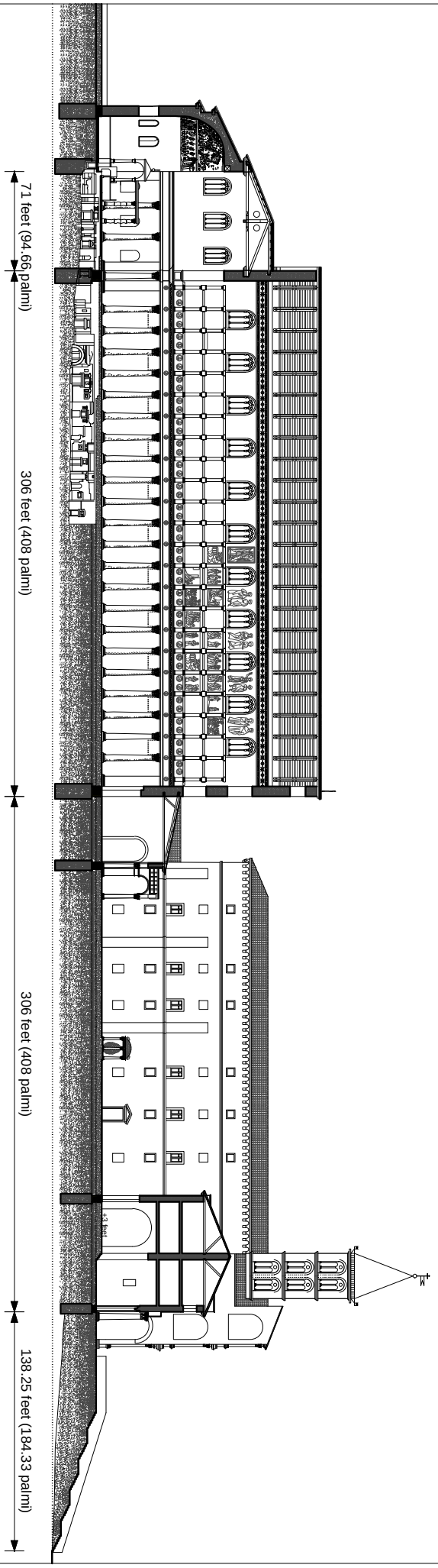
RESEARCH AND DRAWING LUIS DE GARRIDO

1505 A.C	JULIUS II (1503-1513). START OF THE NEW BASILICA PROJECT	OSP	FP-1505



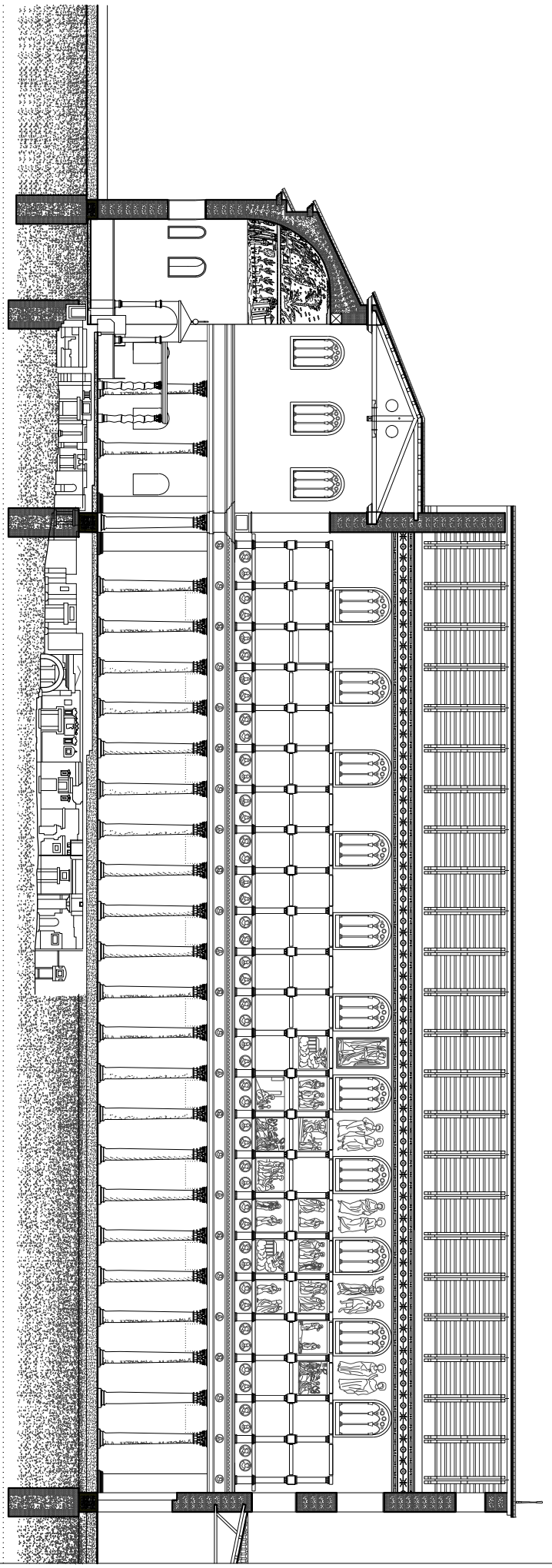
RESEARCH AND DRAWING LUIS DE GARRIDO

1505	Cross section of the old basilica of S. Peter	OSP	CS-1505



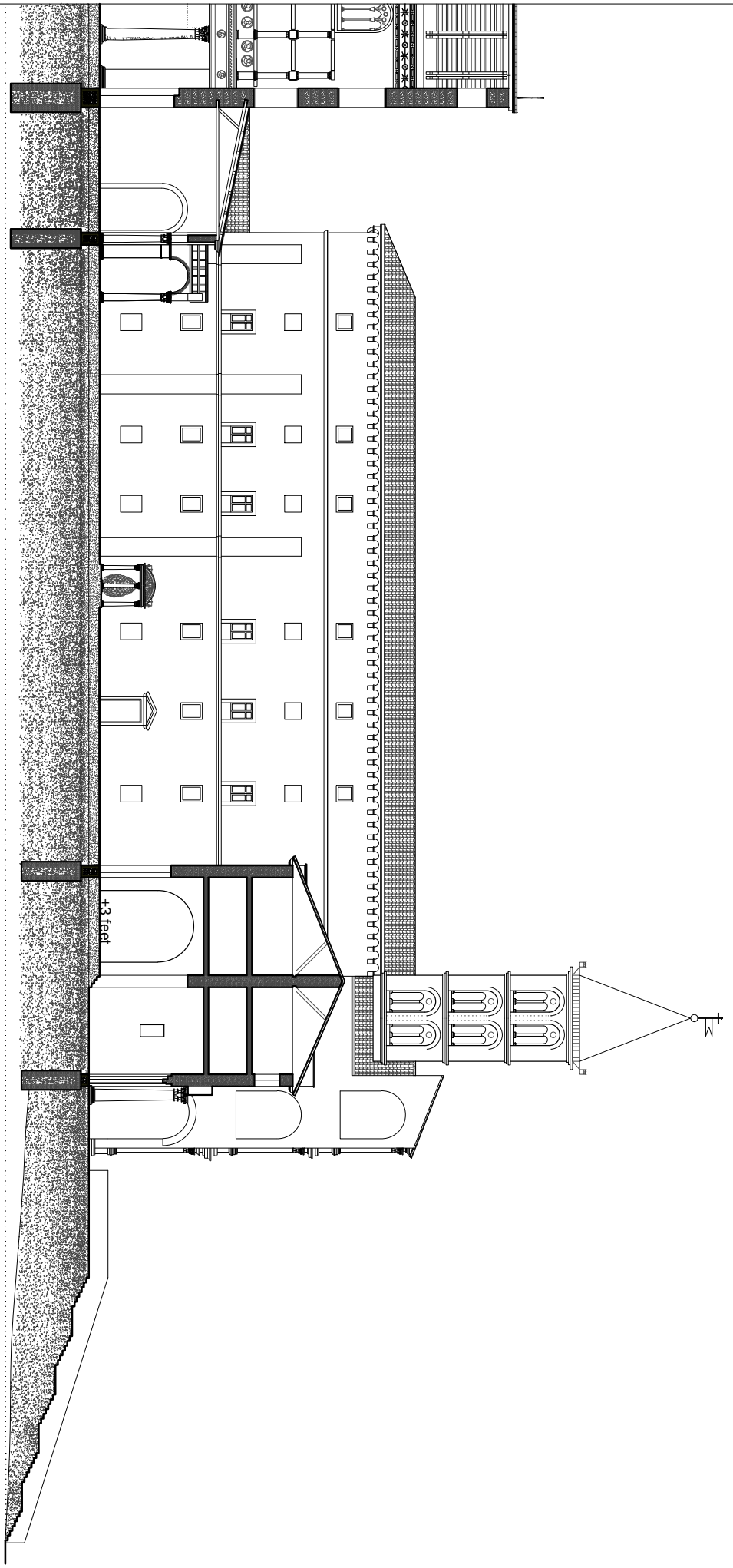
RESEARCH AND DRAWING LUIS DE GARRIDO

1505	Longitudinal section of the old basilica of S. Peter	OSP	LS-1505



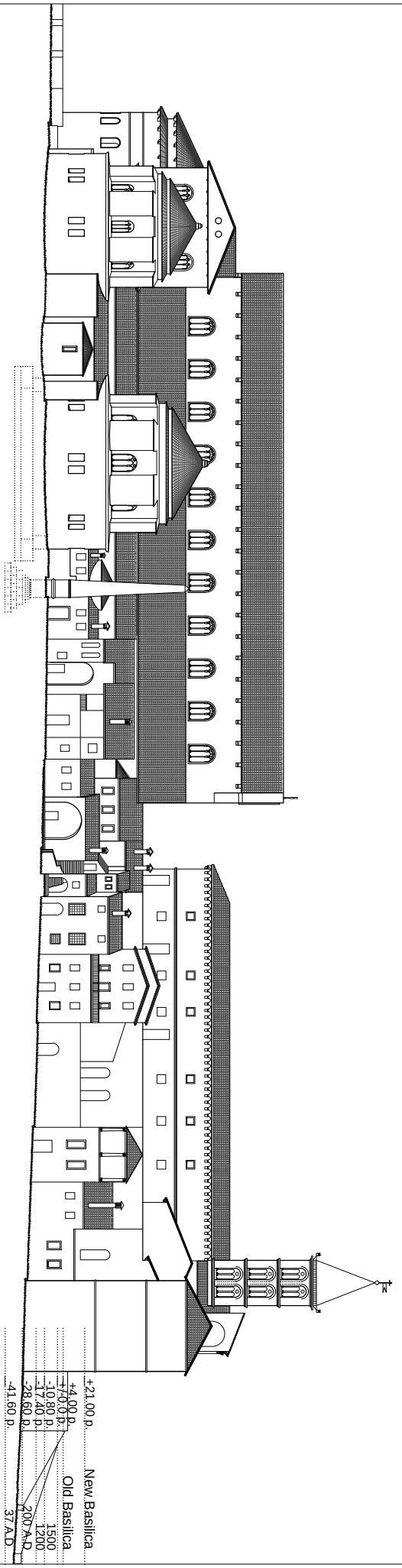
RESEARCH AND DRAWING LUIS DE GARRIDO

1505	Longitudinal section of the old basilica of S. Peter	OSP	LSa-1505



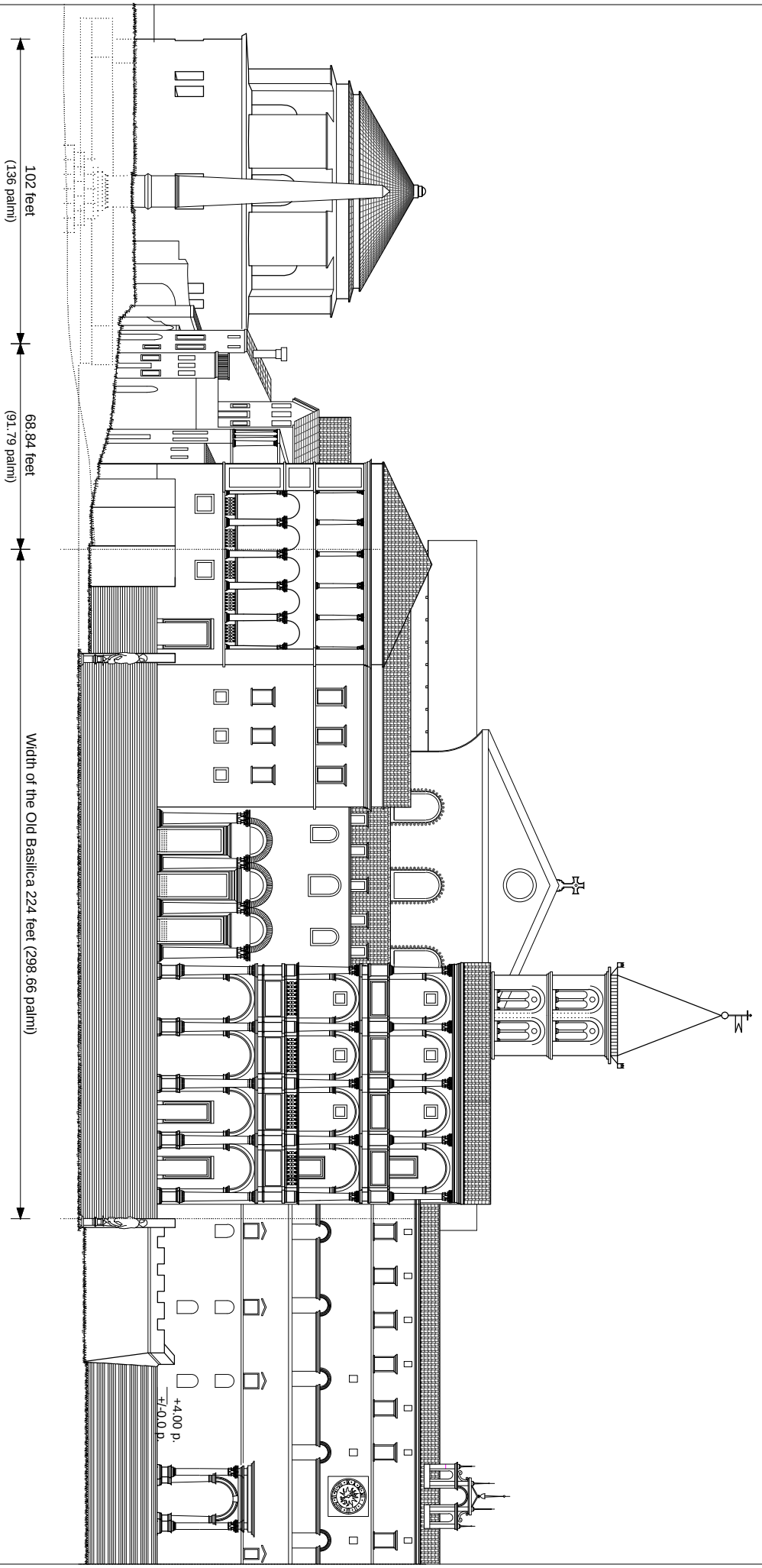
RESEARCH AND DRAWING LUIS DE GARRIDO

1505	Longitudinal section of the old basilica of S. Peter	OSP	LSb-1505



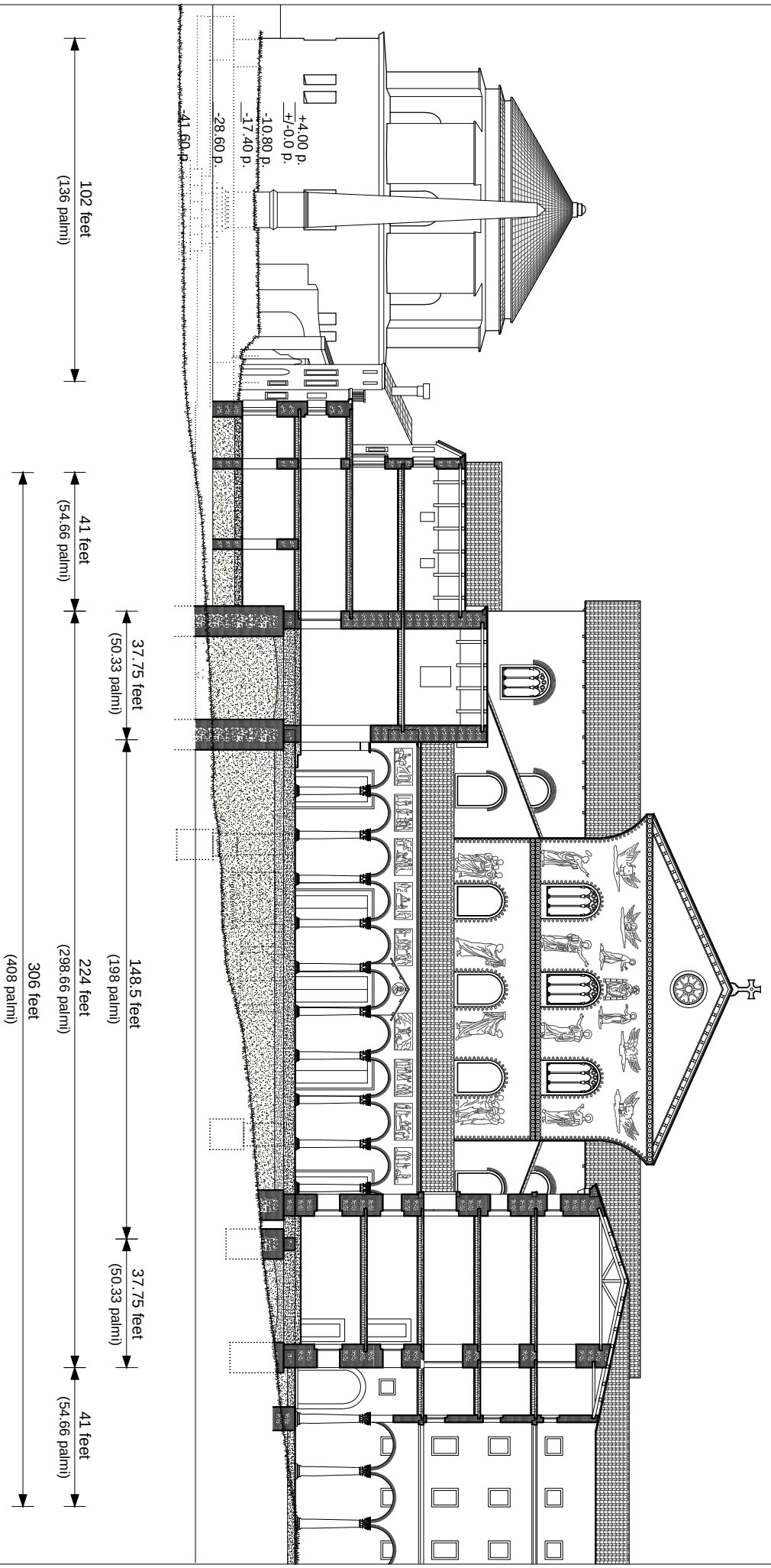
RESEARCH AND DRAWING LUIS DE GARRIDO

1505	South facade of the old basilica of S. Peter	OSP	SF-1505



RESEARCH AND DRAWING LUIS DE GARRIDO

1505	East Facade of the old basilica of S. Peter	OSP	EF-1505



RESEARCH AND DRAWING LUIS DE GARRIDO

1505	East facade of the atrium of the old basilica of S. Peter	OSP	EFA-1505

1505	West Facade of the old basilica of S. Peter	OSP	WF-1505